Networks, Commitment, and Competence: Caste in Indian Local Politics [*]

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Abstract

This paper widens the scope of the emerging literature on economic networks by assessing the role of caste networks in Indian local politics. We test the hypothesis that these networks can discipline their members to overcome political commitment problems, enabling communities to select their most competent representatives, while at the same time ensuring that they honor the public goods preferences of their constituents. Using detailed data on local public goods at the street level and the characteristics of constituents and their elected representatives at the ward level over multiple terms, and exploiting the random system of reserving local council seats for caste groups, we find that caste discipline results in the election of representatives with superior observed characteristics and the provision of a significantly greater level of public goods. This improvement in political competence occurs without apparently diminishing leaders' responsiveness to the preferences of their constituents, although the constituency is narrowly defined by the sub-caste rather than the electorate as a whole.

1   Introduction

Economists historically associated networks and other community-based institutions with nepotism, rent-seeking, and inefficiency. In recent years, however, this view has been replaced by a moderated position, which recognizes that these institutions can, under appropriate circumstances, facilitate economic activity when markets function imperfectly. Greif's (1993) analysis of the Maghribi traders' coalition and Greif, Milgrom, and Weingast's (1994) investigation of the medieval merchant guild highlight the role played by non-market institutions in solving commitment problems in the pre-modern economy. In the contemporary economy, a voluminous literature documents high levels of risk-sharing in informal mutual insurance arrangements throughout the world (e.g., Townsend 1994, Grimard 1997, Ligon, Thomas, and Worrall 2002, Fafchamps and Lund 2003, Cabrales, Calvo-Armengol, and Jackson 2003). The analysis of networks, as a second-best response to a variety of market failures, is now a rapidly growing area in economics. This paper widens the scope of this research program by examining the endogenous response by preexisting social groups, exemplified by the sub-caste in rural India, to commitment problems in representative democracies.

   To illustrate the inefficiency associated with the absence of commitment that we analyze in this paper, consider a local constituency in which a single political representative must be elected from among its residents, as in Osborne and Slivinski (1996) and Besley and Coate (1997). The elected representative must allocate a fixed level of resources (budget) to two public goods, sanitation and street lights, in the constituency. Individuals are heterogeneous in their preferences for public goods and those elected are not accountable to the electorate, choosing their preferred policy, measured by the mix of public goods, once in office. In a local election of this sort, it is straightforward to verify, under reasonable conditions, that the individual at the median of the distribution of preferences in the constituency will be selected in equilibrium. Now endogenize the total level of resources and allow individuals to differ on two dimensions – in their preference for public goods and their political competence. Assume that these two characteristics are correlated such that more competent leaders (e.g., individuals with managerial experience), who bring back a larger budget allocation from the center for their constituency when elected, also happen to prefer larger expenditures on, say, street lights. The tension that arises when accountability is absent is that the pivotal median voter would like to elect the most competent individual in the constituency as the leader but at the same time is aware that the share of resources subsequently allocated to street lights will exceed his own preferred allocation. If the horizontal (preference) dimension of leadership quality dominates the vertical (competence) dimension, the median individual will continue to be selected as the

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leader in equilibrium. This is evidently inefficient, since everyone would be better off if the most competent individual was selected and he could somehow commit to selecting a mix of projects that was aligned with the preferences of the median individual.[1]

According to the Chicago school (Stigler 1972, Becker 1983), electoral competition will ensure that the efficient outcome is obtained. If the pool of potential leaders is sufficiently large, as for example in a presidential election, there will be a wide range of competence levels at each preference point. The most competent individual with median preferences will then be selected in equilibrium. When the pool of potential leaders is limited, as in a local election, the promise of re-election may still be sufficient to discipline the most competent individual *ex post* and, therefore, ensure his selection. And even when term limits weaken these electoral pressures, political parties supporting particular platforms (preferences) can discipline the candidates they put forward from one election to the next (Alesina and Spear 1988, Harrington 1992).

In practice, however, electoral competition is restricted and formal disciplinary institutions are less active in political systems throughout the world. This is reflected in the observation from diverse settings that politicians' own preferences determine their policies. Washington (2008), for example, shows that politicians with daughters are more likely to vote for legislation advancing the interests of women in the United States and Chattopadhyay and Duflo (2004) show that when women are leaders (council heads) in India, the mix of public goods conforms more closely to the preferences of women in the population. Consider the Indian local governments that we analyze in this paper and describe in greater detail in Section 2. Each constituency or ward consists of just 70 households on average and the ward representative must reside there, severely restricting the pool of potential leaders. Moreover, the representative's position is randomly reserved for women and for members of historically disadvantaged castes from one election to the next, weakening re-election pressures. Finally, political parties are weak in developing countries, and they are especially weak at the local level even in countries such as the United States where they are otherwise well established (Ferreira and Gyourko 2009). Based on the preceding discussion, mediocre leaders endowed with representative preferences could end up being

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[1]In recent years, two independent literatures have emerged within the field of political economy separately addressing the vertical and the horizontal dimensions of leadership quality. One literature assesses how outside options and compensation in office (or punishments for corruption) alter both the average competence of candidates and the subsequent effort that democratically-elected leaders exert (Caselli and Morelli 2004, Messner and Polbern 2004, Ferraz and Finan 2008, 2011, Bobonis *et al.* 2010). A parallel literature assesses whether politicians' own preferences, as opposed to the preferences of the electorate, determine their policies (Levitt 1996, Pande 2003, Chattopadhyay and Duflo 2004, List and Sturm 2006, Washington 2008). We bring these two literatures and the two dimensions of leadership quality together by examining whether political accountability, by allowing candidates to credibly commit to particular policy choices once in office regardless of their preferences, results in the election of more competent leaders.

selected in the Indian local governments. Drawing on the recent literature that emphasizes the endogenous institutional response to market failures, however, we argue that this may not be the case. In particular, we explore the possibility that a preexisting social group – the sub-caste – may have expanded the domain of its influence from private economic activity to the public political sphere when democratic local elections were established in the 1990s, disciplining the representatives that it puts forward as candidates and allowing more competent individuals to be selected as representatives.

Close social interactions within the endogamous sub-caste or *jati*, which typically spans a wide geographical area covering many villages, smooth information flows and reduce commitment problems. Not surprisingly, insurance networks have historically been organized, and continue to be organized, around the sub-caste in rural India (Caldwell, Reddy, and Caldwell 1986, Munshi and Rosenzweig 2010, Mazzocco and Saini 2012). When urban jobs became available in the nineteenth century, with colonization and industrialization, these sub-castes supported the migration of their members and the subsequent formation of labor market networks (Morris 1965, Chandravarkar 1994, Munshi and Rosenzweig 2006). Recent evidence from urban India indicates that sub-castes continue to support occupational mobility when payoffs to such mobility emerge (Munshi 2011). We assess here whether ward representatives elected with the support of their sub-caste are both more competent and make decisions that reflect the preferences of the group, even if they do not expect to be elected in the future, to avoid the social and economic punishment they would face if they chose their individually optimal policies instead.

The survey data that we use in the empirical analysis and describe below are indicative of the importance of the sub-caste in local rural Indian politics. Key informants were asked to list the various sources of financial and organizational support that the elected ward representatives received in each of the last three elections. As described in Table 1, caste is clearly the dominant source of support: 82 percent of the elected ward representatives received support from their caste inside the village and 29 percent received support from caste members outside the village. Religious groups and wealthy individuals are evidently much less prevalent sources of support and, more importantly, just 41 percent of local representatives are reported to have received support from a political party. To establish a role for the sub-caste in disciplining its representatives, however, additional information is required. Ideally we would want to compare the characteristics of elected representatives and the level and mix of public goods across wards that are identical on all dimensions except for the presence of caste networks. Sub-caste networks are active throughout the country and so this experiment is unavailable. What we do instead is exploit the 73rd Amendment of the Indian Constitution, passed in 1991, which randomly changes the set

of sub-castes within a ward that are eligible to stand from one election to the next.[2] Based on a model of local representative democracy, this exogenous variation in who is eligible to run allows us to compare observed outcomes in ward-terms with and without caste discipline.

The model, which draws on the citizen-candidate models of Osborne and Slivinski (1996) and Besley and Coate (1997), begins with the case where residents of the ward, heterogeneous in both political competence and in preferences for public goods, stand independently and are not accountable to the electorate once elected. As with the example discussed above, the first result is that the individual with median preferences in the ward will be elected unopposed in equilibrium. Next, we allow a group of socially connected individuals in the ward to put forward their most competent member. It is assumed that the threat of future punishment is strong enough to ensure that this individual will select a mix of projects aligned with the preferences of a pivotal member of the group when elected, even if he only expects to hold office for a single term. In the context of local Indian elections, the group is the sub-caste. The second result of the model is that the caste representative will be elected if he is sufficiently more competent than the median individual in the ward and the gap in preferences between the median individual and the pivotal member of the sub-caste is sufficiently small. Under conditions which we verify empirically, this implies that the caste representative will be elected when the population-share of his group crosses a threshold level. A comparison of ward-terms above and below the threshold thus provides an estimate of the role of the sub-caste in selecting more competent leaders and in increasing the level of public goods.

The survey data that we collected describe the level and the composition (mix) of public goods, as well as the characteristics of all constituents and their elected ward representatives, for three election terms in over one thousand wards covering the major Indian states. Consistent with the predictions of the model, we find that the caste affiliation of elected representatives and their characteristics (plausibly associated with competence) change discontinuously above a threshold share. Assuming that this threshold share divides the sample into ward-terms with and without leadership commitment, our estimates indicate that the ability to discipline leaders increases overall public good provision within a ward by 14-17 percent, with a somewhat higher increase when women are leaders.

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[2]A number of studies have exploited the transformation of Indian local governments with the 73rd Amendment to examine the distribution of public and private goods across and within villages. Broadly consistent with our model, these studies find increased targeting of resources to historically disadvantaged castes when the president's position is reserved for members of those groups (Besley, Pande, Rahman, and Rao 2004, Duflo, Fischer, and Chattopadhyay 2005, Bardhan, Mookherjee, and Torrado 2005). They do not, however, derive conditions under which leaders will be disciplined to serve the interests of their group, nor do they analyze the consequences of this commitment for the competence of leaders selected in equilibrium.

A complete assessment of a leader's quality must be attentive to his choice of the mix of public goods and not just on the level of resources that he brings back to the constituency. Our theory tells us that the pivotal individual, whose preferences determine the mix of public goods, will shift from the median individual in the ward below the threshold to an individual with central (median) preferences in the leader's sub-caste above the threshold. Randomized caste reservation changes who is elected as well as the pivotal individual across election terms in the ward. Using this source of variation in the identity of the pivotal individual, we find that the same leader characteristics that increase discontinuously at a threshold share and are plausibly associated with competence (land wealth, occupation, schooling) also determine the mix of public goods. This indicates that the tension between voter preferences and the competence of the elected leader that underlies our model is an important feature of the local elections we study, highlighting the role played by the sub-caste in enforcing political accountability.

To test directly for leadership commitment, we complete the analysis by considering alternative specifications in which the characteristics of the elected representative rather than a pivotal individual determine the mix of public goods. Below the threshold, these characteristics do as good a job of predicting the mix of public goods as the characteristics of the pivotal individual (with median preferences in the ward) as they should. Above the threshold, however, they do not - we cannot reject the hypothesis that the ward representative's characteristics have no effect on the mix of public goods, which implies that he is choosing policies that diverge from his own preferences. The increase in the level of public goods that is observed above the threshold is thus obtained without sacrificing the leader's commitment to his constituents (within the sub-caste).

Although caste discipline may increase efficiency, its distributional consequences are not necessarily benign. Because the elected caste representative is answerable to the social group he belongs to, his choices will be aligned with the preferences of a pivotal individual in his sub-caste rather than the median individual in the constituency. There is also suggestive evidence indicating that caste representatives are targeting public goods to their own group. Caste discipline is a second-best solution and, ultimately, there is no perfect substitute for well-functioning political parties, which could put forward their representatives on a consistent policy platform, regardless of the reservation that is in place, from one election to the next.

2   Institutional Setting

The 73rd Amendment of the Indian Constitution, passed in 1991, established a three-tier system of local governments or *panchayats* – at the village, block, and district level – with

all seats to be filled by direct election. The village *panchayats*, which often cover multiple villages, were divided into 10-15 wards. *Panchayats* were given the power and the resources to make relatively substantial expenditures on public goods, and regular elections for the position of *panchayat* president and for each ward representative have been held every five years in most states.

The major responsibilities of the *panchayat* are to construct and maintain local infrastructure (public buildings, water supply and sanitation, roads) and to identify targeted welfare recipients. Although *panchayats* raise their own revenues, in large part through land and water usage taxes, these revenues accounted for just 12.6 percent of total annual expenditures in 2006-2007, the last complete years for the *panchayats* in our sample. The state government is the major source of funding, although *panchayats* also benefit from specific central government programs. Most of these external funds are allocated through the Sampoorna Grameen Rozgar Yojana (SGRY), an infrastructure scheme covering irrigation, drinking water, roads, etc., and a Block Grant to the *panchayat*.[3] The *panchayat* has complete control over the Block Grant, and assuming that it has similar autonomy over the revenue that it raises, our data indicate that 50.2 percent of its budget is discretionary. Combining the discretionary and non-discretionary components of the budget, we will later see that the major expenditure items include the construction and maintenance of drinking water and sanitation facilities, roads, electricity, street lights, public telephones, irrigation infrastructure, and public buildings. The delivery of education and health services, however, remains under the control of the state government.

How are *panchayat* expenditures allocated? The council makes decisions collectively (the president does not have veto power) and so the ability of an elected ward representative to channel public goods to his constituency will depend on his influence within the *panchayat* as well as his ability to ensure that the earmarked resources reach their destination. The mix of goods that the representative lobbies for will depend on whether the group he represents can exert discipline *ex post*, with the representative choosing his preferred mix when accountability is absent. What makes the *panchayats* especially interesting for an analysis of the consequences of political accountability is the system of randomized reservation, by caste and by gender, that was also introduced in the 73rd Amendment in 1991. The rule followed by almost all Indian states is that seats are reserved in each election for three historically disadvantaged groups – Scheduled Castes (SC), Scheduled Tribes (ST), and Other Backward Castes (OBC) – in proportion to their share of the

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[3]Based on the balance sheets collected from 40 *panchayats* in the state of West Bengal, Chattopadhyay and Duflo (2004) report that the Block Grant accounts for 33 percent, the SGRY (formerly known as the Jawhar Rozgar Yojana) 30 percent, and welfare programs 15 percent of the external funds. Our all-India data are broadly consistent with these statistics. These data indicate that in the years 2006 and 2007 Block Grants accounted for 43 percent of external funds and the SGRY another 15 percent of these funds.

population in each district. Within each of these categories, and in constituencies open to all castes in that election, one-third of the seats are reserved for women (Chattopadhyay and Duflo 2004). Seats are reserved randomly across wards and, for the position of the president, randomly across *panchayats*, from one election to the next in each district. The only restriction is that no seat can be reserved for the same group across consecutive elections (Besley, Pande, and Rao 2007).

Given the negative priors that the electorate will have about female politicians and politicians drawn from historically disadvantaged castes, council representatives chosen in reserved elections have little chance of being subsequently reelected. Chattopadhyay and Duflo (2004) note that not a single woman in their sample of reserved constituencies in the state of Rajasthan was elected in the subsequent term (without female reservation). Exposure can change these priors, but Beaman et al. (2009) find that it takes two reserved election terms before an increase in women elected in unreserved seats can be detected. Since reserved elections must be interspersed with unreserved elections within a constituency, existing (negative) priors will change very slowly and representatives in most reserved constituencies will be aware that they will hold office for a single term. The representatives with the greatest chance for re-election are men elected in unreserved seats. However, the probability that an unreserved election will be followed by another unreserved election within a constituency is just 0.4.[4] Assuming that leaders in reserved seats are never reelected in the subsequent election, the maximum fraction of incumbent representatives that can be elected from one term to the next is 0.16. Consistent with these low rates of re-election, only 14.8 percent of the ward representatives in our sample had held a *panchayat* position before. For the purpose of our analysis, reservation severely reduces the discipline of re-election in Indian local governments. At the same time, reservation randomly changes the set of sub-castes eligible to stand and, hence, the population share of the most numerous eligible sub-caste, from one election to the next. This allows us to examine the role of the sub-caste in disciplining its representatives, even when they only expect to hold office for a single term.

The basic rule in Hindu society is that individuals cannot marry outside the sub-caste or *jati* in which they are born.[5] Marriage ties built over many generations give rise to frequent interactions within a sub-caste and so exclusion from these interactions serves as a natural and extremely effective mechanism to sustain cooperative behavior. Recent evidence from urban India indicates that networks organized around the sub-caste

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[4]In our sample of 3,302 ward-terms, 60 percent were unreserved, 11 percent were reserved for SC candidates, 6 percent were reserved for ST candidates, and 23 percent were reserved for OBC candidates (see Table 2 below). With one-third of the seats in all categories reserved for women, this implies that unreserved elections would occur 40 percent of the time.

[5]Our data indicate that less than five percent of the over 14,000 marriages that are documented for all of the household heads and their immediate relatives crossed sub-caste lines.

provide jobs for their members and support occupational mobility when returns to mobility emerge (Munshi and Rosenzweig 2006, Munshi 2011). More importantly for the current analysis, these networks continue to serve as the main source of mutual insurance for their members in rural India, particularly for major contingencies such as illness and marriage (Caldwell, Reddy, and Caldwell 1986, Munshi and Rosenzweig 2010, Mazzocco and Saini, 2012). Exclusion from future social interactions and network services can be a powerful disciplining device. We assume in the model that the sub-caste can use the threat of such punishments to discipline its representative even if he only expects to hold political office for a single term. Note that the size of the sub-caste *within* the ward will have no bearing on the level of commitment that can be sustained since the collective punishments are organized at the level of the sub-caste as a whole, which extends beyond the ward and beyond the village. As shown below, sub-caste size in a ward and political commitment are related (in a particular way) only because the population share of the sub-caste affects the probability that its representative will be elected and a political equilibrium with commitment will be obtained.

3   The Model

The model developed in this section extends the citizen-candidate models of Osborne and Slivinski (1996) and Besley and Coate (1997) to a setting in which citizens differ both in their political competence and in their preferences for different public goods. We begin with the case where citizens stand as independent candidates, without institutional support, choosing their most preferred policies, measured by the mix of public goods provided, once elected. Subsequently, we allow for the possibility that a preexisting social group can discipline the candidate it puts forward. This allows the candidate to credibly commit to policies that diverge from his own preferences. The model generates tests of the central hypothesis that this discipline results in the selection of more competent leaders, using the data we have collected for this purpose. We make a number of assumptions for analytical convenience when deriving the results. Theoretical and empirical support for some of the important assumptions are provided in Section 5.

3.1   Individual Preferences and Leadership Quality

N individuals reside in a political constituency. The constituency is small enough that individual preferences and competence are common knowledge and no two individuals have the same preferences. Two public goods are provided in this constituency. Assuming Cobb-Douglas preferences and taking logs, individual i receives the following utility from

spending g_1, g_2 on the two goods:

$$U_i = (1 - \omega_i)ln(g_1) + \omega_i ln(g_2).$$

For a fixed total budget, $G \equiv g_1 + g_2$, the preceding expression can be rewritten in terms of the corresponding shares, $S_1 \equiv g_1/G$, $S_2 \equiv g_2/G$:

$$U_i = [(1 - \omega_i)ln(S_1) + \omega_i ln(S_2)] + ln(G).$$

Utility is separable in the total budget and the mix of public goods, and for a given G it is straightforward to verify that utility is maximized at $S_2 = \omega_i$.

Both the total budget and the mix of public goods; i.e. the share of the budget allocated to the second public good, are determined by the political leader selected by the residents of the constituency for a single term. The total budget allocated to the constituency is a function of the leader's competence. We allow the amount of resources that leader j is able to bring back for his constituency from the center to be correlated with ω_j. In practice, ω_j will be a function of characteristics such as education, occupation, and wealth. This is simply saying that these characteristics determine both preferences for different types of public goods and political competence. Empirical support for this assumption, which drives the results that follow, will be provided in Sections 6 and 7. In the context of the model with two public goods, we additionally assume without loss of generality that political competence is increasing in ω_j, which implies that $G(\omega_j)$ is an increasing function of ω_j.

When leader j is elected, he will select a mix of public goods that is aligned with the preferences of a pivotal individual k; i.e. the share of the budget allocated to the second public good will be ω_k. For the case without commitment, $\omega_k = \omega_j$. Individual i's utility when individual j is elected as the leader is thus:

$$U_i = [(1 - \omega_i)ln(1 - \omega_k) + \omega_i ln(\omega_k)] + ln(G(\omega_j)).$$

The expression in square brackets is maximized when $\omega_k = \omega_i$. It declines in value as ω_k moves away in preference-space from ω_i. Taking a linear approximation to this expression and to the $ln(G(\omega_j))$ function, we arrive at a specification of the individual's utility that precisely matches the specification in Osborne and Slivinsky (1996) and Besley and Coate (1997) except for an additional competence term,

$$U_i = -\gamma|\omega_k - \omega_i| + \beta\omega_j.$$

The first term in the expression above represents the horizontal (preference) dimension of leadership quality, measured by the disutility to individual i when a less preferred mix of

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public goods is chosen by the leader. The second term represents the vertical (competence) dimension of leadership quality, measured by the level of resources (total budget) that the leader can bring back for his constituency. The tension between these two dimensions of leadership quality is key to the analysis that follows.[6]

3.2   Equilibrium without Commitment

Elections are contestable and each resident in the constituency chooses whether or not to stand for election. The decision to stand is accompanied by an entry cost δ, which is close to zero. After all residents have simultaneously made their entry decision, the election takes place and the candidate with the most votes is declared the leader. Voters choose their preferred candidate without coercion or regard to social affiliation *per se*. We restrict attention to single-candidate equilibria. Although it is standard practice to consider two-candidate equilibria in models of multiparty elections, single-candidate equilibria arise naturally in local elections with complete information where ties between candidates will seldom occur. In fact, a single candidate stood for election in 65 percent of our ward-terms.

We begin by considering equilibria without leadership commitment. Individuals stand as independent candidates, without party or social affiliation. Because leaders are elected for a single term, this implies that they will choose their preferred mix of public goods *ex post*. We assume that the horizontal dimension of leadership quality dominates the vertical dimension, $\gamma > \beta$, which provides us with the first result.[7]

Proposition 1. *The individual with median preferences in the constituency stands unopposed for election.*

It is straightforward to verify that the unique equilibrium is characterized by the individual with median preferences in the constituency, m, standing unopposed (the implicit assumption here is that N is odd). Normalize so that the utility obtained in a constituency without a leader is zero. The median individual will not deviate from the equilibrium because $\beta m > 0$. No other individual wants to deviate and stand for election (with its associated cost) since he would receive fewer votes than the median individual. Any individual with $\omega < m$ would certainly lose to the median individual since all individuals with preferences greater than m would vote for the median individual. He is more competent than his

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[6]Although much of the analysis in Besley and Coate focuses on the horizontal dimension of leadership quality, an extension to their model does introduce a vertical (competence) dimension. Besley and Coate specify a Cobb-Douglas utility function and allow preferences and competence to be correlated, as in our model. However, individuals choose between a public and a private good in their model, and the leader's competence is measured by the ability to provide the public good at lower cost. Both models predict that the absence of commitment results in the selection of less competent leaders, but our model goes further to generate tests of this prediction.

[7]If this were not the case, then the most competent individual would always be selected as the leader. This is inconsistent with the empirical results reported below.

rival and is closer in preference-space (on the horizontal dimension) to them. To see why even an individual with $\omega > m$ would not stand, consider an alternative candidate with ability $\omega_j > m$. For any individual with ability $\omega \leq m$, $\beta m - \gamma(m - \omega) > \beta \omega_j - \gamma(\omega_j - \omega)$ for $\gamma > \beta$. A majority of the electorate will thus continue to vote for the median individual. By the same argument, no strategy profile in which someone other than the median individual stands for election can be supported as an equilibrium. When entry costs are close to zero, the median individual will always deviate from such an equilibrium, stand for election and subsequently get elected.

3.3 Equilibrium with Commitment

Although we continue to assume that leaders are elected for a single term and that political parties are absent, we now introduce a social group that is capable of disciplining its members. This group is characterized by the following properties: (i) its scale or *size*, measured by its share of the population in the constituency, S_c, (ii) its *location* in the distribution of preferences in the constituency, measured by the preferences of a pivotal (central) individual, m_c, and (iii) the preferences of its most competent member $\overline{\omega}_c$.

Individuals strictly prefer more to less public goods and so the leader put forward by the social group will be its most competent member. If social punishments are effective, this leader can credibly commit to choosing a mix of public goods that is aligned with the preferences of the pivotal member of the group, with preferences $m_c < \overline{\omega}_c$ (by definition). For commitment to be obtained, the social punishment, P, must exceed the gain to the leader from deviating and choosing his preferred mix of public goods, $\gamma(\overline{\omega}_c - m_c)$. If this condition is satisfied then the result below tells us that the group's representative will be elected if he is sufficiently competent and if m_c is sufficiently close to m.

Proposition 2. *(a) An equilibrium with commitment is obtained if and only if the individual with median preferences in the constituency prefers the group representative to himself as the leader. (b) The leader selected in the equilibrium with commitment is more competent than the median individual.*

We prove part (a) for two cases: (i) $m_c < m$, and (ii) $m_c > m$. For each case we derive the condition under which the median individual in the constituency prefers the group representative to himself as the leader. When this condition is satisfied, we show that the commitment-equilibrium in which the group representative stands unopposed is the unique equilibrium. If the derived condition is not satisfied, we show that the equilibrium without commitment in which the median individual in the constituency stands unopposed is the unique equilibrium.

Case 1: $m_c < m$.

The group representative, who is endowed with ability $\overline{\omega}_c$, chooses a mix of projects that is aligned with the preferences of the pivotal member of his group. The median individual in the constituency will prefer the representative to himself as the leader if $\beta\overline{\omega}_c - \gamma(m - m_c) > \beta m$. Rearranging terms, the required condition is

$$\frac{\overline{\omega}_c - m}{m - m_c} > \frac{\gamma}{\beta}. \tag{1}$$

To show that the commitment-equilibrium is the unique equilibrium when inequality (1) is satisfied, we first show in the Appendix that no one wants to deviate from this equilibrium. We then verify that no other equilibrium can be supported when condition (1) is satisfied. To complete the proof of case 1 we show that the equilibrium without commitment, where the median individual in the constituency stands unopposed, is the unique equilibrium when condition (1) is *not* satisfied.

Case 2: $m_c > m$.

The median individual in the constituency will now prefer the group representative to himself as the leader if $\beta\overline{\omega}_c - \gamma(m_c - m) > \beta m$.

Rearranging terms, the required condition is

$$\frac{\overline{\omega}_c - m}{m_c - m} > \frac{\gamma}{\beta}. \tag{2}$$

We go through the same steps as in case 1 to complete the proof of part (a) (see the Appendix).

Having established conditions under which a commitment-equilibrium is obtained, we now proceed to compare the competence of leaders selected in equilibria with and without commitment. The right hand side of inequality (1) and inequality (2) is positive and the denominator on the left hand side of both expressions is also positive. Therefore, it must be that $\overline{\omega}_c > m$ in both inequalities to complete the proof of the proposition. Intuitively, the median individual will only prefer the group representative to himself, as required by part (a) of the proposition for an equilibrium with commitment, if the group representative dominates him sufficiently on the vertical dimension (the median individual will not prefer anyone to himself on the horizontal dimension).

3.4 Group Size, Commitment, and Competence

Inequalities (1) and (2) specify conditions under which an equilibrium with commitment will be obtained in terms of $\overline{\omega}_c$ and m_c. However, only a single source of variation in group characteristics, generated by caste reservation, is available to test the model. To derive the predictions of the model in terms of a single group characteristic, we begin by placing restrictions on the relationship between $\overline{\omega}_c$ and S_c, m_c:

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A1. $\overline{\omega}_c = w(S_c, m_c), \quad w_1(S_c, m_c) > 0, \quad w_2(S_c, m_c) > 0.$

This assumption simply says that fixing the group's location in the preference distribution, an increase in its size will increase maximal competence in the group, $\overline{\omega}_c$. Holding constant the group's size, a rightward shift in its location will similarly increase $\overline{\omega}_c$.

Given these mild restrictions, the predictions of the model can be derived in terms of either S_c or m_c. S_c is the group's population share, which can be directly computed. In contrast, m_c will be measured by multiple characteristics in the empirical analysis, including the land wealth, occupation, and schooling of the pivotal individual in the group. It will thus be convenient to derive the predictions of the model in terms of S_c. This requires us to place additional restrictions on the relationship between m_c and S_c. When a social group is a minority in a population, it tends to be either relatively disadvantaged or an elite. As it grows larger, it will naturally become more representative of the population. This implies that m_c could be either increasing or decreasing in S_c. We will verify in Section 5 that the former condition applies to our data using alternative measures of m_c. This provides the following restriction:

A2. m_c is increasing in S_c.

Given A2, it follows from A1 that $\overline{\omega}_c$ is increasing in S_c. Proposition 2 can then be restated as follows:

Proposition 3. *(a) The probability that an equilibrium with commitment will be obtained is zero up to a threshold $\underline{S}$ and one thereafter until a share $\overline{S} > \underline{S}$. (b) The competence of the elected leader will increase discontinuously at that threshold.*

m_c and $\overline{\omega}_c$ are increasing in S_c from assumptions A1 and A2. When S_c is close to zero, this implies that m_c and $\overline{\omega}_c$ will be close to zero. The left hand side of inequality (1) will be negative and the commitment-equilibrium will not be obtained. As S_c increases, the left hand side will increase monotonically until it just equals the right hand side at a threshold share $\underline{S}$. Notice that $m_c < m$ at $\underline{S}$, since the left hand side will certainly exceed the right hand side when m_c is very close to m. Once a commitment-equilibrium is obtained, it will continue to be sustained as S_c increases as long as $m_c \leq m$. It will also be sustained for $m_c > m$, from inequality (2), as long as $m_c - m$ is sufficiently small. Thus, there exists a share $\overline{S} > \underline{S}$ up to which the commitment-equilibrium will continue to be sustained. If m_c is not increasing too rapidly in S_c, then the commitment-equilibrium will be obtained over the entire range, $S_c \in [\underline{S}_c, 1]$.

These changes in the political equilibrium map directly into leader competence. Up to $\underline{S}$, the leader's competence will be m, at $\underline{S}$ it will increase discontinuously to $\overline{\omega}_c > m$. A corollary to this result is that the probability that the selected representative belongs to the group will also increase discontinuously at $\underline{S}$.

Competence will continue to increase from $\underline{S}$ to $\overline{S}$ since $\overline{\omega}_c$ is increasing in S_c. However, it will decline and return to m above $\overline{S}$. The model does not have precise predictions for the relationship between the leader's competence and S_c above the threshold. Our focus in the empirical analysis will thus be on identifying the presence of a threshold and estimating the increase in competence at that threshold share. This will allow us to compare competence when leaders can be disciplined with the counter-factual competence that would have been obtained in a political system with no commitment, measured by competence below the threshold. The discontinuity at a threshold will also help rule out an alternative explanation for the increase in competence in Section 6, based on the change in the pool of potential leaders with reservation rather than the change in the selection rule as implied by the model.

4   The Data

The data that we use are unique in their geographic scope and detail. They are from the 2006 Rural Economic and Development Survey, the most recent round of a nationally representative survey of rural Indian households first carried out in 1968. The survey, administered by the National Council of Applied Economic Research, covers 242 of the original 259 villages in 17 major states of India. We make use of two components of the survey data - the village census and the village inventory - for 13 states in which there were ward-based elections and complete data in both components.[8] The census obtained information on all households in each of the sampled villages. The village inventory was designed in part to specifically assess models of public goods delivery, collecting information on the characteristics of the elected ward representatives and public good provision at the street level in each ward in each of the last three *panchayat* elections prior to the survey.

The complete census of households in the sampled villages provides characteristics that plausibly determine the preferences of each household/individual for different public goods. The census collected information on the landholdings of each household, as well as the occupation and education of the household head. We use the value of landholdings (in logs), a variable indicating whether or not the household head is engaged in a managerial occupation, and his education (in years) to measure preferences in the empirical analysis.[9]

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[8]The states are Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Rajastan, Tamil Nadu, Uttar Pradesh, and West Bengal. Punjab and Jharkhand did not have any ward-based elections and the election data are not available for Gujarat and Kerala.

[9]The occupation variable takes the value one if the household head runs either a farm or nonfarm business and zero if he is employed in a professional occupation, skilled labor, unskilled labor, agricultural labor, or housework.

The model assumes that characteristics that determine preferences for different types of public goods are also associated with political competence. This is the source of the tension between the horizontal and vertical dimensions of leadership quality that generates a need for political accountability. We thus use the same variables that are associated with preferences as determinants of political competence in the empirical analysis (further support for their association with competence is provided below).

The village inventory includes a special module that collected information on two characteristics – the education and the occupation – of all of the elected representatives from each ward in each of the last three election terms. Schooling of the elected ward representative is measured in four categories – illiterate, primary graduate, secondary graduate, and post-secondary graduate – and we convert these categories to years to match up this variable to the education measure used to measure preferences with the village census data.[10] We similarly construct the same variable for the ward representative's occupation as we use to measure preferences with the census data, namely whether or not he is engaged in a managerial occupation.

Although the village inventory does not collect information on the representative's landholdings, the census data indicate whether or not the household head (or any family member) was a candidate for the last two elections preceding the survey. 87 percent of the ward elections had at most two candidates, with 65 percent having a single candidate. We can thus use information on the the (log) value of land owned by the candidates in each election, which is available from the census, to construct a measure of political competence that is highly correlated with the wealth of the elected representative and which corresponds to the variable that we use to measure preferences.

The village inventory also obtained information on whether new construction or maintenance of specific public goods *actually* took place on each street in the village for each term. These local public goods include drinking water, sanitation, improved roads, electricity, street lights, and public telephones as well as schools, health and family planning centers, and irrigation facilities. The survey was designed to permit the mapping of street-level information into wards so that public goods expenditures can be allocated to each ward, and its constituents, for each election term. The combined data set covers 1085 wards in 136 villages. Ninety-five percent of the wards have information for at least two elections.

Households provided their sub-caste and religion in the village census.[11] On average,

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[10]Years of schooling are imputed by assigning 4 years of schooling to primary graduates, 10 years of schooling to secondary graduates, and 14 years of schooling to post-secondary graduates.

[11]A sub-caste group is any set of households within a village reporting the same sub-caste name. Most of the Muslim households provided sub-caste (*biradari*) names. We also counted Muslim households within a village that were without a formal sub-caste name as a unique sub-caste.

there are seven wards per village, 67 households per ward, and six sub-castes per ward. The census thus allows us to compute the population share of each sub-caste in each ward. Proposition 3 tells us that the competence of the elected representative and, hence, the level of public good provision will increase discontinuously above a threshold population-share. As discussed below, the most numerous sub-caste is best positioned to challenge the median individual in a ward election. The simplest test of the proposition would then be to regress the characteristics of the elected ward representative or the level of public goods received by the ward (its total budget) on the population share of the most numerous sub-caste. In a cross-section of wards, a change in the representative's characteristics and higher level of public good provision when the share crossed a threshold level would be consistent with the proposition. However, a ward with a numerically dominant sub-caste is also likely to be less fractionalized along caste lines. This result could alternatively reflect the well documented fact that the willingness to invest in public goods, and the accompanying desire to select a more competent representative, is higher in less fractionalized populations (see, for example, Miguel and Gugerty 2005). To avoid such potentially confounding effects, we take advantage of randomized caste reservation in Indian local governments, which exogenously changes eligibility and thus changes the population share of the most numerous *eligible* sub-caste in the ward from one election to the next. This variation in the population share over time allows us to subsume all permanent characteristics of the ward, including the demand for public goods by the electorate, in a fixed effect.[12]

Is there sufficient variation in the population-share of the most numerous eligible sub-caste over election terms within a ward to test Proposition 3? As described in Section 2, ward elections are reserved for Scheduled Castes (SC), Scheduled Tribes (ST), and Other Backward Castes (OBC) in proportion to the share of these groups in the population at the district level. Among the 3,300 ward-terms in our sample, 11 percent were reserved for Scheduled Castes, 6 percent were reserved for Scheduled Tribes, and 23 percent were reserved for Other Backward Castes. Panel A of Table 2 describes the share of the most numerous eligible sub-caste in the ward by type of election. These shares are generally quite large, even in reserved elections, reflecting the fact that neighborhoods in rural India are often dominated by a single sub-caste. Nevertheless, there is substantial variation in population shares across reservation categories. Panel B of Table 2 displays the fraction of ward-terms in which the share of the most numerous eligible sub-caste exceeds alternative

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[12]The implicit assumption when we include the ward fixed effect is that the population of the ward, or the electorate, remains essentially unchanged over time. This is a reasonable assumption given the unusually low spatial mobility that is characteristic of rural India. Munshi and Rosenzweig (2010), for example, report that permanent migration rates of men aged 20-30 out of their origin villages were as low as 8.7 percent in 1999. The corresponding rates for entire households would be much lower. Indeed, the census listing data indicate that since 1991 when the local electoral system was put in place, less than 3 percent of new households had migrated into the sample villages.

pre-specified thresholds, by the type of reservation. Matching the descriptive statistics in Panel A, the proportion of elections in which the threshold is exceeded is largest for unreserved elections, followed by elections in which the ward candidates are restricted to ST, OBC, and SC in that order, regardless of the threshold that is specified. Just as the likelihood that any threshold is crossed varies across different reservation schemes in Table 2, there will be variation in the likelihood that the threshold will be crossed and a commitment-equilibrium will emerge from one term to the next *within* a ward as the type of reservation changes. It is possible that the pool of potential candidates will be weaker in reserved (lower caste) elections where a commitment-equilibrium is less likely to be obtained. All the regression specifications in this paper consequently include a full set of reservation dummies in addition to ward fixed effects.

5 Testing the Assumptions of the Model

This section provides theoretical and empirical support, in the context of Indian local politics, for four important assumptions of the model.

1. Only one social group can compete with the median individual: Many sub-castes in rural India will be able to support leadership commitment, using *ex post* social sanctions as a disciplining device. Restricting attention to a single group in the model is reasonable, however, if the representative from only one group in the constituency has a credible chance of winning the election. In our data, there is usually one sub-caste that is numerically dominant in a ward for any given election type, with a large drop from the size of the largest sub-caste to next largest. In particular, the average share of the most numerous sub-caste in the ward across all elections is 0.71, while the average for the next most numerous sub-caste is 0.22.

The model implies that numerical dominance is not necessary or sufficient for the median individual to prefer the group representative. From inequalities (1) and (2), the group representative will be preferred if $V \equiv \left(\frac{\overline{\omega}_c - m}{|m - m_c|} \right)$ exceeds a critical value. $\overline{\omega}_c$ is an increasing function of the group's population share S_c from assumptions A1 and A2. The probability that the group representative will be elected is therefore increasing in S_c. But it is also decreasing in $|m - m_c|$. A sub-caste that is smaller than the most numerous sub-caste but more centrally located in preference-space could, in principle, put its most competent member forward and win an election.

The data indicate, however, that the most numerous eligible sub-caste in the ward is in almost all elections the only sub-caste that can challenge the median individual. In the equilibrium without commitment, the pivotal individual has median preferences in the ward. In the equilibrium with commitment, the model stipulates that the pivotal

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individual is centrally located in preference-space within the group. In the empirical section of the paper, we assume that this individual has median preferences in the sub-caste. The preferences of the pivotal individuals, m and m_c, will thus be measured by the median value of each of the three preference variables (land value, occupation, and education) within the ward and within the sub-caste, respectively. $\overline{\omega}_c$ will be the maximal value of each variable within the sub-caste.

Given these values of m, m_c, and $\overline{\omega}_c$, which are available for each sub-caste from the census, V is larger for the most numerous sub-caste relative to the next most numerous sub-caste in the ward more than 92 percent of the time. This result and all of the empirical results in this paper are robust to the alternative assumption that the pivotal individual in the commitment-equilibrium is located at either the 40th percentile or 60th percentile value for each preference variable. It thus seems reasonable to assume, both in the model and the empirical analysis that a single group – the most numerous eligible sub-caste in the ward in a given election – is the only viable group to support an equilibrium with commitment.

2. Inter-group sanctions and coalitions are ruled out: Exclusion from social interactions is an effective disciplining mechanism within the sub-caste because these interactions are frequent and economically and socially important. Given the spatial segregation by caste that is characteristic of the Indian village and given the historical restrictions on inter-caste social interactions, a similar collective disciplining mechanism is unavailable to maintain cooperation *between* sub-castes. Inter-caste coalitions could form even if punishments were absent if long-term alliances could be maintained. The randomized reservation scheme described in the previous section rules out long-term political coalitions and it follows that the caste representative cannot commit to implementing policies that diverge from the preferred choice of the pivotal member of his group in equilibrium.

3. Social groups cannot be excluded from receiving public goods: The model implicitly rules out the targeting of public goods *within* the constituency. If there is a private component to the public goods being delivered, as for example with water pipes and latrines, the caste representative cannot credibly commit *ex ante* to delivering services uniformly within the ward once he is elected, following the same argument as above. For the special case where he targets resources exclusively to his sub-caste, no one outside that group will vote for him in equilibrium. Without outside support, the requirements for an equilibrium with commitment are more stringent; condition (1) or (2) must be satisfied *and* the share of the most numerous eligible sub-caste must exceed 0.5. The equilibrium with commitment will then be obtained at max $(0.5, \underline{S})$. Note that while the threshold share may shift with targeting, the qualitative predictions of Proposition 3 remain unchanged.

4. The median individual in the ward is eligible to stand for election: We

assume in the model and in the empirical analysis that the median individual in the ward is eligible to stand for election in the equilibrium without commitment. This equilibrium will be obtained in elections where the population share of the most numerous eligible sub-caste falls below a threshold share, which we later estimate at 0.5. This is more likely to be the case in reserved elections, where only a subset of the population is eligible to stand for election. We thus proceed to verify that the median individual, or someone with preferences very close to that individual, is eligible to stand even in elections where the population-share of the most numerous eligible sub-caste is less than 0.5.

Preferences for public goods are measured by land value, occupation, and education. The individual with the median occupation in the ward was ineligible to stand for election in less than 3.5 percent of ward-terms below the 0.5 threshold share. The education of the median individual and the closest eligible individual were statistically indistinguishable (at the 5 percent level) across those ward-terms. Finally, we could reject the hypothesis that land value was the same for the median individual and the closest eligible individual, but the correlation in the wealth of those individuals was as high as 0.92.

5. Assumption A2: Proposition 3 is derived assuming that m_c is increasing in S_c. We test this important assumption in Table 3, exploiting variation in S_c over election terms within the ward that is generated by randomized caste reservation. m_c is measured by the median value of lanholdings, occupation, and education in the most numerous eligible sub-caste in each ward-term.

Regressing m_c on S_c, with ward fixed effects, a full set of reservation and election-term dummies, and the election year as additional regressors, the coefficient on S_c is positive and statistically significant when m_c is measured by occupation and land value in Table 3.[13] Notice, however, that the coefficient on S_c is *negative* and insignificant when m_c is measured by education. Proposition 3 can thus be tested with wealth and occupation as measures of competence but not with education.

6   Leadership Selection

Proposition 3 of our model indicates that the elected leader's competence will be unchanged up to a threshold and will increase discontinuously at that threshold. The model also implies that the leader's caste affiliation will change discontinuously at the threshold. We begin by providing descriptive evidence supporting these relationships. We then formally test for a threshold and estimate the change in competence at that threshold.

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[13]Election term dummies are included in all the specifications in this paper to allow for experience effects in the selection of leaders and public good provision. The election year is included as an additional regressor to allow for time effects because *panchayat* elections are not synchronized across the country.

6.1   Descriptive Evidence of a Threshold

The measures of political competence used in the empirical analysis are chosen to match the three preference variables – land value, occupation, and education. There is independent reason to expect that they will be associated with competence. Recall from Section 2 that a major task of the ward representative, and the one we focus on here, is to channel resources to his constituency and to subsequently ensure that the planned construction and maintenance of public goods actually takes place. Individuals who manage large enterprizes, such as businessmen and farmers, will be particularly well-suited to manage public goods delivery, and we would expect larger landowners to be more influential in the *panchayat* council. Consistent with the hypothesized link between occupation and competence, Ferraz and Finan (2010) find that an exogenous increase in politicians' wages in Brazil increases legislative effectiveness *and* changes the occupational background of elected representatives.

Education provides many of the skills that are associated with political competence and is likely to be positively correlated with innate ability to the extent that there is positive selection into schooling. Ferraz and Finan find that an exogenous increase in politicians' wages, which increases legislative effectiveness, also results in the selection of better educated leaders. We expect education to be positively associated with the representative's competence in Indian local governments as well.

Appendix Table A1 describes the characteristics of potential leaders, measured by the median characteristic of eligible household heads in each ward in unreserved, SC, ST, and OBC elections. Table A1 also describes the characteristics of elected male and female representatives. Three empirical regularities emerge from the table. First, elected male representatives are much more likely to have managerial experience and have substantially higher education than typical (invariably male) household heads in eligible households, within each reservation category. This suggests that there is systematic (non-random) leader selection. Second, eligible households in unreserved elections have more land wealth, and heads of these households more education, compared with eligible households in restricted elections (particularly when they are reserved for SC and ST candidates). This is because in unreserved elections, unlike in the caste-restricted elections, historically advantaged upper-caste households may also put up candidates. We take account of this in the empirical analysis by including reservation dummies and by controlling for variation in the characteristics of *potential* leaders across election terms. Third, elected female representatives are substantially disadvantaged with respect to schooling and our measure of managerial experience. Few women run businesses; almost all women, and no men, specialize instead in managing households. There is little variation in the occupational

measure that we use among female representatives. Moreover, household land wealth does not reflect management experience for women, who typically do not participate in farm management decisions. We thus examine the selection of male representatives alone.[14]

Proposition 3 indicates that the elected leader's competence will be unchanged up to a threshold $\underline{S}$ and will increase discontinuously at that threshold. We expect this prediction to hold for the ward representative's wealth and occupation, but not necessarily for his education (since assumption A2 is not satisfied for that variable). A corollary of Proposition 3 is that the probability that the ward representative belongs to the most numerous eligible sub-caste should also increase discontinuously at $\underline{S}$. The predictions of the model can be examined by estimating the following equation,

$$y_{jt} = \phi(S_{jt}) + X_{jt}\gamma + \xi_{jt}, \tag{3}$$

where y_{jt} is the relevant leader characteristic (competence or caste affiliation) in ward j in term t, S_{jt} is the share of the most numerous eligible sub-caste in that ward-term, with $\phi(S_{jt})$ a flexible function of S_{jt}, X_{jt} is a vector of additional regressors that includes ward fixed effects, a full set of reservation dummies, election-term dummies, and the election year, and ξ_{jt} is a mean-zero disturbance term.

We are interested in characterizing the nonparametric relationship between y_{jt} and S_{jt}. We estimate this relationship in two steps. In the first step, we partial out the additional regressors, X_{jt}, by estimating an equation that replaces the $\phi(S_{jt})$ function with a vector of dummy variables:

$$y_{jt} = \lambda_0 + \sum_{l=1}^{5} \lambda_l D_{ljt} + X_{jt}\gamma + \xi_{jt}, \tag{4}$$

where $D_{1jt} - D_{5jt}$ are indicator variables that take the value one if $S_{jt} \in (0.2, 0.35]$, $(0.35, 0.5]$, $(0.5, 0.65]$, $(0.65, 0.8]$, and $(0.8, 1.0]$, respectively. The reference category, which determines the constant term, λ_0, in this equation is $S_{jt} \in [0, 0.2]$. Equation (4) will lead naturally to a (restricted) specification that is commonly used in the change-point literature (e.g. Bai 1994, Perron 2007) and which we use for the formal threshold-tests that follow.

The estimated γ from equation (4) can be used to construct the conditional outcome, $\tilde{y}_{jt} = y_{jt} - (X_{jt} - \overline{X})\hat{\gamma}$, where $\overline{X}$, which is the sample average of each additional regressor is included to preserve the mean of the outcome. In the second step, $\tilde{y}_{jt}$ is regressed nonparametrically on S_{jt}:

$$\tilde{y}_{jt} = \phi(S_{jt}) + \xi_{jt}. \tag{5}$$

Figure 1 reports nonparametric estimates of the (conditional) probability that any candidate belongs to the most numerous eligible sub-caste in each ward-term regressed

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[14]This is not a choice-based sample because almost no women were elected in ward-terms that were not randomly reserved for them.

on its population share. The village inventory did not collect information on the elected representative's sub-caste. However, this information is available from the village census for all candidates in the last two *panchayat* elections. We thus replace actual leader characteristics with a binary variable indicating whether any candidate belonged to the most numerous eligible sub-caste in each ward-term. As noted, at most two candidates stood for election in 87 percent of all elections and a single candidate stood for election in 65 percent of those elections, and so this variable will be highly correlated with the elected representative's caste affiliation. As a robustness test, Figure 1 also reports estimates with an alternative three-step procedure for constructing the conditional outcome.[15] We see in the figure with both procedures that there is no relationship between the probability that a candidate belongs to the most numerous eligible sub-caste and the population share up to a threshold close to 0.5, a sharp increase at that threshold, and no relationship thereafter. The magnitude of the mean-shift at the threshold is very large, increasing the probability from 0.45 to 0.65 with the two-step procedure.

Figure 2 reports nonparametric estimates of the three (conditional) competence characteristics regressed on the share of the most numerous eligible sub-caste. The ward representative's competence, measured by the probability that the representative holds a managerial job and (log) land wealth, increases discontinuously at precisely the share, just below 0.5, where we observed a mean-shift in Figure 1. As with the probability that a candidate belongs to the most numerous eligible sub-caste, there is no relationship between these competence measures and the population share to the left and right of the threshold, although the relationship is quite noisy at low population shares. Once again, the magnitude of the mean-shift at the threshold is very large, with an increase in the probability that the elected representative is engaged in a managerial job from 0.5 to 0.8 and an increase in (log) land wealth from 5 to 7. Recall that Proposition 3 cannot be tested with education since Assumption A2 is not satisfied for that variable. As expected, no threshold is discernable with that measure of leadership competence in Figure 2.

6.2 Testing for a Threshold

Figures 1-2 match closely with our model relating leadership selection to the population share of the most numerous eligible sub-caste. There is no relationship between the elected representative's caste affiliation and characteristics associated with his competence (land value and occupation) up to a threshold population share, at which point there is a sharp change in leader characteristics. Past the threshold, where the model has less precise

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[15]Following Robinson (1988), in the first step we estimate y_{jt} and each variable in X_{jt} nonparametrically on S_{jt}: $y_{jt} = \phi_Y(S_{jt}) + \xi_{jt}^Y$, $X_{jt} = \phi_X(S_{jt}) + \xi_{jt}^X$. In the second step, we estimate γ from the equation, $\xi_{jt}^Y = \xi_{jt}^X \gamma + u_{jt}$.

predictions, no relationship is observed between these leader characteristics and the population share. The focus of the analysis that follows will be to formally locate a threshold and to estimate the mean-shift at that threshold. This will allow us to compare leader characteristics in the equilibrium with and without political commitment.

We test the null hypothesis of no structural change versus the alternative hypothesis that a threshold is present by estimating the following equation:

$$\tilde{y}_{jt} = \beta_1 + \beta_2 D_{jt} + \epsilon_{jt}, \tag{6}$$

where $\tilde{y}_{jt}$ is the conditional leader characteristic used in Figures 1-2, and D_{jt} is an indicator variable that is equal to one if the population share in ward j in term t, S_{jt}, is greater than a threshold $\underline{S}$ and is zero otherwise. ϵ_{jt} is a mean-zero disturbance term. The structure imposed on the data with this regression specification is consistent with the patterns observed in Figures 1-2, where the (conditional) outcomes are constant to the left and right of the threshold. It is also consistent with our estimates of equation (4). The estimated coefficients from that equation (not reported) indicate that $\lambda_1 = \lambda_2 = 0$ and $\lambda_3 = \lambda_4 = \lambda_5$.

If the location of the threshold, $\underline{S}$, were known, we could estimate the mean-shift coefficient, β_2, at the threshold to compare leader competence in regimes with and without political commitment. Because the location is unknown, we must estimate both $\underline{S}$ and β_2. The problem of estimating a mean-shift at an unknown threshold has received considerable attention in the econometrics literature. While the traditional solution was to use Maximum Likelihood to estimate $\underline{S}$ and β_2 simultaneously in equation (6), the more recent approach has been to apply Least Squares to first estimate the change-point and then to estimate the mean-shift.[16] To derive the Least Squares estimate of $\underline{S}$ we simply estimate equation (6) for many different values of the *assumed* threshold, S. The Least Squares estimate of $\underline{S}$ is then,

$$\hat{\underline{S}} = argmin_S RSS(S),$$

where $RSS(S)$ is the residual sum of squares when equation (6) is estimated with the assumed threshold at S. Intuitively, equation (6) will best fit the data, and $RSS(S)$ will attain its minimum value, when $S = \underline{S}$. Andrews (1993) shows that the search for a minimum value must be restricted to a subset of the unit interval for tests of a structural break to have sufficient power. In practice, we estimate equation (6) for thresholds $S \in [0.25, 0.75]$ in increments of 0.001. Matching Figures 1-2, $\hat{\underline{S}} = 0.5$ with each of our leader characteristics, with the exception of education, as shown below.

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[16]The Least Squares method allows for a broader specification of correlation structure in the data than Maximum Likelihood estimation, does not place restrictions on the error distribution function, and is computationally simple (Bai 1994).

The Least Squares method provides us with an estimate of the threshold location. It does not, however, tell us if the structural break is statistically significant. To establish significance, we begin by placing bounds on the threshold's location. Consider the hypothesis that any assumed threshold, S, is equal to the true threshold:

$$H_0 : S = \underline{S}.$$

When the data generating process is consistent with equation (6), $\underline{S}$ is consistently estimated by $\hat{\underline{S}}$. It follows that $\underline{S}$ can then be replaced by $\hat{\underline{S}}$ when testing the preceding hypothesis. Hansen (1999) proposes a likelihood ratio test of this hypothesis based on the statistic

$$LR(S) = \frac{RSS(S) - RSS(\hat{\underline{S}})}{RSS(\hat{\underline{S}})} \cdot N.$$

The null hypothesis will be rejected when the assumed threshold is sufficiently far from the true threshold; i.e. when $LR(S)$ exceeds a critical value. Hansen derives the asymptotic distribution of the $LR(S)$ statistic, allowing this critical value to be computed. We will focus on the 5 percent critical value in the empirical analysis that follows.

Notice that the $LR(S)$ statistic is simply a normalization of the $RSS(S)$ statistic, reaching its minimum value – zero – at the assumed threshold $S = \hat{\underline{S}}$. The range of assumed thresholds close to $\hat{\underline{S}}$ for which $LR(S)$ is less than the 5 percent critical value thus defines the 95 percent confidence interval for the threshold location. When the data generating process is characterized by a threshold, as in equation (6), the $LR(S)$ statistic will decline steeply as the assumed threshold nears $\hat{\underline{S}}$ from either side. This will allow us to place precise statistical bounds on the location of the threshold. We expect this to be the case for the leader's caste affiliation and for the competence characteristics – land value and occupation – that satisfy assumption A2 and which revealed a structural break in Figures 1-2. This should not be the case for the competence characteristic – education – that does not satisfy that assumption and for which no break was observed in Figure 2.

Figures 3 and 4 plot the $LR(S)$ statistic for assumed thresholds ranging from 0.25 to 0.75 in increments of 0.001 for our leader characteristics. Matching the discontinuous change in the probability that the elected representative belongs to the most numerous eligible sub-caste at 0.5 in Figure 1, the $LR(S)$ statistic declines steeply when the assumed threshold approaches 0.5 from either side in Figure 3. The asymptotic critical value allows us to place tight bounds on the location of the threshold, which lies between 0.48 and 0.5 with 95 percent confidence. Figure 4 repeats this exercise with the leader competence characteristics reported in Figure 2. The likelihood ratio statistic attains its minimum value at an assumed threshold of 0.5 with land value and occupation in Figure 4. This matches the discontinuous change in these characteristics at that population share in Figure 2. While the $LR(S)$ statistic associated with land value and occupation declines

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steeply as the assumed threshold approaches 0.5 from either side, restricting the 95 percent confidence interval to the 0.48-0.5 range, this is not the case with the representative's education, as expected. The 95 percent confidence interval extends all the way from 0.47 to 0.64 with that variable. Education does not satisfy assumption A2 and so a structural break is not predicted (or observed) for that variable. Education will thus be excluded from the discussion that follows.

Having located a common threshold for the representative's caste affiliation, land wealth, and occupation, we proceed to estimate the mean-shift at that threshold. We estimate equation (6), replacing the conditional outcome, $\tilde{y}_{jt}$, with the unconditional outcome, y_{jt}, and including ward fixed effects, a full set of reservation dummies, election-term dummies, and the election year as additional regressors. It is straightforward to verify that we would arrive at the same specification if we placed the restrictions $\lambda_1 = \lambda_2 = 0$ and $\lambda_3 = \lambda_4 = \lambda_5$ on equation (4). The threshold location was estimated precisely for the representative's caste affiliation, and for his land wealth and occupation, in Figures 3-4. This allows us to treat it as "fixed" when estimating the leader equation (Hansen 1999).

The results reported in Table 4, Columns 1-3, are consistent with the presence of a threshold at 0.5. The mean-shift coefficient is positive and significant at the five percent level for the representative's caste affiliation and for his land wealth and occupation.[17] Based on the average values for the male ward representatives in our sample, the point estimates indicate that the average land value of the elected ward representatives is 56 percent higher and their managerial experience is 30 percent higher in the regime with political commitment.

Our interpretation of Figures 1-2 is that a political equilibrium in which the ward representative is accountable to his group emerges when its population share reaches 0.5, allowing more competent representatives to be selected. An alternative explanation for these results is that the pool of potential leaders changes discontinuously at that threshold. The regression specifications in Columns 1-4 include reservation dummies to allow for the possibility that the pool of potential candidates will be weaker in reserved elections where a commitment-equilibrium is less likely to be obtained. Suppose, however, that the most competent individuals within each sub-caste tend to cluster together in a relatively small number of villages, while less competent individuals are spatially dispersed. A positive relationship between the share of the most numerous eligible sub-caste and leadership

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[17]Hansen (1999) and Perron (2007) propose likelihood ratio and Wald tests, respectively, to test the hypothesis that there is no structural break, $\beta_2 = 0$, in equation (6). These tests, which are based on overall goodness of fit measures, are asymptotically equivalent (Andrews 1993). As expected, the likelihood ratio and Wald statistics computed at $\hat{S} = 0.5$ match closely with each transformed leader characteristic, $\tilde{y}_{jt}$. Hansen also proposes a bootstrap procedure to compute critical values for the likelihood ratio statistic. Using this procedure we reject the null hypothesis of no structural break with 95 percent confidence with each transformed leader characteristic, consistent with the results in Table 4.

competence, net of the average reservation effect, could then simply reflect the fact that the most competent members *within* each sub-caste tend to be located in villages and, therefore, wards where they account for a disproportionate share of the population.

Because we have information on the sub-caste of every household in each ward, we can identify all potential leaders in each ward-term depending on its reservation status. We consequently include measures of the competence distribution among the potential leaders (the eligible citizen candidates) in each ward-term – the median and 25th and 75th percentiles of each characteristic – as additional regressors in Table 4, Columns 5-7 after locating the corresponding thresholds for the conditional outcomes using the Least Squares method described above. Comparing the threshold location, the 95 percent confidence interval, and the estimated mean-shift, the results are essentially unchanged for the representative's occupation and land wealth (Columns 2-3 versus Columns 4-5).

We complete the analysis of leadership selection with a more stringent test to rule out the possibility that the observed changes in the characteristics of the elected ward representatives in Figure 2 are being driven by underlying changes in the pool of potential leaders. This test replaces the actual characteristics of the elected representative with potential leader characteristics in Figure 5. Using the same two-step estimation procedure that was used to generate Figure 2, we nonparametrically regress the 25th and 75th percentile of each characteristic, based on the distribution of potential leaders in each ward-term, on the share of the most numerous eligible sub-caste. In contrast with Figure 2, the main finding from Figure 5 is that no discontinuity is discernable at 0.5 with any characteristic, effectively ruling out this alternative explanation for the results that are obtained.[18] The leadership *selection* rule is evidently changing when the share reaches 0.5, as implied by our theory.

7 Public Good Provision

According to the model, the level of public goods (total budget) is determined by the competence of the selected leader, while the mix of public goods is a function of the characteristics of a pivotal individual. We estimate the determinants of local public good provision taking into account both the relevant pivotal individual's preference for the mix of public goods and the leader's competence, with a specification of the form

$$G_{kjt} = (\alpha_k + \delta_k Z_{jt})(1 + \theta D_{jt}) + h_j + \zeta_{kjt}. \tag{7}$$

The first term in parentheses on the right hand side of equation (7) tells us how each dollar received by the ward is allocated to different public goods, k. α_k, δ_k are public-

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[18]The pool of potential leaders within the most numerous eligible sub-caste does not change discontinuously at 0.5 either (not reported).

good specific preference parameters and Z_{jt} measures the characteristics and, hence, the preferences of the pivotal household or individual in ward j in term t for different public goods. The second term in parentheses tells us how many dollars are received by the ward. The structure of this term is consistent with the discontinuous increase in leadership competence at a threshold population share that we observed in Figure 2, and the absence of any relationship between competence and the population share to the left and right of that threshold. $D_{jt} = 1$ if the share of the most numerous eligible sub-caste in ward j in term t, S_{jt}, is greater than or equal to the threshold share $\underline{S}$ and $D_{jt} = 0$ if S_{jt} is less than $\underline{S}$. The competence parameter θ thus measures the discontinuous increase in the total budget that is implied by Proposition 3 (and Figure 2) with a switch to the equilibrium with commitment at $\underline{S}$.

The product of the two terms in parentheses in equation (7) tells us how many dollars are allocated to each public good k. This determines G_{kjt}, the fraction of households in ward j that received good k in term t. In general, the level of public goods received by a ward is determined by a collective decision-making process, which will depend not only on the competence or bargaining power of the ward representative but also on the characteristics of other ward representatives and the *panchayat* president. However, random and independent reservation in elections across wards and for the president's position implies that changes in the characteristics of the ward representative (and the political equilibrium) will be uncorrelated with changes in the characteristics of other elected representatives in the *panchayat*. Once ward fixed effects, h_j, are included, this allows us to ignore the characteristics of other elected representatives, which are subsumed in the ζ_{kjt} term in the equation above.

When $D_{jt} = 0$, the pivotal household in the equilibrium without commitment is the median household in the ward. When $D_{jt} = 1$ and the regime shifts to the commitment-equilibrium, the pivotal household becomes the median household from the most numerous eligible sub-caste in that ward-term. The δ_k parameters that map pivotal voter characteristics to the provision of public goods are thus identified off changes in the identity of the pivotal household within the ward over time resulting from exogenous changes in the political equilibrium. Note that if the reservation system does not change the political equilibrium in the ward, or if there is only one dominant household that dictates the composition of public goods no matter who is elected, then the δ_k parameters will not be identified. Differencing out the ward fixed effects, h_j, the competence parameter θ and the preference parameters α_k, δ_k can be estimated using nonlinear least squares.

G_{kjt} in equation (7) is measured as the fraction of households in ward j who received a particular good k in a given election term t, where public good provision is defined to include both new construction and maintenance. This variable was constructed by

matching the locations of households and goods, based on the street location of each public goods investment and the street addresses of the households. Our analysis focuses on six goods for which the benefits have a significant local and spatial component; that is, goods for which attachment or proximity to the household is desirable. The goods are: drinking water, sanitation, improved roads, electricity, street lights, and public telephones.[19] These six goods account for 15.2 percent of all local public spending, which is four times the amount spent on schools and health facilities.[20] Appendix Table A2 reports the fraction of households in the ward that received each public good, averaged across wards and election terms, by type of reservation. It is apparent that a large fraction of households benefited directly from expenditures on water, roads, and sanitation, while a much smaller fraction benefited in any term from expenditures on electricity, street lights, and public telephones. Individuals or households with different characteristics will have different preferences for these public goods. We have thus allowed the preference parameters α_k and δ_k in equation (7) to differ for each public good indexed by k.

Table 5 reports estimates of the public goods delivery equation, based on the assumption that 0.5 is the threshold above which an equilibrium with commitment can be sustained. This assumption is consistent with the threshold location derived for different leader characteristics in Figures 3-4. These characteristics were obtained from distinct data sources: the village census for land wealth and caste affiliation, and the village inventory for occupation. Nevertheless, the threshold was independently located precisely at 0.5 with each characteristic, as reported in Table 4. In a previous version of the paper (Munshi and Rosenzweig 2008) we implemented an alternative test to locate the true threshold by estimating equation (7) with different assumed thresholds. We showed theoretically that the estimated θ coefficient would be increasing monotonically as the assumed threshold increased and shifted closer to the true threshold, with a trend-break in this relationship at the true threshold, if the data generating process was consistent with the model. This test has been replaced by formal statistical tests for a threshold and its location, based on the pattern of leadership selection. It is worth noting that the alternative test based on the provision of public goods also located the threshold precisely at 0.5.

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[19]Public irrigation investments or school buildings, for example, are valued local public goods whose placement close to a ward resident, or even within the ward (defined by place of residence) may not be desirable. Some public goods, in contrast, have a private dimension. For example, water could be piped to some households but not to others within a ward. We do not have information on the distribution of public goods at the household level, only at the street level. Thus, it is not possible to carry out an analysis of within-ward discrimination in public goods provision.

[20]Key informants in the village were asked to rank 12 issues, by importance, that came under the purview of the elected *panchayat*. Inadequate roads and drinking water were ranked 1 and 2, followed by health, schooling, sanitation, street lights and electrification. Note that the low spending on health and education and the relatively low level of importance assigned to these goods by the key informants reflects the fact that they are largely allocated at the state level and so fall outside the purview of the village *panchayat*, as discussed in Section 2.

The first three columns Table 5 report estimates from the basic specification, equation (7), measuring the pivotal individual's characteristics sequentially by owned land value, occupation, and education. The next three columns of Table 5 report estimates from an augmented specification that allows competence to vary by the gender of the elected ward representative with the same sequence of pivotal individual characteristics:

$$G_{kjt} = (1 + w_{1r})(\alpha_k + \delta_k Z_{jt}) + (1 + w_{2r})\theta D_{jt}(\alpha_k + \delta_k Z_{jt}) + h_j + \zeta_{kjt},$$

where w_{1r}, w_{2r} estimate the effect of female reservation, separately in the equilibrium with and without commitment, on overall resources.

The preference parameter estimates in Table 5 are precisely estimated, with the intercepts α_k matching the pattern of public good provision in Appendix Table A2. Recall that a relatively large fraction of households benefited from expenditures on water, sanitation, and roads in each ward-term. Public telephones are the reference category in Table 5, and we see that the drinking water, sanitation, and roads intercepts are relatively large in magnitude and very precisely estimated.

The results in Table 5 also indicate that elected ward representatives are responsive to the preferences of the pivotal individuals in their constituencies. Recall that the median individual in the ward is assumed to be pivotal when $D_{jt} = 0$, whereas the median individual in the most numerous eligible sub-caste is pivotal when $D_{jt} = 1$. The δ_k estimates indicate, consistent with the model, that the characteristics of the pivotal household have a significant effect on the mix of public goods in the ward. We can reject the joint hypothesis that the pivotal characteristic has no effect on the distribution of public goods with 95 percent confidence for land value, occupation, and education. The individual δ_k coefficients imply, for example, that relative to public telephone investment (the reference category), when the pivotal household has greater land wealth the allocation of resources to roads is increased and the allocation to electricity is reduced. When the pivotal individual (household head) is employed in a managerial occupation, we see a relative increase in the resources allocated to electricity and street lights. The same characteristics were shown to increase discontinuously at a threshold in the leadership selection equation, which indicates that there is indeed a trade-off between the horizontal and vertical dimensions of leadership quality in this context.

The θ estimates reported in Table 5 indicate that there is not only a change in the pivotal individual when there is a change in the political equilibrium but also a change in the ward representative's competence. The competence parameter θ in Table 5 is positive and significant across both specifications and for all measures of the pivotal individual's characteristics, ranging in magnitude from 0.14 to 0.17 in Columns 1-3. Political accountability substantially increases the overall level of public resources the ward receives. The

threshold is crossed in 58 percent of ward-terms. This implies that the discipline imposed by caste networks increases public goods provision by 8-10 percent in a ward relative to the counter-factual without commitment.

Does the competence of the elected representative vary by gender? Below the threshold, in the equilibrium without commitment, we expect the representative – male or female – to have preferences that are as close as possible to the median individual in the ward. It is not obvious *a priori* how the mapping from these preferences to competence will vary by gender. We see in Table 5, Columns 4-6 that female representatives are 5-6 percent *less* competent than male representatives in the equilibrium without commitment. Above the threshold, where the most competent member of the most numerous eligible sub-caste will be elected, however, we see that female representatives are 11-12 percent *more* competent than male representatives. These results indicate that caste discipline has a stronger effect on the competence of female representatives than it does for men, although this is not reflected in conventional measures of leadership competence.[21] Given that the equilibrium with commitment is obtained in a majority of ward-terms, these statistically significant gender effects also imply that female representatives are more competent than male representatives on average.[22] In a related robustness test, we allowed the competence of the elected representatives to vary by reservation category and gender. Although some of the reservation-category coefficients are individually significant in the augmented specification (not reported), we cannot reject the hypothesis that all the reservation coefficients, above and below the threshold, are jointly zero.

8   Political Commitment

Once ward fixed effects are included, our ability to identify the effects of the pivotal individual's characteristics on the mix of public goods in Table 5 indicates that there was a shift in the pivotal individual above and below the threshold share within a ward across terms. The estimates are obtained assuming that the elected leader in the commitment-equilibrium (above the threshold share) chooses projects that are aligned with the preferences of the median individual in the most numerous eligible sub-caste, regardless of his own preferences, while in an equilibrium without commitment (below the threshold share) the median individual in the ward, who is selected as the leader, will choose his preferred

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[21]In contrast with the strong (discontinuous) competence-share relationship that we obtain for the male representatives in Figure 2, no relationship with any characteristic is obtained for female representatives (not reported). These representatives are evidently being selected on attributes that are poorly measured by the usual characteristics obtained in household surveys.

[22]These findings are broadly consistent with recent evidence in Beaman et al. (2009). Their results, however, are obtained for *panchayat*-level elections for the president's position in which the commitment-equilibrium is less likely to be obtained (a single sub-caste is less likely to be numerically dominant).

mix of projects.

The estimated location of the threshold at 0.5 suggests that the caste representative obtains little electoral support outside his social group. As discussed above, this result would be obtained if he targets public goods to his own sub-caste within the ward when elected and max $(0.5, \underline{S})=0.5$. An alternative explanation is that once a sub-caste attains a majority it is assured of electoral power and so can enter into a repeated game with *any* competent individual in the ward. Although the sub-caste must still coordinate to ensure that all its members vote for the same candidate, the long-term nature of the arrangement between the sub-caste and this candidate ensures *ex post* commitment even if he does not belong to that group. Randomized caste and gender reservation, which exogenously changes the pool of eligible leaders from one election to the next within a ward, makes this explanation less relevant for Indian local politics. Consistent with this argument, we saw in Figures 1 and 2 that there was a discontinuous increase, at the same threshold, in both the probability that elected representatives belong to the most numerous eligible sub-caste and in characteristics associated with their competence.

A second alternative explanation is that an influential (and competent) member of the sub-caste gets elected when it attains a numerical majority, taking advantage of caste identity to retain the rents from political power for himself. To rule out this explanation and to provide additional support for the commitment hypothesis, we proceed to evaluate the predictive power of the pivotal characteristic, Z_{jt}, measured by the joint significance of the preference parameter estimates (δ_k), under different assumptions about the identity of the pivotal individual. We compare the benchmark specification implied by the model against two alternative allocation schemes: (i) The pivotal individual in the equilibrium without commitment (share < 0.5) is the person elected, which is consistent with our model. Replacing the characteristics of the median individual in the ward with those of the elected representative should not have a systematic effect on the preference parameter estimates in this case. (ii) The pivotal individual in the commitment-equilibrium (share > 0.5) is the elected representative. This is inconsistent with our model, which assumes that the representative chooses a mix of projects that is aligned with the preferences of a centrally located member of his sub-caste. A strong test of the commitment hypothesis is that the joint significance of the preference parameter estimates should decline when the median member of the most numerous eligible sub-caste is replaced by the (more competent) representative as the pivotal individual.

Land wealth information is only available for candidates (not elected council members) over two election terms. Given that 87 percent of all elections had at most two candidates and 65 percent had a single candidate, we can use the average land wealth of the candidates in each ward-term in place of the leader's characteristics once again

when testing commitment in Table 6, Columns 1-3. For occupation and education, we replace the pivotal individual's characteristics with the elected representative's characteristics, as described above, when testing for commitment in Table 6, Columns 4-6 and 7-9. Comparing the benchmark specification with the alternative specification where the characteristics of the median individual in the ward are replaced by the leader's (or candidates') characteristics below the threshold, the F-statistic measuring the joint significance of the preference parameter estimates decreases when land wealth and occupation are used to measure preferences, but increases when preferences are measured by education. Notice that the preference parameters are precisely estimated (significant at the 5 percent level) with both specifications and all three characteristics (land wealth, occupation, and education). In contrast, the F-statistic declines substantially with all three characteristics when the leader is assumed to be pivotal for population shares greater than 0.5. Indeed, we cannot reject the hypothesis (at the 5 percent level) that the characteristics of the elected representative have no effect on the distribution of public goods for shares greater than 0.5, consistent with commitment above the threshold.

9 Conclusion

This paper tests the hypothesis that caste networks expanded the domain of their influence from private economic activity to the public political sphere when democratic local elections were established in India in the 1990s. In particular, we assess whether these networks were able to overcome political commitment problems, enabling sub-castes to select their most competent representatives, while at the same time ensuring that they honored the public goods preferences of their constituents.

The empirical analysis uses detailed data on local public goods at the street level and the characteristics of constituents and their elected representatives at the ward level over multiple terms. Exploiting the system of randomized caste reservation, which changes the population-share of the most numerous eligible sub-caste across ward-terms, we find that caste discipline is associated with an increase in public good provision and a change in the characteristics of selected representatives. In particular, the land wealth of elected representatives is 56 percent greater and managerial experience is 30 percent higher when caste discipline is present. Our results indicate that the same characteristics that we associate with leadership competence also determine preferences for public goods. For example, we find that individuals with greater land wealth prefer investments in roads over investments in electricity. Individuals in managerial occupations have a relatively strong preference for electricity and street lights. This correlation between competence and preferences highlights the commitment problem, which the sub-caste overcomes. Indeed,

we find that the (more competent) representative's own characteristics have no effect on the mix of public goods that is chosen in ward-terms where caste discipline is predicted to be present, which implies that he is choosing policies that diverge from his own preferences.

Although our findings suggest that community involvement in politics does not necessarily result in bad governance, they need to be placed in the appropriate perspective. While the sub-caste may be able to control the leaders it nominates at the ward level, it will have less influence at higher levels of government where a single sub-caste is rarely dominant. The negative effect of caste-identity politics on leadership selection and outcomes has been documented at the state level in India (e.g. Banerjee and Pande 2007) and similar negative outcomes have been associated with parochial politics in other parts of the world. Moreover, as our results show, the elected caste representative is answerable to the social group he belongs to and so his choices will be aligned with the preferences of a pivotal member of his sub-caste rather than the median voter in the constituency. The fact that the more competent caste representative can only be elected when his group attains a majority in the ward also suggests that outsiders may not benefit from the resources he provides. Caste politics is a second-best solution and, ultimately, there is no perfect substitute for well functioning political institutions (parties) in a competitive democratic system.

Our results also shed light on the equity and efficiency consequences of political reservation in India, evaluated in terms of the the horizontal and vertical dimensions of leadership quality. The advantage of caste reservation is that it transfers leadership in a ward where an upper caste has a majority to the median individual, allowing a mix of public goods to be chosen that is aligned with the preferences of the electorate rather than a narrowly defined caste group. The disadvantage of caste (and gender) reservation is that the exogenous turnover that goes with it prevents the ward from using the promise of re-election to discipline its most competent member. Moreover, caste reservation, by decreasing the population-share of the most numerous eligible sub-caste, also reduces the probability that an equilibrium with (caste) commitment will be obtained. Our estimates indicate that caste discipline increases public good provision by 14-17 percent. Given that in two-thirds of wards one sub-caste has a majority of the constituents, political competence could be roughly 9-11 percent higher because of caste networks in Indian local governments relative to the counterfactual system in which politicians were unable to commit. The reservation system, by reducing the number of elections in which any sub-caste holds a majority to 58 percent, reduces these gains from caste discipline by 13.4 percent.

10 Appendix

Proof of Proposition 2(a)

Case 1: $m_c < m$. To show that the commitment-equilibrium is the unique equilibrium when inequality (1) is satisfied, we first need to show that no one wants to deviate from this equilibrium:

(i) Any individual with $\omega < m_c$ would lose a straight contest with the group representative because he is more competent ($\overline{\omega}_c > m_c$ by definition) and because m_c is closer in preference-space to all individuals with ω greater than or equal to m.

(ii) Any individual with $\omega \in [m_c, m]$ prefers the group representative to himself as the leader. The median individual prefers the group representative to himself from condition (1). Now consider an individual with $\omega \in [m_c, m)$. This individual will also prefer the group representative to himself if $\beta\overline{\omega}_c - \gamma(\omega - m_c) > \beta\omega$. Rearranging the inequality, it is straightforward to show, by substituting for $\overline{\omega}_c$ from inequality (1) that $(\overline{\omega}_c - \omega) - \frac{\gamma}{\beta}(\omega - m_c) > \left(\frac{\gamma}{\beta} + 1\right)(m - \omega) > 0$.

(iii) Any individual with $\omega_j > m$ would lose a straight contest with the group representative because all individuals with $\omega \leq m$ would vote against him. Consider individuals with $\omega \in [0, m_c)$. We need to show that $\beta\overline{\omega}_c - \gamma(m_c - \omega) > \beta\omega_j - \gamma(\omega_j - \omega)$. Rearranging the inequality, the required condition is $(\omega_j - m_c) - \frac{\beta}{\gamma}(\omega_j - \overline{\omega}_c) > 0$, which is satisfied since $m_c < \overline{\omega}_c$ and $\beta < \gamma$. We saw above that individuals with $\omega \in [m_c, m]$ prefer the group representative to themselves as the leader. They will also prefer themselves to the individual with $\omega_j > m$ since $\gamma > \beta$. This implies that they will prefer the group representative to that individual.

Verifying that no other equilibrium can be supported when condition (1) is satisfied is also straightforward. A strategy profile in which an individual, other than the median individual in the constituency, stands unopposed is not an equilibrium since the median individual would deviate and stand against him. A strategy profile in which the median individual stands unopposed is also not an equilibrium. The group would put its representative forward and everyone with ω less than or equal to m would vote for him. Individuals with ω less than m_c would prefer the group representative because he dominates the median individual on both the horizontal and vertical dimension. The median individual prefers the group representative to himself. It follows that individuals with ω between m_c and m would also prefer the group representative since his chosen mix of goods is even closer to their preferred mix.

Having established that the commitment-equilibrium is the unique equilibrium when condition (1) is satisfied, all that remains is to show that the equilibrium without commitment, where the median individual in the constituency standing unopposed, is the

unique equilibrium when condition (1) is not satisfied. No other individual outside the group wants to deviate from this equilibrium since he will certainly lose to the median individual in a straight contest. The group will also not put forward a candidate since its representative will now lose to the median individual in a straight contest, with all individuals with ω greater than or equal to m voting for the median individual. Consider an individual with $\omega \in [m, 1]$. For this claim to be true, $\beta m - \gamma(\omega - m) > \beta \overline{\omega}_c - \gamma(\omega - m_c)$. Rearranging the inequality, the required condition is $\beta(\overline{\omega}_c - m) - \gamma(m - m_c) < 0$, which is evidently satisfied when the sign of inequality (1) is reversed. By the same argument, no other strategy profile could be supported as an equilibrium since the median individual would always deviate and stand for election.

Case 2: $m_c > m$. To show that the commitment-equilibrium is the unique equilibrium when condition (2) is satisfied, we must first establish that no one wants to deviate from this equilibrium. Following the same steps as in case 1, it is straightforward to verify that (i) individuals with ability $\omega \in [0, m)$ would lose a straight contest with the group representative, (ii) individuals with ability $\omega \in [m, m_c]$ prefer the group representative to themselves as the leader, and (iii) individuals with ability $\omega \in (m_c, 1]$ would lose a straight contest with the group representative. Following the same argument as in case 1, it is also straightforward to verify that no other equilibrium can be sustained when condition (2) is satisfied, and that the equilibrium without commitment is the unique equilibrium when that condition is not satisfied, to complete the proof.

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Table 1: Sources of Support for Ward Representatives

Source of support:	within village (1)	outside village (2)
From caste	82	29
From religion	28	13
From wealthy individuals	38	--
From a political party	--	41

The statistics are computed over the last three local governments in each ward.

Each statistic reflects the percent of representaives who received support from a given source.

Table 2: Share of the Largest Eligible Sub-Caste in the Ward

Type of election:	Open	SC	ST	OBC
	(1)	(2)	(3)	(4)
Panel A: Distribution of shares				
25 percentile	0.42	0.14	0.16	0.20
50 percentile	0.60	0.33	0.57	0.41
75 percentile	0.85	0.65	0.95	0.69
Panel B: Fraction of ward-terms where share exceeds				
0.3	0.92	0.52	0.67	0.63
0.4	0.79	0.46	0.61	0.53
0.5	0.67	0.37	0.52	0.44
Total number of observations	1,973	373	187	769

SC=scheduled caste, ST=scheduled tribe, OBC=other backward caste.

Information on reservation and election outcomes is obtained for three terms in each ward.

Table 3: Relationship between Caste-Median and Share of Most Numerous Eligible Sub-Caste

Dependent variable:	caste-median		
Preference characteristic:	log(land value)	manager	education
	(1)	(2)	(3)
share	1.23	0.12	-0.17
	(0.45)	(0.04)	(0.24)
Reservation dummies	Yes	Yes	Yes
Number of observations	3029	3029	3029

Standard errors in parentheses are robust to heteroscedasticity and clustered residuals within each ward-term.

Caste-median is median value of preference characteristic in the most numerous eligible sub-caste in the ward-term

Share is the population-share of the most numerous eligible sub-caste in the ward-term

All regressions include ward fixed effects, reservation dummies, term dummies, and election year.

Managerial occupation takes value one for business and farming,

   zero for profesional occupations, agricultural labor, skilled and unskilled labor, technicians, and housewife.

Education is measured in years of schooling.

Table 4: Representative and Candidate Characteristics

| | Probability that a candidate is from the most numerous sub-caste | ward representative characteristics | | | |
| | | log(land value) | manager | log(land value) | manager |
	(1)	(2)	(3)	(4)	(5)
Mean-shift at threshold	0.44	2.82	0.21	3.10	0.17
	(0.13)	(1.05)	(0.06)	(1.07)	(0.08)
Reservation dummies	Yes	Yes	Yes	Yes	Yes
Potential rep. characteristics	No	No	No	Yes	Yes
Number of observations	1145	1681	1994	1681	1852
Threshold location	0.49	0.50	0.50	0.50	0.50
95% confidence interval	[0.48,0.50]	[0.48,0.50]	[0.49,0.50]	[0.48,0.50]	[0.49,0.50]

Standard errors in parentheses are robust to heteroscedasticity and clustered residuals within each ward-term.

All regressions include ward fixed effects, reservation dummies, term dummies, and election year.

Potential representative characteristics are 25th, 50th, and 75th percentile of the distribution of eligible individuals in the ward-term.

Managerial occupation takes value one for business and farming,
     zero for profesional occupations, agricultural labor, skilled and unskilled labor, technicians, and housewife.

Each regression is estimated at the threshold derived from the Likelihood Ratio test.

Threshold in Column 1 is based on two-step procedure. The threshold with the three-step procedure is 0.47.

Table 5: Public Goods Parameters

Dependent variable:	public good provision					
Specification:	no female representative interactions			female representative interactions		
Pivotal characteristic:	log(land value)	manager	education	log(land value)	manager	education
	(1)	(2)	(3)	(4)	(5)	(6)
Water intercept	0.55	0.58	0.55	0.55	0.57	0.56
	(0.02)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
Sanitation intercept	0.28	0.34	0.31	0.28	0.29	0.31
	(0.02)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
Roads intercept	0.50	0.57	0.56	0.50	0.55	0.57
	(0.02)	(0.04)	(0.02)	(0.03)	(0.02)	(0.02)
Electricity intercept	0.12	-0.03	0.08	0.11	0.08	0.08
	(0.02)	(0.03)	(0.01)	(0.02)	(0.01)	(0.01)
Street lights intercept	0.10	-0.03	0.09	0.09	0.08	0.09
	(0.02)	(0.03)	(0.01)	(0.02)	(0.01)	(0.01)
Pivotal char. x water	3.24	-0.02	2.82	3.45	0.01	1.45
	(2.05)	(0.04)	(3.31)	(2.11)	(0.02)	(3.51)
Pivotal char. x sanitation	3.84	-0.04	-1.05	4.05	0.03	-2.28
	(2.19)	(0.04)	(3.49)	(2.25)	(0.02)	(3.68)
Pivotal char. x roads	8.98	-0.005	-1.22	9.07	0.04	-2.75
	(2.28)	(0.04)	(3.55)	(2.35)	(0.02)	(3.75)
Pivotal char. x electricity	-6.33	0.10	-4.44	-6.20	-0.04	-5.67
	(1.78)	(0.03)	(2.62)	(1.81)	(0.02)	(2.81)
Pivotal char. x street lights	-2.26	0.12	-3.19	-1.76	-0.01	-4.26
	(1.77)	(0.03)	(2.65)	(1.79)	(0.02)	(2.85)
Theta	0.14	0.16	0.17	0.10	0.12	0.14
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Woman (above threshold)	--	--	--	0.11	0.11	0.12
				(0.04)	(0.04)	(0.04)
Woman (below threshold)	--	--	--	-0.05	-0.06	-0.06
				(0.03)	(0.03)	(0.03)
all pivotal char.-goods=0						
F-statistic	17.00	10.68	2.32	16.67	5.81	2.83
(p value)	(0.00)	(0.00)	(0.04)	(0.00)	(0.00)	(0.01)
Number of observations	14,250	14,215	14,255	14,250	14,215	14,255

Standard errors in parentheses are robust to heteroscedasticity and clustered residuals within each ward-term.

The dependent variable is computed as the fraction of households in the ward who received a given public good in a given term.

  Public telephone is the excluded local public good.

Pivotal characteristic is the median in the ward (most numerous sub-caste) when a commitment-equilibrium is assumed to be absent (present).

A commitment-equilibrium is assumed to be present when the share of the most numerous eligible sub-caste exceeds 0.5.

Land value is measured in Rupees. Coefficients on land value-goods in Columns 1 and 4 must be divided by 10^3.

Managerial occupation takes the value one for business and farming,

  zero for professional occupations, agricultural labor, skilled labor, unskilled labor, technician, and housewife.

Education is measured as years of schooling. Coefficient on education-goods in Columns 3 and 6 must be divided by 10^3.

All regressions include ward fixed effects, term dummies and the election year.

Table 6: Political Commitment Tests

Dependent variable:	public good provision								
Pivotal characteristic:	log(land value)			manager			education		
Pivotal individual:	medians	rep. for share < 0.5	rep. for share >0.5	medians	rep. for share < 0.5	rep. for share >0.5	medians	rep. for share < 0.5	rep. for share >0.5
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Pivotal char. x water	0.16	0.04	0.15	0.21	0.11	-0.21	0.21	0.27	0.17
	(0.25)	(0.16)	(0.14)	(0.21)	(0.14)	(0.13)	(0.33)	(0.16)	(0.15)
Pivotal char. x sanitation	0.27	0.21	0.35	0.36	0.22	-0.08	-0.14	0.30	0.01
	(0.27)	(0.17)	(0.15)	(0.22)	(0.15)	(0.14)	(0.34)	(0.18)	(0.16)
Pivotal char. x roads	0.64	0.49	0.01	0.48	0.15	-0.06	-0.15	-0.41	-0.21
	(0.28)	(0.17)	(0.15)	(0.23)	(0.15)	(0.14)	(0.35)	(0.19)	(0.16)
Pivotal char. x electricity	-0.83	-0.60	-0.10	-0.55	-0.39	-0.26	-0.52	-0.25	-0.09
	(0.22)	(0.13)	(0.10)	(0.17)	(0.11)	(0.10)	(0.26)	(0.13)	(0.11)
Pivotal char. x street lights	-0.19	-0.13	-0.04	-0.20	-0.04	0.02	-0.35	0.02	0.05
	(0.21)	(0.13)	(0.11)	(0.17)	(0.12)	(0.11)	(0.26)	(0.14)	(0.12)
Theta	0.21	0.20	0.27	0.14	0.18	0.17	0.16	0.16	0.17
	(0.04)	(0.05)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
all pivotal char.xgoods=0 (F stat)	12.68	7.19	1.79	8.34	3.55	2.15	2.78	3.97	1.27
(p value)	0.00	0.00	0.11	0.00	0.00	0.06	0.02	0.00	0.27
Number of observations	9110	9110	9110	14235	14245	14240	14130	14135	14135

Standard errors in parentheses are robust to heteroscedasticity and clustered residuals within each ward-term.

The dependent variable is the fraction of households in the ward who received a given public good in a given term. Public telephone is excluded public good.

medians: pivotal individual is median in the ward (most numerous sub-caste) for share <0.5 (share>0.5).

Ward representative is pivotal for share<0.5 in Columns 2, 5, and 8.

Ward representative is pivotal for share>0.5 in Columns 3, 6, and 9.

Managerial occupation takes the value one for business and farming, zero for professional occupations, agricultural labor,

skilled labor, unskilled labor, technician, and housewife. Coefficient on manager-goods in Columns 4-6 must be divided by 10.

Land value coefficents in Columns 1-3 must be divided by 10^2.

Education is measured as years of schooling. Coefficient on education-goods in Columns 7-9 must be divided by 10^2.

All regressions include ward fixed effects, reservation dummies, term dummies, the election year, and public good dummies.

Table A1: Pivotal Individual and Ward Representative Characteristics

Election type:	Open	SC	ST	OBC
	(1)	(2)	(3)	(4)
Panel A: Median individuals				
Land value	94.80	47.35	63.35	94.76
	(173.19)	(105.85)	(182.02)	(157.49)
Managerial occupation	0.34	0.33	0.40	0.42
	(0.47)	(0.47)	(0.46)	(0.49)
Education	4.46	3.53	3.30	4.03
	(3.76)	(3.59)	(3.65)	(3.36)
Panel B: Male representatives				
Land value	99.55	81.50	58.36	83.21
	(23.69)	(20.16)	(19.91)	(15.23)
Managerial occupation	0.75	0.38	0.82	0.72
	(0.43)	(0.49)	(0.38)	(0.45)
Education	7.42	6.01	5.30	7.05
	(4.43)	(4.49)	(3.99)	(4.30)
Panel C: Female representatives				
Land value	95.61	43.01	31.50	62.44
	(30.23)	(10.10)	(40.86)	(91.83)
Managerial occupation	0.10	0.32	0.05	0.54
	(0.30)	(0.47)	(0.22)	(0.50)
Education	3.23	5.78	2.22	4.72
	(3.83)	(4.39)	(2.05)	(4.17)

All characteristics in Panel A are measured as the median value in the ward for the relevant reservation category.

The means (standard deviations) of these characteristics across all wards are reported in the table.

Representatives' occupation and education is obtained for last three terms in each ward.

Information on land value is based on all candidates in the ward over the last two terms.

Information on the landholdings of elected representatives was not collected

Land value is measured in thousands of Rupees.

Managerial occupation takes the value one for business and farming and zero for

professional occupations, agricultural labor, skilled labor, unskilled labor, technicians, and housewife.

Education is measured as years of schooling.

SC=scheduled caste, ST=scheduled tribe, OBC=other backward caste.

Table A2: Fraction of Households in the Ward Receiving Public Goods in each Term

Type of election:	Open	SC	ST	OBC
	(1)	(2)	(3)	(4)
Water	0.69	0.73	0.78	0.72
	(0.40)	(0.39)	(0.71)	(0.39)
Sanitation	0.42	0.42	0.55	0.42
	(0.46)	(0.46)	(0.47)	(0.46)
Roads	0.69	0.72	0.74	0.73
	(0.41)	(0.40)	(0.41)	(0.39)
Telephones	0.07	0.12	0.08	0.10
	(0.24)	(0.30)	(0.25)	(0.28)
Electricity	0.14	0.20	0.17	0.20
	(0.34)	(0.38)	(0.36)	(0.38)
Street lighting	0.16	0.19	0.19	0.22
	(0.36)	(0.38)	(0.39)	(0.40)
Number of observations	1,704	373	176	619

Means and standard deviations (in parentheses).

SC=scheduled caste, ST=scheduled tribe, OBC=other backward caste.

Statistics are based on the last three terms in each ward.

Figure 1: Candidate Belongs to the Largest Eligible Sub-Caste
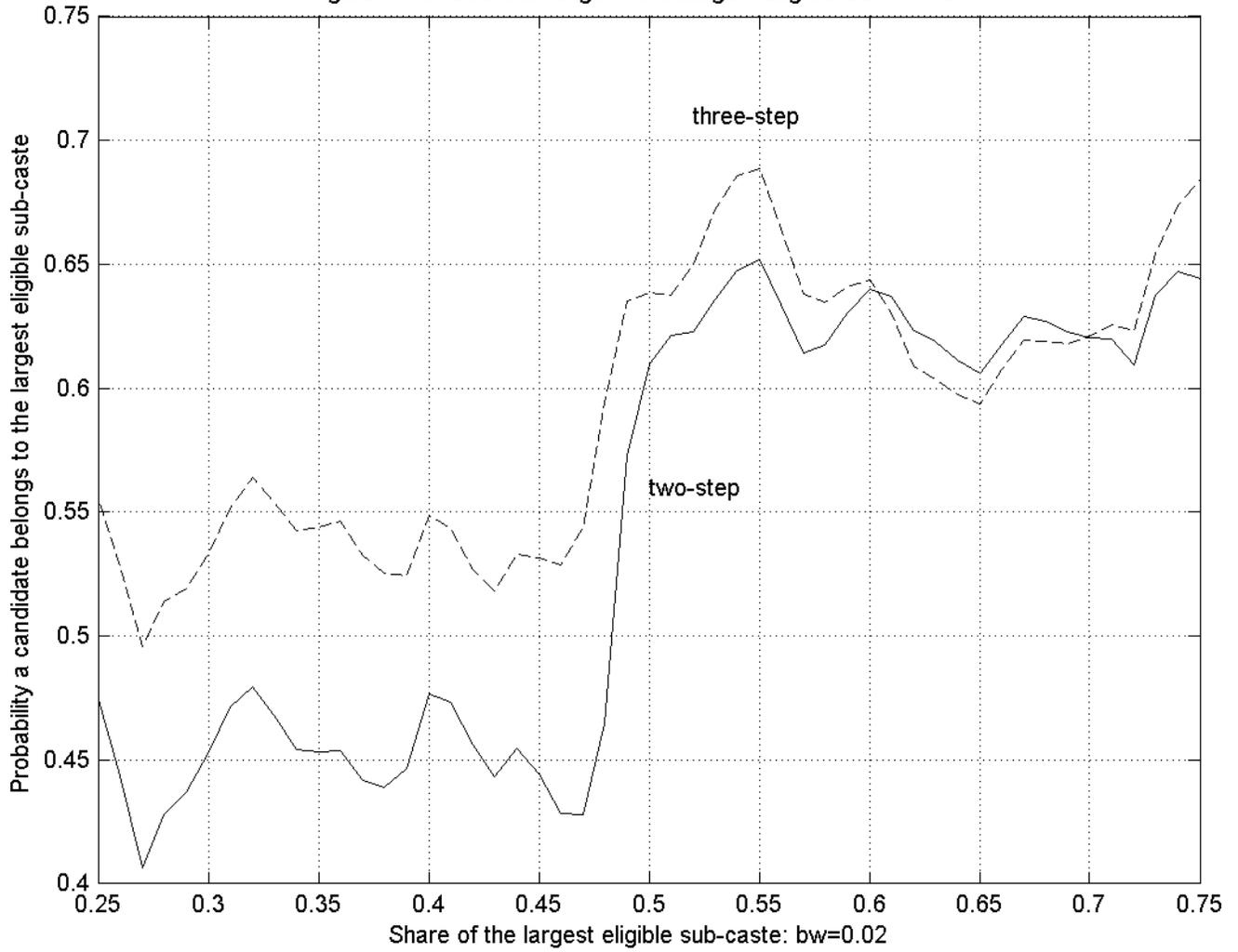
Figure 2: Male Ward Representative Characteristics
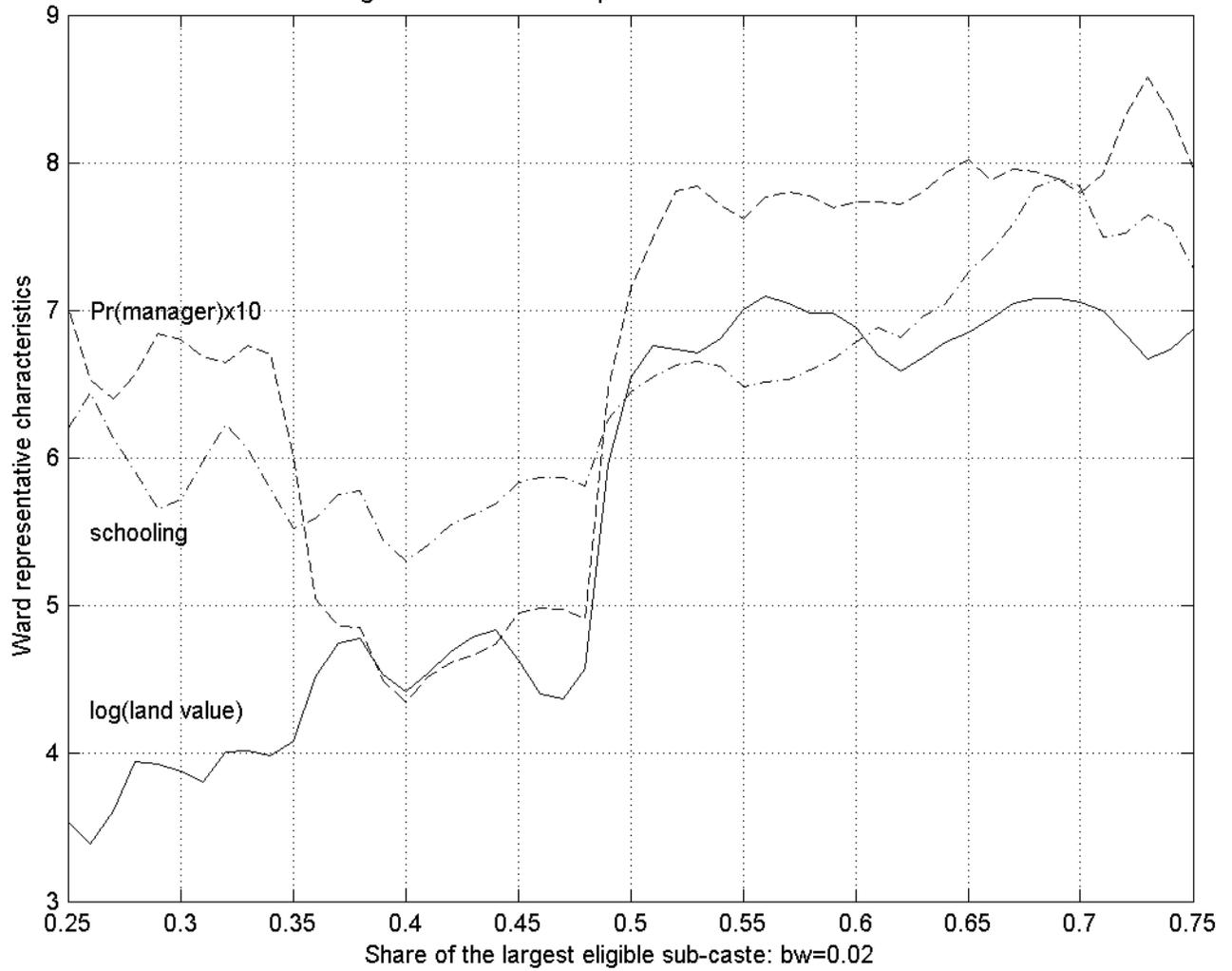
Figure 3: Threshold Location: Candidate from Largest Eligible Sub-Caste
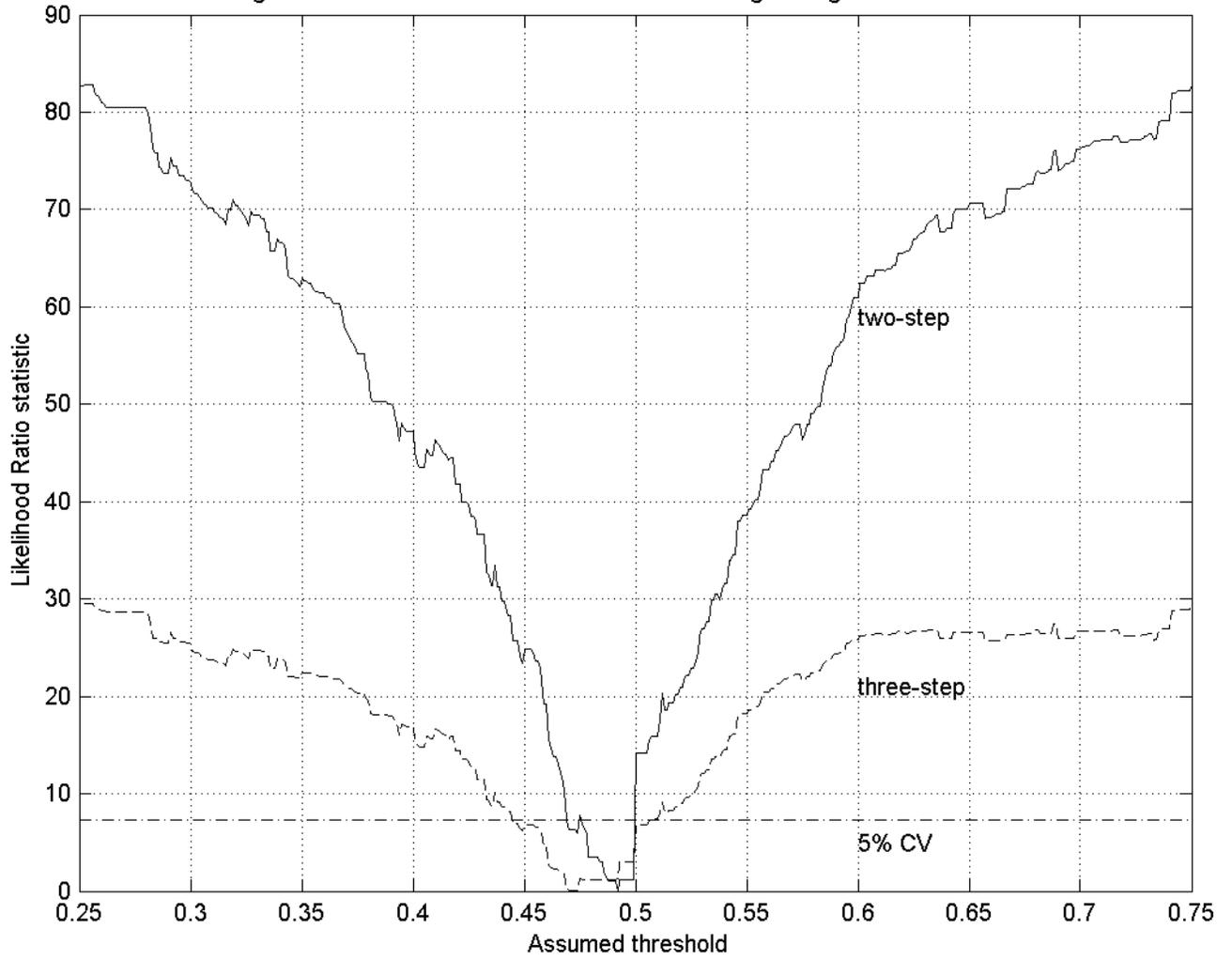
Figure 4: Threshold Location: Ward Representative Characteristics
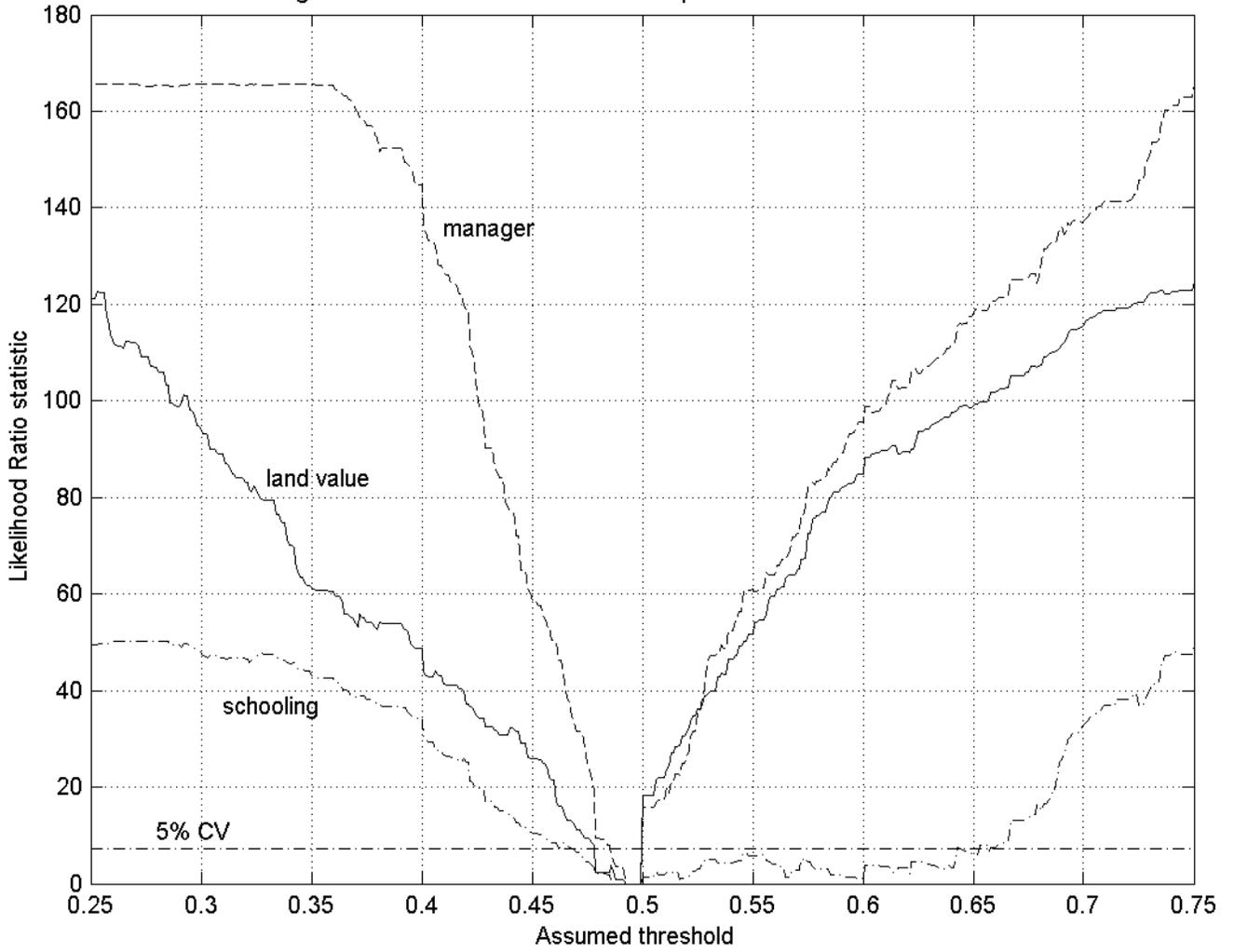
Figure 5: Distribution of Potential Representatives