Those Who Can’t Sort, Steal: Caste, Occupational Mobility, and Rent-Seeking in Rural India

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Abstract

This paper is concerned with three important features of modern India: rent-seeking, occupational immobility, and caste. We argue that these features are related in an important way. We present novel stylized facts from the 2012 round of the India Human Development Survey, using a unique question on household practices of untouchability as an indicator for the local strength of caste: we find that villages where caste is more important feature less occupational mobility and more rent-seeking. The second part of our paper provides a new model to explain our empirical findings, in which castes are associated with occupations, and some individuals who want to switch occupations do it to find an easier source of rents rather than for productive reasons. This generates a lack of trust between castes, and shuts down occupational mobility, which can lead to even more rent-seeking due to an inability of low-skill individuals to sort into occupations that fit their talents. We also consider several extensions and policy implications: we show that our model predicts that this problem will be especially severe in a geographically dense and integrated country such as India, where it is easy to interact with other castes, and we suggest a form of redistribution as a possible solution to the problem.

Keywords: caste, occupational mobility, rent-seeking, India

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1 Introduction

A huge literature in development economics considers the consequences for development of productive versus extractive/rent-seeking institutions.\(^1\) Another literature focusses on the economic consequences of inequality: do economically unequal countries have worse growth?\(^2\)

We analyze the important case of caste in India, a context in which both of these questions are significant – in which extractive, immiserating institutions are endogenously co-determined with social and horizontal inequality.

In particular, this paper is concerned with three important features of modern India: rent-seeking, occupational immobility, and caste. As argued by The Economist (March 15, 2014), rent-seeking is a significant problem in India: the article in question presents estimates which suggest that annual returns from rent-seeking in India are around $80 billion, or about 4% of GDP, and this includes only scams, relative performance in industries prone to rent-seeking, and relative performance of politically-linked listed firms.\(^3\) A substantial empirical literature demonstrates that occupational mobility is very low in India: Hnatkovska, Lahiri, and Paul (2013) find that only 41% of their sample in 2004-05 worked in a different 3-digit occupation than their household head.\(^4\) And finally, caste remains one of the defining feature of India’s social structure: Indians are divided both vertically (into broad classes known as *varna*) and horizontally (into sub-caste groups known as *jati*) on caste lines, into social groups that are hereditary and often endogamous.\(^5\)

\(^1\)Baland and Francois (2000) argue that resource booms can lead to an increase in unproductive rent-seeking, depending on the nature of the initial equilibrium, and Mehlum, Moene, and Torvik (2006) find supporting evidence: countries with producer-friendly institutions benefit from increased resource revenues, while the opposite is true for countries with “grabber-friendly” institutions. Murphy, Shleifer, and Vishny (1991) presents an analysis of the effect of rent-seeking on growth, when rent-seeking is predatory as in our paper.

\(^2\)See, for example, the empirical debate between papers such as Persson and Tabellini (1994) and Forbes (2000), and theoretical analyses such as Galor and Moav (2004).

\(^3\)In an earlier period when more of the “License Raj” was still in place, Mohammad and Whalley (1984) found that the percentage of the economy captured by rent-seeking could be as high as 30-45% of GNP in 1980-81 if controls on capital, goods, and labour were included.

\(^4\)Similarly, Kumar, Heath, and Heath (2002) find that, in 1971, 75% of male workers stayed in the same broad class of employment as their father, and that this measure of immobility had only declined to 71% by 1996. Reddy (2015) goes so far as to argue that, if one controls for changes in occupational structure, the probability of occupational mobility has actually declined in the last 30 years.

\(^5\)There are traditionally 4 *varna*: Brahmans, Kshatriyas, Vaishyas, and Shudras; the Dalits, or untouchables, are traditionally considered to be outside the caste system, and thus constitute a separate 5th layer. Typical estimates of the number of *jati* represented in India are on the order of 4000: Johnson and Johnson
inefficiency of caste as a social equilibrium that shuns and punishes those who break caste customs.

We argue that these three features are inter-related in an important and previously unrecognized way. In particular, we motivate our analysis with a series of novel stylized facts from the 2012 round of the India Human Development Survey (IHDS), in which we are able to use a unique question on household practices of untouchability. Using the village average of this variable as an indicator for casteism, or the local strength of the social forces of caste, we find that villages where caste is more important feature less occupational mobility and more rent-seeking (in the form of theft, threats, conflict). We further find evidence that casteism is associated with lower returns to education, lower consumption, and lower geographical mobility.

We further argue that these results are collectively puzzling. A correlation between casteism and occupational mobility is not surprising – because *jati* are traditionally associated with an occupation – and this particular result is consistent with previous empirical analysis. However, the association between casteism and rent-seeking is not at all obvious: places where caste is more important might be thought to be more socially conservative places in which one might expect individuals to “know their place”. The model in Akerlof (1976) cannot explain this outcome, as it is a model of self-fulfilling expectations in which nobody is off the equilibrium path, so that punishment and/or violence never happens; indeed, Akerlof’s model is entirely consistent with the aforementioned social conservatism story.\(^6\) Meanwhile, many alternative models of social division would similarly suggest that theft and other forms of rent-seeking would be less common in areas suffering from more discrimination: a taste-based model of discrimination as in Becker (1957) would imply that poor people are less able to indulge in discrimination – and caste tends to be more important in poorer parts of India.

Therefore, in the main part of our paper, we provide a new theoretical model which can explain our empirical findings, and which we can subsequently use to consider extensions and

\(^6\)Furthermore, Akerlof (1976) does not generate predictions about policy implications, which will be an important focus of our paper.
policy options. Specifically, we present a model in which individuals are of multiple types, which face differing incentives to engage in predatory rent-seeking, and in which there is a utility cost of rent-seeking which is larger when an individual steals from their own caste, where we will use the word “caste” to refer to horizontally-differentiated *jati*. We motivate this assumption by the idea that there is an added risk from rent-seeking within one’s own caste: a *jati* provide a network of mutual insurance to its members, as demonstrated by Munshi and Rosenzweig (2016), and it seems plausible that rent-seeking within one’s *jati* carries a risk of being cut off from the insurance network. An implication of this assumption is that, if occupations are traditionally associated with castes, some individuals who want to switch occupations do it not for productive reasons, but rather to find an easier or less costly place to engage in rent-seeking. In our model, this generates a lack of trust between castes, and makes people unwilling to interact with people from other castes/occupations. Thus, the existence of caste, combined with a low-enough utility cost of rent-seeking, shuts down occupational mobility. Finally, in the absence of occupational mobility, some individuals will be stuck in an occupation – the one associated with their caste – that does not suit their abilities, and we show that in a significant region of parameter space, this leads to even more rent-seeking than in a setting without caste identities.

Therefore, our model predicts that the existence of caste can generate both occupational immobility (due to fear of rent-seeking from other castes) and increased rent-seeking (due to the low productivity of some workers who have been unable to sort into a suitable occupation). These results are consistent with our stylized facts from the IHDS. To be clear, our empirical analysis is not causal in nature, as we cannot claim that the local strength of caste is exogenous to other unobserved factors which may influence outcomes such as occupational mobility or rent-seeking; rather, we interpret our stylized facts as correlations (conditional on a variety of controls) that are endogenous equilibrium outcomes of the real data-generating process – exactly as our theoretical results are endogenous equilibrium outcomes of our model.

In a final section of the paper, we present a series of extensions of our model, including an analysis of possible policy implications of our analysis. We begin by adding a general utility
cost from interacting with other castes – whether productively or for rent-seeking – and we show that, surprisingly, this dislike of cross-caste interaction can increase the probability of attaining the efficient equilibrium. Essentially, in this setting, a worker would only switch occupations/castes in order to receive a large income gain; in other words, this new utility cost deters cross-caste rent-seekers, leaving only those individuals whose productivity is much higher in the other occupation wanting to switch. This extension can explain why an inefficient high-rent-seeking equilibrium is particularly likely in a highly geographically dense and integrated country such as India: the utility cost of migrating to interact with other castes is very small.

A second extension considers the role of redistribution: we show that, under certain assumptions, redistribution would be predicted to reduce rent-seeking, encourage occupational mobility and efficiency, and thus reduce the segregation of castes. Finally, we extend our model to consider the role of education, and show that a lowered return to education when caste is important is another natural implication of our model, because casteism encourages occupational immobility which limits the return to specialized education, and because casteism can generate predatory rent-seeking which directly reduces the return to investment in productive capabilities.

Our model contributes to several theoretical literatures. Most importantly, our paper is complementary to the work of Munshi and Rosenzweig (2016) on misallocation of labour and caste networks of mutual insurance; here, the misallocation is across occupations rather than space, and the mechanism is different: rent-seeking does not appear in Munshi and Rosenzweig (2016). Another literature considers conflict within and between groups, and our results effectively invert the logic found in Münster and Staal (2011), who find that groups have an incentive to fight with other groups to exhaust any desire to fight within-group; in our context, we find that an inability to “fight” with outsiders can intensify internal fighting, in the form of rent-seeking.

Our stylized facts are also related to a variety of papers in an empirical literature on the effects of caste on cross-caste interactions. For example, Anderson (2011) provides evidence of breakdowns in trade between caste groups which lead to higher incomes for low-caste
households when a lower caste dominates their village, while Jacoby and Mansuri (2015) finds that children in Pakistan – especially those from lower castes, and girls in particular – are unlikely to attend schools located in settlements dominated by other castes.

The rest of the paper proceeds as follows. Section 2 presents and discusses a series of stylized facts about caste, with a particular focus on occupational immobility and rent-seeking. Section 3 then presents the main model and derives results, while section 4 considers a number of extensions of the model and possible policy options. Section 5 concludes the paper.

2 Motivation: Stylized Facts

Following from Akerlof (1976), a variety of empirical papers touch on caste and a dimension of economic or social interactions. Unlike these prior papers that investigate households’ or workers’ own caste status or identity (perhaps in combination or interaction with other persons’ caste identities), we study a novel measure of casteism, the attitude or posture that supports caste-based discrimination and its enforcement. This will be a key feature of our model.

We add to this empirical literature with results in Figure 1. In each panel of this figure, the horizontal axis plots a measure of village-level casteism: the mean number of households in a village that report enforcing the rules of untouchability in their interactions with others. This is possible due to a unique set of survey questions that asked about untouchability in the 2012 round of the Indian Human Development Survey (IHDS). We use only rural households from the IHDS. Each observation is a single collapsed village; we analyze these data at the village level because we are interested in equilibrium outcomes in labor markets. In appendix A we confirm that none of these results are due to the caste, religious, occupational, or educational composition of villages.

Stylized Fact 1. Casteism occurs alongside occupational and geographic immobility.

This is visible in panels (a) and (e). Panel (a) shows that villages in which more households report enforcing untouchability are villages where household heads are more likely
Figure 1: Stylized Facts: Casteism across Rural Indian Villages

(a) occupational immobility

(b) income

(c) theft or threats

(d) conflict

(e) geographic immobility

Notes:
• Data: 2012 India Human Development Survey.
• Observations are villages in rural India: household-level survey data are collapsed into village-level averages.
• All variables are residualized at the household level, before taking village means, after controlling for state fixed effects and own caste and religion.
• “Casteism” indicates that the household reports enforcing the rules of untouchability (e.g., not allowing a Dalit into the kitchen).
• “Occupational immobility” is reporting the same occupation for the household head and his father.
• “Geographic immobility” is reporting that the household has lived in the same place for over 100 years or “forever.”
• “Theft or threat” and “conflict within the village” are as reported by survey respondents.
• Blue lines are linear regressions. Red lines are locally weighted non-parametric regressions. Green dots, to visualize the data, are averages in 20 equally-sized ventile bins, increasing in village casteism.
to work in the same occupation as their fathers. Panel (e) shows that villages with more reported casteism are villages where household heads are more likely to report that their household has lived in the same home forever (rather than having moved to their home). Urbanization and permanent migration more broadly (other than of women for marriage) are both known to be unusually uncommon in India, plausibly due to the social capital and ties of the caste system (Munshi and Rosenzweig, 2016).

**Stylized Fact 2. Casteism occurs alongside poverty and lower income.**

This is visible in panel (b): household incomes are lower, on average, in villages where more people report enforcing the rules of untouchability. This is consistent with a classic understanding of discrimination in economics, where discrimination can be costly and unproductive, because workers are not horizontally matched to the occupations where they would be most productive.

**Stylized Fact 3. Casteism occurs alongside rent-seeking, conflict, and crime.**

This is visible in panels (c) and (d), which show that intra-village conflict (as reported in a survey section on social relations within the village) and crime (as measured by household reports of “theft” or “threats” in a survey section on crime) are both more common in villages where more survey respondents report casteist social attitudes.\

Casteism paradoxically combines stasis with conflict: economic arrangements endure alongside equally enduring contestation and appropriation. Thus, it is not merely true that casteism is associated with occupational difference or even with low productivity and income; it is also associated with ongoing conflict and rent-seeking, in a way that cannot be accounted for by mere equilibrium horizontal differentiation.

The rest of this paper focuses on our main contribution: a theoretical account of caste and casteism that accounts for these stylized facts as equilibrium outcomes. For more detail on the variables and data used in Figure 1, and for an in-depth investigation of the robustness of these associations in a regression framework, please see supplementary appendix A.

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8Although this stylized fact is popularly understood within India to be correlated with the difference between northern plains states such as Uttar Pradesh, and southern states such as Kerala or mountain regions, in our supplementary appendix we show that this is true even for variation within Indian states.
3 Model & Results

We now present a simple discrete-type model of production, to investigate how the forces of caste can generate both occupational immobility and rent-seeking. The first subsection presents the setup of the model, while the second presents the solution for the equilibrium, and a third subsection discusses the effects of caste on occupational immobility and rent-seeking, to identify how our theoretical results connect to the stylized facts from section 2.

3.1 Model Setup

There are two castes, 1 and 2, which are horizontally differentiated only in the sense that each is associated with a particular occupation;\(^9\) we abstract from the hierarchical aspect of the caste system in order to focus on the horizontal division of society into separate sub-caste or \textit{jati} groups.\(^{10}\) While we will refer to occupations, the intuition is more general: the model is isomorphic to one in which individuals who “switch occupations” simply choose to have some economic interaction with individuals from another caste, and thus have the possibility of stealing from the members of another caste. Our mechanism thus emphasizes that it is the possibility of interacting with members from different groups which may lead to rent-seeking.

An individual’s type is described by three variables: caste \(c = \{1, 2\}\); output in own occupation \(z_c = \{1, 2\}\); and output in the other caste’s occupation \(z_f = \{1, 2\}\). We assume that each caste contains 50% of the overall population, and that within each caste one-quarter of the population is of each of 4 productivity types: \(\{z_c, z_f\} = \{\{1, 1\}, \{1, 2\}, \{2, 1\}, \{2, 2\}\}\).

Each individual makes 2 choices: (i) to stay in the occupation associated with their own caste or to switch to the other occupation, and (ii) to work productively or to engage in predatory rent-seeking. All individuals receive linear utility from consumption, and face a

\(^9\)See, for example, the discussion of the occupational aspects of the caste system in Hnatkovska, Lahiri, and Paul (2013).

\(^{10}\)The hierarchy of the caste system is also of considerable importance along numerous dimensions, and may be relevant for rent-seeking as well, but our goal is to demonstrate that the pervasive feature of rent-seeking can be explained by the division of Indian society into thousands of \textit{jati} sub-groups, many of which are ambiguously ranked relative to each other. Our focus on \textit{jati} is consistent with the findings, empirical and theoretical, in Mayoral and Ray (2016) that conflict between social groups over private prizes is more likely to take place at the level of smaller groups.
utility cost (perhaps negative) of rent-seeking,\textsuperscript{11} which may differ depending on occupation. Specifically, we assume that it is more costly to rent-seek from one’s own caste than from another caste, as the penalty if caught is likely to be higher within one’s own caste. Munshi and Rosenzweig (2016) demonstrate that sub-caste groups serve as a network of mutual insurance, and it is natural to suppose that this insurance could be lost if an individual is found to have been stealing from the group. We model this difference of rent-seeking costs in a reduced-form way: we assume that rent-seeking is always successful in obtaining income, but that the utility cost is $d$ if rent-seeking from the other occupation, and $d + m$ if stealing from one’s own caste. We assume that $d > -1$ to ensure that it is efficient for everyone to work productively, and that $m > 0$ is the added cost from the loss of mutual insurance.\textsuperscript{12} We also assume that there is a vanishingly small cost of switching occupations, an epsilon that can be ignored in welfare calculations but which ensures that ties are broken in favour of staying within the occupation associated with one’s caste; we similarly assume that ties between producing and rent-seeking within an occupation are broken in favour of producing.

In each occupation, output is linear in worker skill $z$, but a share $\tau s$ is taken by rent-seekers within that occupation, where $s$ is the fraction of individuals in that occupation who are rent-seekers. $\tau$ denotes the power of rent-seekers, and we assume that $\tau < \min\{1 + \frac{d}{2}, 1\}$ to ensure that highly-skilled workers will always choose to work productively. We consider only symmetric equilibria, so the result will be identical in each occupation, and thus we drop caste subscripts when they are not needed. A productive individual with skill $z$ will receive consumption $y(z) = (1 - \tau s)z$, whereas rent-seeker consumption does not depend on the rent-seeker’s skill: $y_t = \tau(1 - s)E(z)$, where $E(z)$ is the average skill of productive workers in that occupation. Therefore, utilities are as follows:

$$U(z) = y(z) = (1 - \tau s)z$$

$$U_{tc} = \tau(1 - s)E(z) - d - m$$

\textsuperscript{11}We normalize the disutility of productive work to zero.

\textsuperscript{12}Even if occupational mobility is possible, in equilibrium it will always be the case that at least 50\% of the workers in an occupation are from the caste associated with that occupation, and so we assume that the utility cost structure is insensitive to occupational membership. Imagine, for example, that a member of the caste associated with the occupation in question is always the “boss” of that occupation, so that stealing from that occupation will be punished as if it was stealing from the caste itself.
$$U_{tf} = \tau (1 - s) E(z) - d$$

where $U(z)$ represents the utility of a productive worker with skill $z$, $U_{tc}$ is the utility for individuals who rent-seek within their own caste, and $U_{tf}$ is the utility for those who rent-seek from the other caste.

The assumption that $\tau < 1 + \frac{d}{2}$ implies that, in equilibrium, individuals with a skill of 2 will always choose to be productive, which means that types $\{2, 2\}$ and $\{2, 1\}$ always stay in their own occupation and work productively.\(^{13}\) But there are a variety of possibilities for types $\{1, 2\}$ and $\{1, 1\}$: the $\{1, 2\}$ types could stay in their own occupation and either produce or rent-seek, or they could switch occupations to produce; meanwhile, the $\{1, 1\}$ types could stay in their own occupation and either produce or rent-seek, or they could switch occupations to rent-seek.\(^{14}\)

We consider the equilibrium of a game in which there are two stages. In the first stage, each caste decides whether or not to allow members of the opposite caste to work in their occupation; we assume that one of the individuals with $z_c = 2$ is chosen to make this decision, but the results are identical if the decision depends on a majority vote if ties are broken in favour of allowing occupational mobility. For the purpose of this decision, we introduce a new term $x$ representing the disutility experienced by the decision-maker in equilibrium if members of the opposite caste steal from the decision-maker’s caste, and we assume that $x \geq 0.5\tau$.\(^{15}\) In the second stage, all individuals make their own personal occupational and production/rent-seeking decisions. Given the assumption that $x \geq 0.5\tau$, occupational mobility will be allowed in the first stage if and only if none of the occupation-switching individuals intend to engage in rent-seeking in the second stage. We will look for a subgame-perfect pure-strategy equilibrium: one such unique equilibrium always exists, and mixed-strategy equilibria would generally only be relevant at the boundaries between

\(^{13}\)If this condition is not satisfied, equilibrium may require a mixed strategy in which some individuals with a skill of 2 engage in rent-seeking. We further assume that $\tau < 1$ to ensure that productive workers never lose all of their output to rent-seekers.

\(^{14}\)Since individuals with a skill of 2 will always work productively, the $\{1, 2\}$ types will never switch occupations to rent-seek. Meanwhile, the vanishingly small cost of switching occupations implies that $\{1, 1\}$ types will never switch occupations to produce.

\(^{15}\)This assumption is necessary to generate the “bad equilibrium” to come, as a situation with high within-caste rent-seeking must be preferable to the decision-maker to a situation with moderate across-caste rent-seeking. The frequency of between-caste riots in India would seem to support the idea that the disutility from being stolen from by members of another caste is higher.
different equilibrium regions in parameter space – and as we have ruled out ties in utility with our tie-breaking assumptions, mixed-strategy equilibria are in fact impossible in our model. The following subsection presents the solution.

3.2 Equilibrium Solution

We denote actions with an $S$ for “stay” or an $M$ for “move” (i.e. move to a new occupation), followed by a $P$ for “productive” or an $R$ for “rent-seeking”. We proceed by backwards induction, considering each branch of the game tree. Suppose, first of all, that occupational mobility is allowed in the first stage; then in the second stage, there are 9 possible cases, from the interaction of SP, SR, and MP for the \{1, 2\} types and SP, SR, and MR for the \{1, 1\} types. However, many of these can easily be ruled out from the structure of the model above. Given that $m > 0$, any action of SR is dominated by MR in a symmetric equilibrium; meanwhile, for the \{1, 2\} types, SP is dominated by MP, since productivity is higher in the other caste. This leaves only two possibilities: MP/MR and MP/SP, where the first action refers to \{1, 2\} types and the second refers to \{1, 1\} types.

The equilibrium that maximizes total utility is MP/SP: both types work productively, making the pie as large as possible, and the \{1, 2\} types who are more productive in the other caste’s occupation switch to make the best use of their skills. However, if the utility costs from rent-seeking are low enough, rent-seeking may occur in equilibrium; in particular, if $d$ is small, the \{1, 1\} types will want to switch occupations just for the sake of rent-seeking.

However, if any individuals choose to switch occupations for the purpose of rent-seeking, occupational mobility will be blocked in the first stage. In that case, the \{1, 1\} and \{1, 2\} types both have a choice simply between SP and SR, and given that both types are in identical situations and break ties in favour of producing, the only possible equilibria are SP/SP and SR/SR. SP/SP – an equilibrium in which every individual works productively within their own caste – is inefficient, because it does not allow for occupational mobility of the \{1, 2\} types, but clearly SR/SR is even worse, as it generates an average output of 1 per person rather than the 1.5 that is produced in the SP/SP equilibrium.

Thus, there are three possible outcomes: MP/SP, SP/SP, and SR/SR. For the efficient MP/SP outcome to be an equilibrium requires that the \{1, 1\} types prefer SP over MR,
or $1 \geq 1.75 \tau - d$. If this condition is not satisfied, the $\{1, 1\}$ types will prefer to switch occupations for the purpose of rent-seeking,\footnote{It is easy to show that $\tau = \frac{1+d}{1.75}$ partitions the space of potential outcomes if mobility is allowed: MP/SP is the outcome if $\tau \leq \frac{1+d}{1.75}$, whereas MP/MR is the result if $\tau > \frac{1+d}{1.75}$.} which will be blocked in equilibrium. In that case, SP/SP will be an equilibrium if both types prefer SP over SR, which requires $1 \geq 1.5 \tau - d - m$, or $\tau \leq \frac{1+d+m}{1.5}$. Clearly, $\frac{1+d+m}{1.5} > \frac{1+d}{1.75}$, which implies that the subgame-perfect pure-strategy equilibrium can be described by the following proposition.

**Proposition 1.** The subgame-perfect pure-strategy equilibrium to our model takes the following form:

- if $\tau \leq \frac{1+d}{1.75}$, the equilibrium will be MP/SP;
- if $\tau \in \left(\frac{1+d}{1.75}, \frac{1+d+m}{1.5}\right]$, the equilibrium will be SP/SP;
- if $\tau > \frac{1+d+m}{1.5}$, the equilibrium will be SR/SR.

This result can be seen graphically in Figure 2, which presents results with $\tau = 0.65$, and Figure 3, which presents the case where $\tau = 0.95$. Both figures demonstrate that, for a given $\tau$, the good equilibrium (MP/SP) exists when $d$ is sufficiently positive; if $d$ is small, then the equilibrium depends on the value of $d + m$. Unsurprisingly, the good equilibrium is harder to reach when $\tau$ is large, in which case the monetary gain from rent-seeking is large.

Figure 2: Equilibrium with $\tau = 0.65$  
Figure 3: Equilibrium with $\tau = 0.95$

The utility cost of rent-seeking across caste lines is $d$, and if this cost is small enough relative to the ease of rent-seeking $\tau$, low-skilled individuals – those of type $\{1, 1\}$ – will want...
to switch occupations for the purpose of rent-seeking from the other caste. However, this threat of rent-seeking – indeed, the inability of low-skilled individuals to credibly commit not to rent-seek – will generate distrust between castes and lead to a breakdown of occupational mobility, or more generally an unwillingness to interact with people from other castes. If the utility cost of rent-seeking from one’s own caste is not too large, this breakdown of occupational mobility can actually lead to more rent-seeking in equilibrium, in the SR/SR outcome.

3.3 The Role of Caste

The model presented above represents a situation in which caste plays a meaningful role in society. To connect our theoretical results to the stylized facts presented earlier, we now consider an alternative “caste-free” version of the model. In this version of the model, being of type \( c = 1 \) or \( c = 2 \) no longer indicates membership in a rigid social category, but simply indicates whether the individual is born to a parent that specialized in occupation 1 or 2. There are only two substantive differences from the model presented above: because there are no inherent differences between the two groups, we assume that the utility cost of rent-seeking is constant regardless of which occupation an individual chooses to work in, so that \( m = 0 \). Additionally, and more importantly, the first stage of the game vanishes: the members of “caste” 1 no longer represent an exogenous social group, and thus no longer have the ability to prevent occupational mobility.

In this model, there are only two possible equilibria: as above, if \( \tau \leq \frac{1+d}{1.75} \), the equilibrium will be MP/SP, whereas for any larger value of \( \tau \) the equilibrium will be MP/SR.\(^{17}\) Thus, the comparison is simple: when caste is an important social force, occupational mobility ceases if \( \tau > \frac{1+d}{1.75} \), and rent-seeking will also increase if \( \tau > \frac{1+d+m}{1.5} \). Our model provides a microfoundation for the standard result that casteism generates occupational immobility: our results suggest that this could be due to the inability of individuals to commit not to steal from members of other castes, which leads to a lack of trust and a tendency to avoid economic interactions with other castes. This occupational immobility, meanwhile,

\(^{17}\)Given that ties between moving and staying within one’s “occupation at birth” are broken in favour of staying, SR will be chosen over MR when \( m = 0 \).
can further explain a positive association between strength of caste and rent-seeking: when casteism is sufficiently strong to block occupational immobility, in some cases individuals whose skills are a poor fit for their traditional occupation will find it more profitable to engage in rent-seeking, even if constrained to steal from their own caste.

4 Extensions & Public Policy

In the previous section, we presented our main model and showed how the resulting equilibrium depends on the relative costs and benefits of rent-seeking. In the current section, we present several extensions to our analysis. First, we add a new parameter to our model representing the utility cost of interactions with the other caste; this parameter could come from monetary costs of interaction, such as those arising from geographical distance between castes, or could arise if castes fundamentally dislike each other. We show, surprisingly, that such interaction costs can actually increase the likelihood of attaining the good equilibrium. Second, we analyze the effects of redistribution, and demonstrate that certain types of redistribution can weaken incentives to rent-seek, thus encouraging occupational mobility and raising efficiency. Finally, we study the implications of extending the model to include individual education decisions, and show that our model can explain our earlier empirical finding of lower returns to education in the presence of strong forces of caste.

4.1 Interaction Costs

We now introduce a new parameter $b > 0$ to the model, which is a utility of cost of entering the occupation associated with the other caste, whether for productive purposes or rent-seeking. The utility functions now take the following form:

$$U_c(z) = y(z) = (1 - \tau s)z$$

$$U_f(z) = y(z) - b = (1 - \tau s)z - b$$

$$U_{tc} = \tau (1 - s)E(z) - d - m$$

$$U_{tf} = \tau (1 - s)E(z) - d - b$$
where \( U_c(z) \) now represents the utility of a productive worker who stays in his own caste, while \( U_f(z) \) is the utility of a producer who works in the other occupation.

In this setting, the equilibrium becomes significantly more complicated, and appendix B presents the calculations, as well as the analytical results for equilibrium in Proposition 4. The resulting conditions for equilibrium are quite complicated, but the implications of introducing \( b \) can best be understood by considering the solution in graphical form: Figure 4 below presents the results with \( \tau = 0.65 \), while Figure 5 presents the case when \( \tau = 0.95 \). The most obvious result is that increasing \( b \) expands the region of parameter space that generates the good MP/SP equilibrium. A positive \( b \) also introduces a region in which MP/SR is the equilibrium, if \( m \) is small enough relative to \( b \); and when \( b \) is very large, it becomes possible that no pure-strategy equilibrium exists (which was not possible for \( b = 0 \)).

Figure 4: Equilibrium with \( \tau = 0.65 \)
The main result of this section is that a positive $b$ can actually improve the outcome in certain cases: given an equilibrium involving occupation-switching, a positive $b$ reduces the average utility, but it increases the likelihood of attaining an efficient equilibrium with occupational mobility. The logic of this result is as follows: if it is fundamentally costly to interact economically with individuals from other castes, it is less likely that any given individual will want to switch occupations – and more importantly, the financial gain from switching would have to be substantial. In the current model, it is assumed that rent-seekers all obtain the same income (that is, rent-seeking skill is identical for all individuals), whereas there is a distribution of productive abilities, and thus only those with very large gains from switching occupations will do so – that is, those who are the most productive in the other occupation. In a more general model with a continuous joint distribution of productive and
rent-seeking skills, a similar result would apply if the distribution of productive skills was wider than that of rent-seeking skills.

Thus, with $b > 0$, only those who really get paid from switching occupations are willing to tolerate the utility cost of doing so. This utility cost $b$ could be interpreted as a fundamental dislike of the other caste, which would generate the surprising result that mutual dislike between castes can, under certain circumstances, improve economic efficiency. However, the more interesting interpretation of $b$ is as a measure of geographical integration: if individuals of different caste groups are closely clustered together, the cost of interaction $b$ will be small.

This provides an explanation for why rent-seeking and occupational immobility are especially likely to happen in a country such as India: population density in India is extremely high, and members of another jati or varna are almost always nearby. Thus, the physical costs of interacting with other castes are low, which, in our model, makes it harder to reach the efficient equilibrium.

### 4.2 Redistribution

We now move to the question of public policy: what policy tools might help a government that desires to reduce rent-seeking and encourage occupational mobility? Obviously, a simple answer is to raise the utility costs of rent-seeking $d$ and $m$, or to lower the return from rent-seeking $\tau$, but this may be beyond the power of a government with limited institutional capacity, such as the government of India.\[^{18}\] Another equally – or even more – infeasible policy reform would be to eliminate the social force of caste, which has been a stated goal of the government of India for decades.

However, another possibility is the use of some form of redistributive policy. Suppose that we introduce a proportional income tax rate $t < 1$ into our model, which is applied to all sources of income, with the proceeds redistributed to the population via a lump-sum grant. In our baseline model without $b$, we now require that $\tau < \min\{1 + \frac{d}{2(1-t)}, 1\}$ in order to ensure that highly-productive individuals continue to work productivity rather than rent-seek, and

\[^{18}\]Baumol (1990) discusses the possibility of policy to discourage or encourage rent-seeking behaviour, and argues that at various places and times in human history, rent-seeking has often been seen as not only normal, but actually virtuous. Given the ongoing campaigns for reservations in public employment by a wide variety of groups in India – jobs which are often associated with benefits from rent-seeking – this may not be an inaccurate model of India today.
then the conditions for equilibrium can be described by the following proposition.

**Proposition 2.** The subgame-perfect pure-strategy equilibrium to our model with proportional taxation takes the following form:

- if $\tau \leq \frac{1-t+d}{1.75(1-t)}$, the equilibrium will be MP/SP;
- if $\tau \in (\frac{1-t+d}{1.75(1-t)}, \frac{1-t+d+m}{1.5(1-t)})$, the equilibrium will be SP/SP;
- if $\tau > \frac{1-t+d+m}{1.5(1-t)}$, the equilibrium will be SR/SR.

**Proof.** For MP/SP to be an equilibrium requires that the $\{1,1\}$ types prefer SP over MR, which requires $(1-t) \geq 1.75(1-t)\tau - d$, which simplifies to $\tau \leq \frac{1-t+d}{1.75(1-t)}$. If this condition is not satisfied, the $\{1,1\}$ types will prefer MR, which will be blocked; SP/SP will then be the outcome if both types prefer SP to SR, which requires $(1-t) \geq 1.5(1-t)\tau - d - m$, or $\tau \leq \frac{1-t+d+m}{1.5(1-t)}$.

We can no longer guarantee that $\frac{1-t+d+m}{1.5(1-t)} > \frac{1-t+d}{1.75(1-t)}$, so it is now possible that no SP/SP region of parameter space exists. Otherwise, however, the structure of equilibrium is unchanged; it is only the thresholds that are affected by taxation.

In particular, consider the condition for an efficient MP/SP equilibrium: $\tau \leq \frac{1-t+d}{1.75(1-t)}$. The right-hand side of this expression is increasing in $t$ if and only if $d > 0$: if rent-seeking is costly in utility terms, and thus done for money and not for fun, redistribution reduces the financial gain from rent-seeking and thus the incentive to switch occupations in order to rent-seek. Thus, taxation can improve occupational mobility, raising efficiency.

Similarly, consider the condition for the worst possible equilibrium, SR/SR: $\tau > \frac{1-t+d+m}{1.5(1-t)}$. The right-hand side of this expression is increasing in $t$ if and only if $d + m > 0$, which is a weaker condition than $d > 0$ given that $m > 0$. In this model redistribution may not only raise occupational mobility; it may also reduce the incentive to engage in rent-seeking behaviour, and both changes will tend to improve efficiency.

Thus, our results suggest that, as long as rent-seeking is costly in utility terms, taxation may encourage occupational mobility and the mingling of castes, leading to potential efficiency gains from taxation. In a more general model in which taxation also reduces labour effort on an intensive margin, this conclusion could be more ambiguous, but it introduces
the possibility of a new efficiency motivation for redistribution in less-developed economies. Indeed, our results suggest that it is possible that high-income people may prefer higher levels of redistribution: if someone is going to come and take your money, better that it be the government which will directly transfer it to the poor to supplement their labour incomes, rather than it being stolen by individuals who have no other labour income and need a larger amount to get by. A further implication of our results is that the optimal level of taxation is likely to be increasing in casteism.

However, one important caveat is needed: our analysis above assumes that the government can introduce a form of taxation that applies to all (net) income, whether from productive work or from rent-seeking. This may be unrealistic; if rent-seeking income is more “under-the-table”, it may be less likely to be subject to taxation than formal labour income. This simply implies that it is very important to consider the form of redistribution used; consumption and other indirect forms of taxation may be less subject to this caveat, and indeed this may be a partial explanation for why income taxation represents a very small portion of the overall revenues of the Indian government: formal income taxation may tend to discourage formal labour market participation, encouraging rent-seeking along with other less formal types of employment.

4.3 Education

As a final extension of our baseline model from section 3 we introduce education as a choice variable. This is motivated by an additional stylized fact displayed in Figure 6, which uses the same IHDS data as section 2. The figure shows an interaction between education and untouchability: the returns to education – visible in the gradient between education and log wages – is steeper for adult men in villages where casteism is low than in villages where casteism is high.¹⁹ Note that because the man’s own caste is controlled for, this interaction is a fact about the casteism of the neighbors in his village, not his own caste status or rank.

We consider a case in which education \( e \) can be obtained at a cost \( c(e) = \frac{\alpha}{2} e^2 \); to ensure well-defined boundaries of parameter space for equilibria, we assume that \( \alpha < 0.5 \) and

¹⁹In particular, the figure plots locally weighted regressions, for observations which are individual adult men, of the log of the equivalent hourly wage in rupees on years of education, where wages are residualized after regression on indicator variables for age, the man’s caste category, and the man’s religious category.
Education is assumed to have no direct effect on the returns from rent-seekers, but it raises the output of a productive worker. Suppose that output for a productive individual with skill $z$ and education $e$ is $ze$, so that the income of such an individual is $y(z, e) = (1 - \tau s)ze$; then the utility of this individual is:

$$U(z, e) = y(z, e) - c(e) = (1 - \tau s)ze - \frac{\alpha}{2} e^2.$$ 

Given a choice to be a productive worker, the first-order condition for $e$ gives us $e^*(z) = \frac{(1 - \tau s)z}{\alpha}$, which implies that we can write indirect utility as:

$$U(z) \equiv U(z, e^*(z)) = \frac{((1 - \tau s)z)^2}{2\alpha}.$$ 

Now consider the second stage of the game, if mobility is allowed in the first stage. As before, SR is dominated by MR given $m > 0$, and for the $\{1, 1\}$ types, MP is dominated by SP given the tie-breaking rules; meanwhile, SP is dominated by MP for the $\{1, 2\}$ types. To ensure that MR is dominated by MP for the $\{1, 2\}$ types, we modify our earlier assumption on $\tau$: we now assume that $\tau < \min\{1, \frac{2 + d}{3}\}$. Given this assumption, once again the only two possible second-stage pure-strategy outcomes are MP/SP and MP/MR. However, unlike in the baseline model, it is now possible that a region of parameter space exists in which no pure-strategy equilibrium exists, and thus we loosen our earlier assumptions – i.e. on
tie-breaking rules – to allow for mixed-strategy equilibria when no pure-strategy equilibrium exists. In particular, there may be a region in between MP/SP and MP/MR in which the \( \{1, 1\} \) types randomize between SP and MR. However, both this mixed-strategy equilibrium and the pure-strategy MP/MR equilibrium will be blocked in the first stage, as long as a new condition on the disutility from cross-caste rent-seeking \( x \) is satisfied: \( x \geq \frac{2r-0.5r^2}{\alpha} \).

Therefore, for the first stage, the important question is when MP/SP can be sustained as an equilibrium, and appendix C demonstrates that the condition is \( \tau \leq \frac{1+2\alpha d}{6.5} \). For any larger value of \( \tau \), at least some \( \{1, 1\} \) types will want to switch occupations in order to rent-seek, and occupational mobility will be blocked in the first stage of the game. In that case, the possible outcomes are SP/SP, SR/SR, and a mixed-strategy equilibrium in which some of the \( \{1, 1\} \) and \( \{1, 2\} \) types rent-seek while the rest work productively; given that those two types are in identical situations when mobility is not possible, all that matters for describing the equilibrium is the overall fraction of rent-seekers, not the proportions in which the rent-seekers are drawn from each of the two types.

Appendix C demonstrates that the outcome will be SP/SP when \( \tau \leq \frac{1+2\alpha(d+m)}{5} \) and SR/SR when \( \tau > 1.125 - \sqrt{\frac{3.0625}{4}} - \alpha(d+m) \); in between the outcome will feature mixed strategies. The subgame-perfect equilibrium can be described by the following proposition.

**Proposition 3.** The subgame-perfect equilibrium to our model with education takes the following form:

- if \( \tau \leq \frac{1+2\alpha d}{6.5} \), the equilibrium will be MP/SP;
- if \( \tau \in \left( \frac{1+2\alpha d}{6.5}, \frac{1+2\alpha(d+m)}{5} \right] \), the equilibrium will be SP/SP;
- if \( \tau \in \left( \frac{1+2\alpha(d+m)}{5}, 1.125 - \sqrt{\frac{3.0625}{4}} - \alpha(d+m) \right] \), the equilibrium will feature types \( \{1, 1\} \) and \( \{1, 2\} \) mixing between SP and SR, with an overall proportion \( s \) of individuals engaged in rent-seeking that is described by \( \alpha(d+m) = (1-\tau s)(2.5\tau - s\tau - 0.5) \);
- if \( \tau > 1.125 - \sqrt{\frac{3.0625}{4}} - \alpha(d+m) \), the equilibrium will be SR/SR.

**Proof.** See appendix C. \( \square \)

---

20 As in the baseline case, \( \frac{1+2\alpha(d+m)}{5} > \frac{1+2\alpha d}{6.5} \), and so an SP/SP region always exists.
Consider the effects of casteism on this equilibrium. Absent the ability of castes to limit occupational mobility, and with \( m = 0 \), the equilibrium would feature MP/SP if \( \tau \leq \frac{1+2\alpha d}{6.5} \), MP/SR if \( \tau \) was sufficiently large, and a mixed-strategy equilibrium in between. Our earlier empirical analysis found that returns to education tend to be lower when caste is more important, and our results are consistent with that intuition: if the return to education is \( \frac{dy}{de} = (1 - \tau s)z \), that return could be lower in the presence of caste for two reasons. First, if \( \tau \) is sufficiently large, the equilibrium with caste will feature a higher level of rent-seeking as before, and a larger \( s \) will reduce the return to education. Second, in the absence of occupational mobility, productivity \( z \) will be lower for the \( \{1, 2\} \) types, which could also tend to lower returns to education.

If casteism reduces the returns to education, it would naturally also lead to lower values of education \( e \), which enhances the possibility of casteism as a development trap: in the presence of caste-related rent-seeking, individuals will obtain less education, making the relative returns to a productive career lower and, under some circumstances, raising the relative attractiveness of rent-seeking.

5 Conclusion

In this paper, we focus on three important features of modern-day India: caste, rent-seeking, and occupational immobility. We start with an empirical analysis based on data from the India Human Development Survey-II, from which we are able to produce a series of stylized facts indicating that, among other things, these three features of India are significantly positively correlated across space.

We then present a model that can explain these findings. If castes are associated with occupations and it is easier or less costly to rent-seek across caste lines, some people who want to switch to a different occupation do so to find an easier place to seek rents. This creates distrust between castes, and an unwillingness to work with people from other castes, which shuts down the possibility of occupational mobility. Finally, if as a result many workers are stuck in jobs that are a poor fit for their talents, rent-seeking may become even more attractive and prominent than it would in the absence of caste.

We continue our analysis of the implications of our model with a number of extensions:
first, we find that it may be beneficial if it is costly to interact with other castes – which could explain why rent-seeking and immobility are particular problems in India, which has a high population density and in which it is never hard to find a member of another jati. We demonstrate that redistribution may also reduce rent-seeking and thus the segregation of castes, leading to a more efficient equilibrium. And finally, our model conforms to an empirical result that returns to education are likely to be lower when caste is more important.

Our model is a simple static model, but the reasoning applies in a dynamic sense as well: if new generations enter each period and choose a fixed occupation for the rest of their life, reaching a good equilibrium may be even harder than in a static model, for reasons similar to the model of collective reputations in Tirole (1996). Additionally, our model and the insights it generates could be applied to other contexts, in other developing countries, or even in a country such as the United States, where considerable debate in recent years has focussed on the extent to which crime is committed within racial groups. We are hopeful that our paper will help to advance the literature on economic choices and group identities more broadly in the years to come.

A Supplementary Appendix: Empirics of Stylized Facts

The main contribution of this paper is its theoretical model, which can account for the theoretical stylized facts presented in section 2. Our claim is that these observed correlations are equilibrium outcomes: casteism, occupational immobility, low income, and rent-seeking mutually cause one another in equilibrium. So, we precisely do not claim that we have an exogenous source of variation in casteism that we exploit to identify a causal effect of one upon the other.

Instead, what is novel about our empirical results is that we are able to document correlates of casteism, the disposition towards and practice of social differentiation, rather than a household’s own caste identity, or the caste composition of the households in a village. This is because we use a novel survey question included in the 2012 round of the India Human Development Survey, which asked 27,000 rural households about households’ practice of untouchability, meaning whether or not they enforce the rules of untouchability in their interactions with Dalit (very low caste-ranking) people. The survey asked two questions to each household-level respondent:

- **A**: In your household do some members practice untouchability?
- **B**, if no to A: Would there be a problem if someone who is scheduled caste were to enter your kitchen or share utensils?

21 See, for example, Lee (November 25, 2014).
22 This question can be asked even to Dalits, because there is rank among Dalits, and because Dalits of one type, such as leather-workers who interact with dead animals, might enforce untouchability in interactions with Dalits of another type, such as those who empty latrine pits. In any event, all of our empirical results control of own-caste or caste composition of the village, as appropriate.
In general, we count a household as practicing untouchability if it answers yes to A or B; we then compute village-level casteism as the average over this household-level variable in the village. In one specification, for robustness, we instrument for village average A or B untouchability with village average A untouchability. This question is a valuable step beyond what is ordinarily included in survey datasets such as the National Sample Survey or the Demographic and Health Surveys because it offers a measure of social attitudes of the sort that we study.\textsuperscript{23}

We construct geographic averages of our dependent and independent variables to represent the fact that our model is a model of an equilibrium in a local labor market. We also construct village-average control variables, to rule out that our results are driven by patterns of the composition of the village. In particular, we regress

$$
\overline{outcome}_{vs} = \beta \overline{casteism}_{vs} + \delta s + \Gamma C_{vs} + f (X_{vs}) \varepsilon_{vs},
$$

(1)

where $v$ indexes villages, $s$ indexes states, $\beta$ is the coefficient of interest, $\delta$ are state fixed effects, $C$ is a vector of controls for the caste (6 categories) and religion (9 categories) composition of the village, and $X$ is a set of extended controls that will be included for robustness. Because villages are primary sampling units of the rural IHDS, village averages are consistent for village means.

Occupational mobility is categorized for each household head based on the responses to two survey questions:

- What is the principal source of income for the household?
- What was the primary occupation of the household head’s father (for most of his life)?

Table A1 presents regression results for each of the five outcome variables reported in Figure 1. Panel A reports a direct implementation of regression equation 1, with state fixed effects. Although there is considerable variation in casteism across the states of India, these state fixed effects ensure that our results are not merely a spurious reflection of geography or variation in policy or governance. Panel B replaces the OLS framework of 1 with an IV approach that instruments for the village average of “A” practice of untouchability with the village average of “A or B” practice of untouchability. This instrumentation is motivated by the possibility of measurement error in survey-reported untouchability, both because respondents may not answer correctly for their entire household, and because within-village information is computed from a sample survey. Panels C and D substitute district fixed effects for state fixed effects; districts in India are approximately 600 administrative sub-divisions of states. These district fixed effects therefore account for a fine degree of variation in geographic and policy environments. Finally, panel D adds controls for the education of household heads (16 indicators for possible levels of schooling) and controls for the occupational category of household heads’ fathers, as used to construct the occupational mobility variable. These ensure that the particular human capital or occupation of households is not driving our results about the match of occupational category.

The principal message of regression table A1 is that each of these variations in specification and functional form make essentially no difference to our empirical results. The one exception is

\textsuperscript{23}This question has previously been studied in the economics literature on sanitation and health by Spears and Thorat (2017), who show that — controlling for a wide range of socioeconomic status variables of the sort that we study here and many other variables — people who live in villages where more people practice untouchability are more likely to defecate in the open. Their study is concerned to understand a dimension of variation on sanitation behavior that is uncorrelated with other health inputs or health beliefs conditional on socioeconomic status, and holds constant the issues of this paper (occupation, income, rent-seeking) by controlling for them.
Table A1: Robustness of stylized facts: Regression with alternative specifications

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<td>ln (income p.c.)</td>
<td>geographic immob.</td>
<td>theft or threat</td>
<td>village conflict</td>
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Note: Data are from the 2012 India Human Development Survey. The survey is a household-level survey; we have computed village level averages by collapsing household-level data into means. In Panel B, instrumentation is used to address measurement error in casteism: the fraction of households reporting a more expansive definition of practicing casteism is used to instrument for the fraction of households reporting a less expansive definition; elsewhere the more expansive definition is used. All panels control for the caste and religion composition of the village; panel D adds extended controls for the composition of the village by the household head’s education and by the occupational category of the household head’s father. Standard errors are robust but not clustered, because they are already collapsed by survey primary sampling unit. Two-sided p-values: * p < 0.10, ** p < 0.05, *** p < 0.01.
that the coefficient on village casteism predicting village conflict becomes small when district fixed
effects are substituted for state fixed effects; this suggests that much of the variation in reported
intra-village conflict within states is correlated at the district-level.

B Proof of Equilibrium with \( b > 0 \)

In the model presented in section 4.1, the branch of the game tree in which mobility is blocked is
unaffected when we introduce a positive utility cost of cross-caste interaction \( b \), but the outcome
when mobility is allowed is far more complicated. Consider the possible actions of the \( \{1, 2\} \) and
\( \{1, 1\} \) types. As before, the \( \{1, 2\} \) types have a choice between MP, SP and SR; type-2 individuals
will always work productively, given the assumption that \( \tau < \min\{1 + d/2, 1\} \), which rules out MR.
Meanwhile, the \( \{1, 1\} \) types have a choice between MR, SP and SR, as MP is always dominated by
SP for these individuals. And as before, SP/SR and SR/SP are impossible given the tie-breaking
rules. This leaves a set of 7 possibilities for equilibrium, which depend on the following conditions:

1. MP/MR: we need that type \( \{1, 2\} \) prefers MP to SP and SR, and that type \( \{1, 1\} \) prefers
MR to SP and SR; the condition that type \( \{1, 1\} \) prefers MR to SR, along with the condition
that \( \tau < 1 + d/2 \), implies that the condition that type \( \{1, 2\} \) prefers MP to SR is satisfied, and
thus the conditions for MP/MR to be an equilibrium are:

\[
b < 1 - 0.25\tau \quad \& \quad 1 < 1.75\tau - d - b \quad \& \quad b < m.
\]

2. MP/SP: we need that type \( \{1, 2\} \) prefers MP to SP and SR, and that type \( \{1, 1\} \) prefers SP
to MR and SR; the condition that type \( \{1, 2\} \) prefers MP to SP, along with the condition that
type \( \{1, 1\} \) prefers SP to SR, implies that the condition that type \( \{1, 2\} \) prefers MP to SR is satisfied, and thus the conditions for MP/SP to be an equilibrium are:

\[
b < 1 \quad \& \quad 1 \geq 1.75\tau - d - m \quad \& \quad 1 \geq 1.75\tau - d - b.
\]

3. MP/SR: we need that type \( \{1, 2\} \) prefers MP to SP and SR, and that type \( \{1, 1\} \) prefers SR
to MR and SP; the condition that type \( \{1, 2\} \) prefers MP to SR, along with the condition that
type \( \{1, 1\} \) prefers SR to SP, implies that the condition that type \( \{1, 2\} \) prefers MP to
SR is satisfied, and thus the conditions for MP/SR to be an equilibrium are:

\[
b < 2(1 - \tau) + d + m \quad \& \quad 1 < 1.75\tau - d - m \quad \& \quad b \geq m.
\]

4. SP/MR: we need that type \( \{1, 2\} \) prefers SP to MP and SR, and that type \( \{1, 1\} \) prefers MR
to SP and SR; the condition that type \( \{1, 1\} \) prefers MR to SP, along with the condition that
type \( \{1, 2\} \) prefers SP to SR, implies that the condition that type \( \{1, 1\} \) prefers MR to SR is satisfied, and thus the conditions for SP/MR to be an equilibrium are:

\[
1 \geq 1.5\tau - d - m \quad \& \quad b \geq 1 - 0.25\tau \quad \& \quad 1 < 1.5\tau - d - b.
\]

5. SP/SP: we need that type \( \{1, 2\} \) prefers SP to MP, that type \( \{1, 1\} \) prefers SP to MR, and
that both types prefer SP to SR; the conditions for SP/SP to be an equilibrium are:

\[
b \geq 1 \quad \& \quad 1 \geq 1.5\tau - d - b \quad \& \quad 1 \geq 1.5\tau - d - m.
\]
6. SR/MR: we need that type \{1, 2\} prefers SR to MP and SP, and that type \{1, 1\} prefers MR to SP and SR; the condition that type \{1, 1\} prefers MR to SR, along with the condition that type \{1, 2\} prefers SR to SP, implies that the condition that type \{1, 1\} prefers MR to SP is satisfied, and thus the conditions for SR/MR to be an equilibrium are:

$$1 < 1.5\tau - d - m \quad \& \quad b \geq 2(1 - \tau) + d + m \quad \& \quad b < m.$$ 

7. SR/SR: we need that type \{1, 2\} prefers SR to MP, that type \{1, 1\} prefers SR to MR, and that both types prefer SR to SP; the conditions for SR/SR to be an equilibrium are:

$$b \geq m \quad \& \quad 1 < 1.5\tau - d - m \quad \& \quad b \geq 2(1 - \tau) + d + m.$$ 

It is easy to verify that the equilibrium of this subgame, when it exists, is always unique; however, as we will see, it is possible that a pure-strategy equilibrium does not exist when \(b\) is sufficiently large. In the latter case, mixed-strategy equilibria will exist if the utility-tie-breaking rules presented in section 3 are dropped.

Any case in which MR is an outcome chosen by one of the types – that is, cases 1, 4, and 6 – will be blocked in the first stage, and in that case the outcome is exactly as in section 3: SP/SP will be the outcome if \(\tau \leq \frac{1 + d + m}{1.5}\), and otherwise the result will be SR/SR. Therefore, the subgame-perfect pure-strategy equilibrium can be described by the following proposition.

**Proposition 4.** The subgame-perfect pure-strategy equilibrium to the extended model with \(b > 0\) takes the following form:

- if \(b < 1\) and \(1 \geq 1.75\tau - d - m\) and \(1 \geq 1.75\tau - d - b\), the equilibrium will be MP/SP;
- if \(b < 2(1 - \tau) + d + m\) and \(1 < 1.75\tau - d - m\) and \(b \geq m\), the equilibrium will be MP/SR;
- if \(b \geq 1\) and \(1 \geq 1.5\tau - d - b\) and \(1 \geq 1.5\tau - d - m\), or if \(1 \geq 1.5\tau - d - m\) and \(b \geq 1 - 0.25\tau\) and \(1 < 1.75\tau - d - b\) and \(b \geq m\) and \(\tau \leq \frac{1 + d + m}{1.5}\), the equilibrium will be SP/SP;
- if \(b \geq m\) and \(1 < 1.5\tau - d - m\) and \(b \geq 2(1 - \tau) + d + m\), or if \(1 < 1.75\tau - d - b\) and \(b < m\) and \(\tau > \frac{1 + d + m}{1.5}\), the equilibrium will be SR/SR;
- if none of the above conditions are satisfied, there will be no pure-strategy equilibrium.

This complicated set of conditions is most easily represented graphically, and the equilibria for \(\tau = 0.65\) and \(\tau = 0.95\) can be found in Figures 4 and 5 in section 4.1.

**C Proof of Equilibrium with Education**

We begin with the second-stage result if mobility is allowed in the first stage. MP/SP will be the outcome as long as type \{1, 1\} prefers SP to MR, which requires:

$$\frac{1}{2\alpha} \geq \frac{3.25\tau}{\alpha} - d$$

and this simplifies to \(\tau \leq \frac{1 + 2ad}{6.5}\). If \(\tau\) takes a larger value, the resulting outcome will either be MP/MR or a mixed-strategy outcome, both of which will be blocked in the first stage.
If mobility is blocked, the outcome will be SP/SP if types \{1, 1\} and \{1, 2\} prefer SP to SR, which requires:

\[
\frac{1}{2\alpha} \geq \frac{2.5\tau}{\alpha} - d - m
\]

and this simplifies to \(\tau \leq \frac{1+2\alpha(d+m)}{5}\); as in the baseline case, \(\frac{1+2\alpha(d+m)}{5} > \frac{1+2\alpha d}{5}\), and so an SP/SP region of parameter space always exists. Meanwhile, the outcome will be SR/SR if types \{1, 1\} and \{1, 2\} prefer SR to SP, which requires:

\[
\frac{1 - 0.5\tau}{2\alpha} < \frac{2\tau(1 - 0.5\tau)}{\alpha} - d - m
\]

and this simplifies to \(\alpha(d + m) < (1 - 0.5\tau)(2\tau - 0.5)\); we then use the quadratic formula to solve for \(\tau > 1.125 - \sqrt{\frac{3.0625}{4} - \alpha(d + m)}\).

The critical minimum value of \(\tau\) for SR/SR is always weakly larger than the critical maximum value for SP/SP, and in between, the equilibrium will feature mixed strategies: some of the types \{1, 1\} and/or \{1, 2\} will work productively, and others will engage in rent-seeking. In particular, the overall proportion \(s\) of individuals engaged in rent-seeking needs to ensure that the utility from rent-seeking equals the utility from productive work, which implies:

\[
\frac{1 - \tau s}{2\alpha} = \tau (1 - s) E(ze) - d - m.
\]

\(E(ze)\) can be written as \(\frac{1 - \tau s}{\alpha} E(z^2)\), and \(E(z^2) = \frac{2.5 - s}{1 - s}\), which allows us to write the above equation as:

\[
\frac{1 - \tau s}{2\alpha} = \tau (2.5 - s) \frac{1 - \tau s}{\alpha} - d - m
\]

and this simplifies to \(\alpha(d + m) = (1 - \tau s)(2.5\tau - 0.5\tau - 0.5)\). We could further use the quadratic formula to solve for a closed-form solution for \(s\), but the resulting expression does not add any new intuition to the results.

References


