Rent-Seeking and Criminal Politicians: Evidence from Mining Booms

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Abstract

We study how natural resource rents affect the selection and behavior of holders of public office. Using global price shocks to thirty-one minerals and nationwide geological and political data from India, we show that local mineral rent shocks cause the election of criminal politicians. We also find a moral hazard effect: politicians commit more crimes and accumulate greater wealth when mineral prices rise during their term in office. These politicians have direct influence over mining operations but no access to fiscal windfalls from mining; we thus isolate the direct political impacts of mining sector operations.

JEL Codes: P16, O13, D72, Q33
I Introduction

The selection of honest politicians and the prevention of the misuse of power in office are central to good governance, especially in developing countries where institutions place fewer constraints on the behavior of officials (Caselli and Morelli, 2004; Besley and Reynal-Querol, 2011; Dal Bó et al., 2017). An important hypothesis in the literature on governance is that certain types of economic activity directly affect who obtains power and how they behave in office.\(^1\) The mineral extraction sector is thought to be particularly pernicious to political institutions for two reasons. First, it creates fiscal windfalls with no basis in taxation, which may limit the accountability of politicians. Second, due to the inherent nature of its operations, mining concentrates large rents in firms that have incentives to make illegal deals with officials. It has thus far proved difficult to empirically distinguish between these two channels, which have substantially different policy implications. In this paper, we use exogenous variation in mineral rents, holding constant institutions and fiscal windfalls, to isolate the impact of local mineral extraction on politician selection and behavior.\(^2\)

We draw on mandated public disclosures of assets and criminal charges of all candidates contesting state-level elections in India. To generate exogenous shocks to local mineral wealth, we draw on changes in the global prices of 31 subsurface minerals, located in geological deposits throughout India. For a concrete example, consider two mineral-rich areas, one of which is rich in gold, and the other rich in silver. When the global price of gold rises relative to silver, there is an exogenous mineral rent shock to the gold-rich region that is not expected to be correlated with other events in that region, except through the increased value of gold. We exclude areas with no minerals, to avoid comparing mineral-rich to mineral-poor

\(^{1}\)See, for example, Sokoloff and Engerman (2000), Easterly and Levine (2003), and Acemoglu et al. (2009).

\(^{2}\)At the country level, natural resource wealth is associated with worse economic and political outcomes in countries with weak institutions (Mehlum et al., 2006; Arezki and Brückner, 2011; Arezki and Brückner, 2012; Bhattacharyya and Hodler, 2010; Lei and Michaels, 2014; Caselli and Tesei, 2016). A second generation of research on the subject addresses the endogeneity of resource-rich places by exploiting resource discoveries, price shocks or rent allocation formulas (Brückner et al., 2012; Carreri and Dube, 2017; Caselli and Tesei, 2016). For a thorough review of studies on the relationship between political outcomes and resource wealth, see Ross (2015) and van der Ploeg (2011).
areas, which may be different on many dimensions.\textsuperscript{3}

We document three primary findings. First, increases in local mineral rents cause criminal politicians to win more elections, in spite of increases in electoral competition. The effect is particularly large for politicians charged with violent crimes. Second, when the value of local minerals rises during the electoral term, elected politicians engage in more criminal behavior. Third, elected politicians accumulate substantially more wealth during mining booms. The increases in crime and wealth are limited to politicians who gain office; we find neither effect on politicians who competed for office but were not elected. The results are robust to a range of specifications and do not appear in a placebo test of unproductive deposits.

Because of the structure of mineral taxes and royalties in India, we can rule out the possibility that these results are driven by increases in state revenue or larger discretionary budgets for politicians. This is important, because fiscal windfalls can have independent adverse effects on political outcomes (Brollo et al., 2013; Robinson et al., 2006; Martínez, 2015). Mineral taxes and royalties are collected by state governments and are not disproportionately disbursed in the areas where mining takes place. Local increases in economic activity associated with mining may raise revenue at other levels of government, but do not affect the discretionary funds available to the state legislators that we study. To our knowledge, this is the first study to isolate the impact of natural resource wealth on political outcomes in the absence of fiscal windfalls. In fact, several of the best identified studies on natural resources and political outcomes draw identification from exogenous allocation of oil windfalls to municipalities in Brazil, and thus test strictly for the fiscal windfall impact in isolation from direct rent-seeking from mineral extraction operations (Caselli and Michaels, 2013; Ferraz and Monteiro, 2014).\textsuperscript{4} Our study is a perfect complement to these: the direct impact of

\textsuperscript{3}Our use of global price shocks to identify exogenous changes in mineral wealth is similar to Dube and Vargas (2012), Bruckner and Ciccone (2010) and Berman et al. (2017), among others.

\textsuperscript{4}These studies exploit a formula that allocates royalties to municipalities based on characteristics unrelated to resource extraction activities in the municipalities or to the hold-up powers of the mayors. They find that fiscal windfalls lead to: (i) increased municipal spending with little impact on municipal public goods (Caselli and Michaels, 2013); and (ii) increased public employment and short-term incumbency advantages (Ferraz and Monteiro, 2014). Brollo et al. (2013) study fiscal windfalls that occur for reasons unrelated to natural resource wealth, finding that they cause the election of less educated mayors and cause
mining operations that we isolate is a channel that these earlier studies explicitly rule out. We can interpret our findings through a political agency model in the spirit of Persson and Tabellini (2000). Politicians are characterized by their individual return to illegal activity, and illegal behavior is constrained by the risk of getting caught. Politicians can collude with firms to illegally raise output (and thus shared rents), for example by granting mining permits in protected areas or by diverting law enforcement from illegal activities. The model highlights two channels for worse political outcomes when rents are high, which map directly to our empirical tests. First, pre-election shocks to expected mineral rents increase criminal politicians’ effort to gain office (adverse selection). Second, shocks to mineral rents that occur after elections induce worse behavior from politicians already in office (moral hazard).

While we cannot directly observe the specific illegal acts that politicians are charged with, the existing literature suggests that firms can benefit substantially from politicians who are willing to break the law. State-level politicians’ de facto primary role is to act as fixers, or as intermediaries between citizens and the state: they resolve local disputes outside of the court system, control local bureaucrats (including law enforcement officials), and control access to licenses and permits, while collecting illegal contributions from citizens and firms. Further, violence appears to be a central rather than a peripheral tool of criminal politicians. More than half of the criminally-accused politicians in our sample face charges for serious violent crimes. The willingness to resort to violence may make them more effective fixers and help them to win elections and intimidate other public officials.

The electoral and private returns to violence are likely to be amplified by the presence of a large-scale business sector like mining that often operates at the margins of illegality.

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5 Their de jure role as legislators who vote in state assemblies appears to be largely secondary to this primary informal role. See Berenschot (2011a), Jensenius (2017), Iyer and Mani (2012), Lehne et al. (2018), Asher and Novosad (2017), and Vaishnav (2017) for additional details.

6 Criminal politicians appear to deliberately develop reputations as effective users of violence for these reasons (Witsoe, 2009; Berenschot, 2011b; Vaishnav, 2017). The most comprehensive analysis of criminal politicians in India is Vaishnav (2017); we discuss his findings in the context of our results below.

7 Mining scandals have emerged in over ten different states and across many minerals, with costs reaching to the billions of dollars. See the reports of the Shah Commission of Inquiry on illegal mining (discussed below), available at the web site of the Ministry of Mines. Illegal mining, discussed in detail in Section II.A,
Illegal business operations around the world not only benefit from bending of official rules, but frequently employ violence to enforce illegal contracts or to intimidate whistle-blowers.\(^8\) Violence-using politicians in India are well placed to provide these services to mining firms, allowing firms to expand illegal production in exchange for a share of the rents. This use of violence by politicians is distinct from political violence that aims to influence public policy, as described by Dal Bo and Di Tella (2003), Acemoglu et al. (2013), and Alesina et al. (2016). But like these other forms of political violence, it leads to a political equilibrium that benefits criminal politicians and their allies at the expense of citizens.

This paper makes four novel contributions to a growing literature on the relationship between natural resources and political behavior. First, we show that mineral extraction operations have a direct adverse effect on political outcomes, even in the absence of fiscal windfalls.

Second, we show that politicians get wealthier when rents increase in a sector over which they have substantial influence.\(^9\) Previous work has identified broad deterioration in aggregate political outcomes and worse behavior in politicians with access to fiscal windfalls, but we are aware of no other study that has identified the impact of rents on the actions or incomes of political agents with direct influence over mining sector operations.

Third, we directly and separately test for the moral hazard and adverse selection channels in political rent-seeking, both of which prove to be economically meaningful, but have different implications. Paying closer attention to voter decision-making and the operation of elections can mitigate the selection effect, while better monitoring of candidates in office can mitigate moral hazard. The best empirical evidence to date of these channels is in Brollo et al. (2013), which models the adverse selection and moral hazard effects of fiscal windfalls.

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\(^8\)See, for example, Gambetta (1996), Bandiera (2003), Chimeli and Soares (2017), and Skarbek (2011). The latter provides a literature review on the uses of violence in organized crime.

\(^9\)Andersen et al. (2017) present indirect evidence of the enrichment of leaders from oil booms, showing that oil shocks lead to increased tax haven bank deposits from autocratic oil-exporting countries. Using the same asset data as us, Fisman et al. (2013) find that Indian politicians gain disproportionate wealth when elected to office.
in Brazil. They provide suggestive evidence that the moral hazard channel is important, in that controlling for candidate education does not change the effect of fiscal windfalls on corruption, but they do not rule out selection effects. Further, education may not be a sufficient proxy for candidate integrity; in our sample, criminal charges are marginally positively correlated with school attainment.

Finally, we provide empirical evidence that rent-seeking opportunities can raise the return to violent agents even in the absence of broader conflict. Previous economic work on criminal politicians in India has focused on theft and corruption (Prakash et al., 2015; Fisman et al., 2013), but has struggled to explain why violence plays such a large role in criminal politics in India. Our findings on political violence bring together two largely parallel literatures on the effects of natural resource wealth: the literature on political outcomes and the literature on conflict.10 Armed conflict over control of natural resources predominantly occurs in weak states which do not have the capacity to maintain a monopoly on the use of force. India occupies an intermediate position on the state capacity spectrum: conflicts simmer in remote regions, but none threatens to overthrow the state. In this context, mineral wealth leads to only a partial appropriation of the functions of the state; violent actors are able to seize significant mining rents, but violence does not escalate to the level of armed conflict.

The paper is structured as follows. In the next section we describe the Indian mining industry, the state political system and the roles of criminal politicians. Section III presents a political agency model that generates predictions about mineral wealth, political crime and violence. Sections IV and V respectively describe the data and the empirical strategy. We present results in Section VI and Section VII concludes.

10See, for example, Miguel and Kremer (2004), Angrist and Kugler (2008), Bruckner and Ciccone (2010), Dube and Vargas (2012), Cotet and Tsui (2013), Sanchez de la Sierra (2017), and Berman et al. (2017).
II  Background: Mining and Politics in India

II.A  The mineral industry in India

In 2010, the mining sector in India employed 521,000 workers and produced 2.5% of Indian GDP from over sixty different minerals (Indian Bureau of Mines, 2011). This is a small share of the economy as a whole, but the output share of the mineral sector is much higher in the localized regions where extraction takes place. From independence until the 1990s, Indian mines were predominantly state-owned. Many mines were privatized in the subsequent liberalization era. By 2010, 2229 of 2999 mines were privately owned, representing 36% of total production value (Indian Bureau of Mines, 2011). The mining sector is jointly regulated by the federal and state governments; royalties and taxes paid by mining corporations go directly to state and federal governments.

Importantly, there is no requirement for fiscal proceeds from mining to be spent in communities affected by mines, nor is there any indication that they are. 11 Elected politicians in many states receive development funds under the MLA Local Area Development fund schemes; these sums are small and constant across constituencies and are thus not influenced by local mineral rents. Local taxation operates at jurisdictional levels with no direct relationship with the legislative assemblies that are the subject of this study; therefore, even if mineral wealth shocks increase local business activity, this does not affect the discretionary budget of the local state legislator. We can thus rule out the possibility that our results are caused by the fiscal windfalls present in other studies of natural resource wealth.

Large scale criminal activity was present in the mining sector throughout the period of our study (2003-2013). Most of the illegal activity in this period was directly linked to the role of government in the mineral sector; management of fiscal windfalls played little role, as royalties are treated as general funds by state and federal governments and are not linked to mining activities. Illegal mining includes but is not limited to: (i) underreporting of mineral

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11In 2015, India revised the Mines and Minerals Act to require a share of mineral royalties to be paid to a district development fund. Even these districts are seven times the size of constituencies, the unit of observations in this study, and no such payments had yet been made at the time of writing.
output to avoid taxes and royalties; (ii) conducting prospecting and mining in areas without official permits, including preservation areas; (iii) violation of environmental regulations; and (iv) bribe-taking by state officials in exchange for mining permits. Intimidation of activists and journalists have also been widely reported. Major mines in India are now largely open caste mines, with activities visible from outer space, which makes illegal mining difficult to hide. Authorities are thus virtually always complicit in illegal mining.

In 2010, the federal government formed the Shah Commission of Inquiry to investigate illegal mining in a range of states and minerals. The Commission documented illegal mining at a large scale in every mineral and every state where it conducted investigations. The scale of illegal activities implied coordination at many levels of government. The findings of the Shah Commission eventually motivated the Supreme Court of India to ban iron mining in three major states (Chaturvedi and Mukherji, 2013). The Commission was terminated in 2013 by the federal government with little explanation, though investigations in several states had yet to begin.12

The case of the Reddy brothers in Karnataka encapsulates many features of the complementarity between mining and politics in India. Through the benefit of political connections, the brothers first obtained iron licenses in Andhra Pradesh in the early 1990s. Over the course of a 10-year iron boom, they became key financiers of elections, eventually becoming billionaires and government ministers. They have been charged with a range of illegal mining activities, perhaps most brazenly of moving the state boundary markers dividing Andhra Pradesh from Karnataka to place their mining operations in the state with the more favorable regulatory environment. They have openly admitted to bribing politicians to switch parties, and have been accused of various acts of violence and intimidation (Vaishnav, 2017).

The mineral sector is tied to illegal behavior in many countries other than India as well. See, for example, Africa Progress Panel (2013) on illegal outflows from Africa. The existence

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12 For more information on illegal activity in the mining sector, see the various state reports of the Ministry of Mines Shah Commission. See also the report of the Karnataka Lokayukta (an anti-corruption commission) on iron ore mining (July 27, 2011). Chauhan (2012) summarizes specific criminal allegations against mining firms in eleven different states.
of an industry funded organization aiming in part to decreasing the amount of law-breaking in the mining industry, the Extraction Industries Transparency Initiative, is a case in point of the ubiquity of illegal activity in the sector.

II.B Political context

Indian states have ownership rights over all minerals within their boundaries; while federal clearances are required for the mining of certain minerals, states have hold-up power over these as well. State politicians, also known as Members of Legislative Assemblies (MLAs), are elected in first-past-the-post, single elector constituencies. The formal powers of state politicians are exercised through the state legislatures; while they have no formal role in the permitting process, research suggests that they play a significant informal role. In practice, a central role of local politicians is to help citizens obtain services from the state (Berenschot, 2011a; Jensenius, 2017); they also exert significant authority over state bureaucrats through their ability to reassign them (Iyer and Mani, 2012; Vaishnav, 2017). This gives local politicians significant control over the many permits and clearances that are required before mining operations can begin, including reconnaissance permits, prospecting licenses, mining leases, environment clearances and surface rights (often to government-owned land). In other work, we find that political factors influence the allocation of these permits (Asher and Novosad, 2017). The set of regulatory restrictions known as the License Raj has persisted in the mining sector even while it was dismantled elsewhere, and additional permits are required for the expansion or alteration of existing leases, as well as expanding production from given mines. The state legislator is thus one of the most important officials that mining firms rely upon both for facilitation of operations and for prevention of predation by the state. We spoke with several mine operators, and each one had a personal relationship with the legislator representing the constituency of the mine.

As we discuss in Section IV, candidates seeking office must disclose open criminal charges that have been filed against them. In 2014, 33% of elected politicians at the state and federal level in India were facing criminal charges. Explanations for the success of criminal
politicians in India remain contested. Four prevailing hypotheses are: (i) voters would prefer non-criminal representatives, but lack information about the criminality of candidates (Banerjee et al., 2014; Pande, 2011); (ii) voters penalize criminal candidates, but may nevertheless choose them for ethnic reasons (Chauchard, 2015); (iii) criminals are favored by parties because they are self-financing (Vaishnav, 2017); and (iv) criminals are favored by voters because they are better at delivering services from a failing state (Vaishnav, 2017).

The limited evidence to date on the effects of representation by criminal candidates suggests that they do not deliver better services. Chemin (2012) and Prakash et al. (2015) find that average outcomes are worse in constituencies represented by criminal politicians, and vignette studies suggest that, all things equal, voters prefer non-criminal candidates (Banerjee et al., 2014; Chauchard, 2015). The impact of criminal representatives on citizens and firms is an important topic, but outside the scope of this study.

III Model

In this section, we present a political agency model to elucidate the channels by which resource extraction operations influence the behavior of politicians. The model is in the spirit of the career concerns model of Persson and Tabellini (2000), which Brollo et al. (2013) extend to allow endogenous entry of politicians. Our model is oriented toward understanding rent-seeking through illegal collusion between politicians and firms.

We focus on two features of the resource extraction sector. First, the mining sector generates rents, which can be expropriated by politicians through their control over the regulatory inputs required by mining firms. Second, mining is rife with illegality, both in India and in other developing countries. This increases the dependence of firms on local authorities, and raises the relative returns to both politicians and firms willing to engage in illegal activity.

Consider a single mining firm that operates in a constituency represented by a single

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13 The soaring cost of elections in India and tight official restrictions on spending lead to a high demand among politicians for untraceable money, or “black money” as it is known in India (Vaishnav, 2017). As an industry with the potential to rapidly generate undocumented cash, mining is widely suspected to be a significant funding source for many political campaigns.

14 See Pande (2011) for a summary of empirical research on voter preferences for politician quality.
politician. The mining operation has a high fixed cost and a low marginal cost; the price of output is such that the firm is profitable. Politicians have a type that is characterized by returns to illegal behavior $\theta \in (0, 1)$. A high $\theta$ could represent a low risk aversion, indicating a willingness to risk being caught and punished for crime. It could also represent a set of skills that increase returns from criminal activities, such as a propensity toward violence, or connections to criminal networks and other corrupt officials. Politicians who are caught in illegal activities pay a formal legal punishment and may face worse odds of re-election.

We intentionally treat $\theta$ as a generally propensity toward crime that is not specific to any type of crime, as this appears to fit the context. Qualitative evidence suggests that a willingness to commit crimes for one’s party organization or local bosses is used as an intentional signaling strategy. Such politicians may wish it to be known that they are effective at acting outside of the law (Witsoe, 2009; Berenschot, 2011b; Vaishnav, 2017).

The model has two periods. In the first period, each candidate chooses an election campaign effort level $e$, with a convex cost $f(e)$. This could be a time cost or a financial cost. Election outcomes cannot be predicted with certainty and the probability of getting elected is a concave function of effort, which we denote $\pi(e)$. The candidate’s utility function is:

$$U = \pi(e)g(\cdot) - f(e),$$  

where $g(\cdot)$ is the utility gain from getting elected, and includes the continuation value of future elections.

In the second period, in exchange for payment, the elected politician can take an illegal action that increases the firm’s output, such as granting an environmental clearance or land use permit that would have been rejected by the formal process. The action raises the

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15 We do not take a stand in the model on the relationship between $\theta$ and the politician’s ability to provide services to constituents. Brollo et al. (2013) assume that corrupt politicians provide worse services to citizens; Vaishnav (2017) argues they are better at providing services, in part because the formal state does such a poor job.

16 While we view it as unlikely that voters would reward a politician for being convicted, the model only requires that the punishment from being caught outweighs any electoral benefit.

17 While the action itself may be legal or illegal, the exchange of the action for payment is illegal. Other
firm’s output by an increasing concave function $q(a)$; more serious crimes (with higher $a$) have bigger effects on output.\textsuperscript{18} The action increases the firm’s profit by $\mu q(a)$, where $\mu$ is the mineral markup, or the difference between the price and extraction cost of the mineral. If the politician takes the illegal action, the rents are shared according to the Nash Bargaining solution. We assume equal discount rates for simplicity but the model results do not depend on this assumption, as long as the difference in discount rates is not extreme. The utility cost of illegal action is $\frac{c(a)}{\theta}$, where $c()$ is a convex increasing function of the severity of the action $a$. The cost function encapsulates the probability of being caught, the punishment conditional upon being caught, and any future electoral consequences. High $\theta$ politicians pay a lower utility cost for committing a given crime.

Equation 2 summarizes the politician’s net utility from the illegal action:

$$g(a, \mu, \theta) = \frac{1}{2}(\mu q(a) - \frac{c(a)}{\theta}).$$

(2)

We solve the model by backward induction. In the second period, the politician chooses $a$ to maximize rents, trading off profit against the risk and cost of getting caught. The first order condition is:

$$\mu q'(a^*) = \frac{c'(a^*)}{\theta}.$$  

(3)

Under Inada conditions, any politician with $\theta$ strictly greater than zero will choose $a^* > 0$ and commit at least some illegal action.\textsuperscript{19}

If the price of mineral output, and thus the mineral markup $\mu$ rises, then crime severity $a^*$ must rise according to Equation 3.\textsuperscript{20} Since $\mu$ and $a^*$ are rising, the politician’s rents in actions could be expediting a permit that would have been granted anyway (a less serious crime), or arranging for police to arrest or intimidate local activists (a more serious crime).

\textsuperscript{18}Any crimes for which the marginal profit is not increasing in the severity of the crime would be dominated choices, and thus not considered. We could model criminal competency by assuming that $q()$ is a positive function of $\theta$; this strengthens the predictions below because the politician trades off the increase in $q()$ against the cost of crime, which is decreasing in $\theta$.

\textsuperscript{19}In the words of a four-time Chief Minister of Uttar Pradesh, “Even an honest MLA [politician] gets a [10\%] kickback on discretionary spending” (Vaishnav, 2017).

\textsuperscript{20}Specifically, $\frac{\partial a^*}{\partial \mu} = \frac{q'(a^*)}{\mu q''(a^*) - \mu q''(a^*)}$. 

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Equation 2 must rise as well. This gives us the moral hazard result: when mineral rents are high, politicians provide more illegal services to firms and both firms and politicians earn greater rents from mining operations.

We now consider how politician type affects the effort exerted to obtain office. Each candidate chooses an effort level such that the marginal gain in terms of rents in office is equal to the marginal cost of effort required to win:

\[ f'(e^*) = \frac{1}{2} \pi'(e^*) (\mu q(a^*) - \frac{c(a^*)}{\theta}). \]  

\[ (4) \]

The change in effort in response to an increase in the mineral markup is given by:

\[ \frac{\partial e^*}{\partial \mu} = \frac{1}{2} \frac{\pi'(e^*) \cdot q(\mu, \theta)}{f''(e^*) - \pi''(e^*) \cdot g(\mu, \theta)}. \]  

\[ (5) \]

The expression is positive. Politicians earn greater rents from office when mineral rents are high, and therefore all candidates try harder to win elections when mineral prices are high. This has the biggest effect on effort when \( q(\cdot) \) is large, and thus when \( \theta \) is large—that is, on the candidates with the highest propensity toward illegal activity. High mineral values will increase the probability that a criminally inclined candidate gets elected, unless the mineral shock also decreases voters’ preferences for criminal candidates. This is the adverse selection effect.\(^{21}\) Both the adverse selection and moral hazard effects lead to increased illegal behavior by politicians in office when mineral rents are high. These effects are likely not only additive, but reinforcing: the moral hazard effect is worse for candidates who are more criminally inclined.

The model makes three key predictions, which we test in this paper. First, positive mineral

\(^{21}\)For simplicity, we have assumed that mineral wealth does not affect voter preferences over candidate type. Voter preferences could shift in either direction. They may dislike criminal candidates, and pay closer attention to elections when rents are high, thus mitigating the adverse selection effect. Alternately, they may prefer criminal candidates if they are perceived to facilitate mining operations. In the empirical part of this paper, we observe a joint outcome of voter preferences and candidate effort. The empirical test of the selection effect is thus jointly testing for the sum of the increase in candidate effort and any voter shift toward the more criminal candidate.
wealth shocks in the first period (i.e. before elections take place) will lead criminal politicians to win more elections. Second, positive mineral wealth shocks in the second period (i.e. after candidates have been selected into office) will cause politicians in office to gain wealth and commit more crimes. By focusing on shocks that occur after candidates win elections, we can thus isolate the moral hazard effect. Third, the wealth and crime gains may occur for all types of politicians, but should be strongest for the most criminal types.

IV  Data

We combined data on electoral outcomes and candidate characteristics with geological data on mineral deposits and administrative data on mineral production. India is divided into approximately 600 districts and 4000 constituencies, of which about 400 have productive mineral deposits. Constituency and district boundaries do not cross. All of our data is available at the constituency level, with the exception of mineral production, which is at the district level.

Data on electoral outcomes from 1990-2013 come from the Election Commission of India (ECI), described in Jensenius (2016). We tracked changes in names of parties over time in order to identify the local incumbent party in each constituency. To measure political competition, we use the effective number of parties (ENOP), an inverse Herfindahl measure based on vote share (Laakso and Taagepera, 1979).

Data on politician characteristics come from sworn affidavits submitted by candidates to the ECI. These include a list of criminal charges currently under prosecution, assets and liabilities of candidates and their relatives, as well as the candidate’s age and education. These affidavits have been required from all candidates seeking state-level election following Supreme Court rulings in 2002 and 2003 and have been digitized and disseminated by the Indian Electoral Commission and the Association for Democratic Reform (ADR). The resulting candidate-level data have been widely analyzed and discussed in the media as well as by scholars (Prakash et al., 2015; Fisman et al., 2013). Election laws in India bar convicted criminals from contesting elections; for sitting politicians, criminal charges are the
best available measure of politician criminality. Criminal charges are unlikely to be omitted, as they are easily verified from public record and politicians can be fined, disqualified from elections or imprisoned if found with incorrect affidavits. We computed net wealth as assets less liabilities across all family members. Figure 1 shows a scan of a submitted affidavit; the list of numbers under the entry marked (iii) in the figure is a list of sections under the Indian Penal Code under which this candidate has been charged. In order to observe changes in politician wealth and criminal behavior over time, we constructed a time series of candidates who recontest elections. We extended data from Fisman et al. (2013) and ADR, manually matching candidates based on name, age, level of education and tax ID number, creating a panel of 6,181 recontesting candidates.

Geocoded data on the type and size of all known mineral deposits in India come from the Mineral Atlas of India (Geological Survey of India, 2001). Production data are published at the district-mineral level in the annual Statistics of Mineral Information, which we digitized. We divided district production into all constituencies within a district that had matching deposits of the same mineral, weighting by deposit sizes. 91% of reported mineral output can be matched to specific deposits. To avoid bias from the possibility that election outcomes in sample could influence production quantities, we defined local production as the average value of output from 1990-2003, a period that predates the politician crime and asset data. From a list of 45 minerals for which we have both deposit and price data, we excluded minerals for which the Indian Bureau of Mines does not publish production statistics (on account of their low value), and we excluded constituencies with economically insignificant production in all years. To account for the fact that mineral deposits may span constituency boundaries, we also assigned production to all constituencies within 10km of an active deposit, using a

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22 As in Fisman et al. (2013), who study the private returns to political office in India, we removed candidates with net wealth less than Rs 100,000 (approximately USD 1500), and winsorized at the 1st and 99th percentile. Alternate choices do not materially affect the results.

23 The Geological Survey of India is a technocratic agency which to date has remained clear of India’s many mining scandals. All our results except those on election results are from after 2001, mitigating any reverse causality from mineral prices to deposit discovery; the results on elections are robust to using data only from later dates.

24 Specifically, we dropped constituencies where annual production never exceeded USD $100,000.
triangular kernel that puts the greatest weight on the nearest deposits. Results are robust to alternate choices on all of these dimensions, many of which are shown in appendix tables.

The final sample includes 1325 deposits and 31 distinct minerals across 374 constituencies in 25 Indian states (see Appendix Figure A1). Figure 2 shows a map of deposit locations (points), along with district-level production, where the most productive districts are shaded the darkest. The map reveals the wide dispersion of minerals across India. Most of the unexploited deposits are in the difficult-to-access Himalaya mountain region.

Commodity prices come from the United States Geological Survey (Kelly and Matos, 2013), which reports average annual U.S. price from before 1900 to 2013. Where the price of ore as reported in the Indian deposit data is not available, we use the price of the processed output of the mineral deposit (e.g. we use aluminum prices for bauxite deposits). Relative to world totals, India is a small producer of all minerals except iron and coal, so there is little concern that global prices are endogenous to Indian constituency-level politics. Constituency boundary shapefiles were purchased from ML Infomap. Finally, we construct several constituency-level variables from the 2001 population census describing demographics and public goods.

India underwent a national redelimitation of political boundaries in 2007-08. Since politicians began submitting affidavits with criminal case information only in 2003, our sample contains one election under each delimitation for most states and we cannot observe the same constituency over time. For robustness, we constructed a synthetic constituency panel consisting of pairs of pre- and post-2007 constituencies that have at least 50% of their area in common; about two thirds of sample constituencies can be matched in this way.

V Empirical strategy

Our goal is to estimate the impact of local mineral rents on the selection and behavior of elected politicians. This is challenging because natural resource wealth is endogenous to the

\footnote{We show that results are robust to the exclusion of these two minerals in Appendix Table A5. India produces 13% of the world’s iron; for all other minerals, India produces less than 10% of global value (British Geological Survey 2014).}
quality of local political institutions for at least two reasons. First, minerals are typically found in places that are remote and rugged; settlements driven by natural resource wealth may be more remote or have fewer other natural advantages. Second, productive mines require not only the presence of mineral deposits but also government-dependent inputs such as infrastructure, clearances and capital; a given deposit may be more productive if the state can supply these inputs efficiently.

We address these concerns by identifying plausibly exogenous changes in the subsurface wealth of mineral-producing areas that are driven by changes in global mineral prices, an approach used by Bruckner and Ciccone (2010) and Berman et al. (2017), among others. In this section, we first explain how we construct local mineral wealth shocks. We then describe how we use these shocks to separately test for adverse selection and moral hazard.

V.A Defining Exogenous Mineral Price Shocks

For each constituency-election, we use global price changes to identify exogenous shocks to constituency-level mineral rents. We weight global price changes by the average production value of minerals in or near each constituency, using the mean of production in the pre-sample period 1990-2003 as weights.\(^{26}\) While the initial level of production in a given constituency may be endogenous to constituency characteristics other than the mineral deposit, the predicted change in resource wealth is affected only by exogenous global price movements.

We measure price shocks in five year terms to match the legislative electoral term. A price shock thus measures the extent to which local minerals have changed in value from the period just before the previous election. Given the mean-reverting nature of commodity prices, we prefer the five-year term to a shorter term as it is more likely to capture a persistent change in a commodity’s value, and thus its expected value over the next electoral term.\(^{27}\) Results

\(^{26}\)Results are robust to using different base years to construct these averages (Appendix Table A3). We use a time-invariant average rather than time-varying production for two reasons. First, we are missing data for approximately one third of the years, for which we were not able to obtain editions of Statistics of Mineral Information. Second, year-to-year changes in production numbers are large, possibly indicating errors or misreporting, the latter of which could be correlated with price shocks. The average is thus a better estimate of potential constituency production.

\(^{27}\)Cashin and McDermott (2002) estimate the 90% confidence interval of the half-life of commodity price
are robust to a range of different price shock periods.

We thus define a pre-election constituency-level price shock as the change in the global value of the constituency production-weighted mineral basket from years $t = -6$ to $t = -1$, relative to an election in year $t = 0$. The price shock in constituency $c$ and state $s$ preceding an election in year $t$ is defined as:

$$\text{PriceShock}_{c,s,t-6,t-1} = \frac{\sum_{m \in M} (Q_{c,s,m} \cdot \frac{p_{m,t-1}}{p_{m,t-6}})}{\sum_{m \in M} (Q_{c,s,m})},$$

where $M$ is the set of minerals in constituency $c$, $Q_{c,s,m}$ is the baseline (1990-2003) production value of mineral $m$ in state $s$ and constituency $c$, and $p_{m,t}$ is the global price of mineral $m$ in year $t$.

We winsorize the upper tail of the price shock distribution at a 200% increase (approximately the 99th percentile) to ensure that results are not driven by extreme shocks in a small number of places.\footnote{We do not winsorize the bottom tail of price shocks, as the minimum shock is a 43% loss, which is not a particularly large outlier. Results are not substantively changed by either winsorizing the bottom at the first percentile, or leaving the top tail unwinsorized.} Figure 3 shows the mineral-level price changes that precede elections taking place in 2004, denoted above as $p_{m,2003}/p_{m,1998}$. Figure 4 shows a map of sample constituencies, shaded in a gradient corresponding to the same mineral price shock. Figure 5 presents a histogram of the 5-year price shocks generated in all constituency-year pairs in the main analysis sample. The mean price shock is above one because the sample period 2003-2013 was characterized by rising commodity prices.

An ancillary benefit of this price shock definition is that it is not biased by misreporting of mineral production, which is thought to be widespread in India. The incentive to underreport mineral production is highest when mineral prices are high for two reasons: (i) mining permits put a ceiling on legal production; and (ii) taxes and royalties are increasing in output value. We use production data only to get a time-invariant within-constituency value weight for each deposit. Because we predict changes in local mineral wealth from shocks to be between 2.2 and 6 years.
international prices, time-variant misreporting of production cannot bias our estimates, nor could a relationship between underlying political factors and baseline production. For completeness, we also estimate a specification that ignores production data entirely and treats each mineral deposit as if it was productive. For this specification, we weight minerals within constituencies by deposit size.

An alternate strategy would be to use global prices to predict changes in mineral output rather than changes in the local mineral price level. While our results are robust to using this strategy, it is subject to an omitted variable bias. Given that the average price shock is positive, the output shock from global prices will be largest in places that are heavy mineral producers at baseline. A secular increase in criminality in the most mineral-rich places would therefore bias upward the estimate of the impact of the price shock.

V.B Estimating the Selection Effect

The adverse selection effect predicts that high anticipated mineral rents will lead to the election of more criminal candidates. To test this, we examine the impact of local mineral price shocks that occur before an election takes place. For an election outcome at time \( t \), we estimate the following equation at the constituency-year level:

\[
Y_{c,d,s,t} = \beta_0 + \beta_1 \cdot \text{PriceShock}_{c,t-6,t-1} + \zeta \cdot X_c + \gamma_{s,t} + \nu_d + \epsilon_{c,t}.
\]  

(7)

\( Y_{c,d,s,t} \) is a political outcome (in the primary specification, an indicator for whether the elected representative is facing criminal charges) in constituency \( c \), district \( d \), state \( s \) and year \( t \). \( \text{PriceShock}_{c,t-6,t-1} \) is the price change of the production-weighted basket of mineral deposits found in constituency \( c \) over the five years before the election. \( X_{c,s} \) is a vector of time-invariant constituency controls, which include the number of deposits in and within 10km of the constituency, a Herfindahl-based measure of the dispersion of mineral types in each location at baseline, the log of constituency population, the population share living in rural areas, the share of villages with electricity, and the per capita number of primary
schools. State-year and district fixed effects are represented by $\gamma_{s,t}$ and $\nu_d$ respectively. There are about seven constituencies in every district. The coefficient $\beta_1$ identifies the effect of a change in local mineral wealth on the outcome.

State-year fixed effects control for any state level changes in politician criminality that could be correlated with mineral price movements; estimates are driven strictly by variation in mineral wealth shocks within a given state-election. State-year fixed effects also control for fiscal windfalls from mining taxes and royalties, which accrue to state governments. District fixed effects control for time invariant characteristics of geographic regions, for example, a predilection for the election of criminal candidates. Given the exogeneity of global price shocks, these fixed effects (along with the constituency controls) are not strictly necessary but improve estimation precision. In principle, the inclusion of constituency fixed effects would be more conservative and ensure that all the variation comes from changes in mineral prices in the same constituencies over time. Unfortunately, this specification is made impossible by the national updating of constituency boundaries that occurred in the middle of the sample period; very few states in our sample have more than one election under a given delimitation. Our results are robust to a specification with synthetic constituency fixed effects, where we match old to new constituencies for the set of constituencies where at least 50% of area remained contiguous. However, because this necessitates dropping one third of the sample and the constituency pairs are not exact, we prefer the district fixed effect specification. To take into account the colocation of similar minerals and serial correlation of political outcomes, standard errors are clustered at the district level. Because of the colocation of minerals, much of the variation in mineral rent shocks is effectively at the district level; there are also many districts with only one kind of mineral deposit. District-year fixed effects would therefore take away much of the variation that we want to exploit.\footnote{For completeness, we present this specification in Appendix Table A3; the point estimate is similar to our main estimate, but the standard error approximately twice as large.}
V.C Estimating the Moral Hazard Effect

The moral hazard effect predicts that politicians in office engage in more rent-seeking when mineral rents are high. A simple test of the effect of the mineral price level on behavior during a politician’s term in office would not isolate the moral hazard effect, because the selection effect might have caused a worse politician to gain office in anticipation of those high rents. To isolate the moral hazard effect, we identify shocks to mineral rents that take place after selection into office has taken place. Specifically, we use the shock to local mineral rents from the first year after a politician is in office to the fifth and last year of their electoral term. This captures the extent to which local mineral rents increase during the candidate’s term in office. We limit the sample to electoral terms that last the norm of five years, and use the following estimating equation:

\[ Y_{c,d,s,t+5} = \beta_0 + \beta_1 \ast PriceShock_{c,t+1,t+5} + \beta_2 Y_{c,d,s,t} + \zeta \ast X_c + \gamma_{s,t+5} + \epsilon_{c,d,s,t+5}. \] (8)

The politician is elected in year \( t \), observed again in year \( t + 5 \). \( Y_{c,d,s,t+5} \) is a candidate-level characteristic (assets, or criminal charges faced) observed at the end of the politician’s term in office and \( Y_{c,d,s,t} \) is the same characteristic at the beginning of the electoral term. The remaining variables are defined as in Equation 7. As before, state-year fixed effects restrict the estimation to within-election variation across constituencies. Because this test necessitates observing politician characteristics (assets and criminal charges) at the beginning and end of the electoral term, for most states we observe candidates only over the course of one electoral term. We therefore do not include district fixed effects, as they remove much of the meaningful variation in mineral rent shocks. Robust standard errors are clustered at the district level.

To control for the possibility that mining booms cause all candidates (or all individuals) to gain wealth or commit crimes, we estimate a version of this specification with runner-up candidates in the sample, and test for differential effects for election winners. This test could
be biased by the possibility that election winners are inherently different from losers. A close election regression discontinuity approach is not feasible here because there are too few close elections in mineral-rich constituencies.

VI Results

VI.A Summary statistics

Table 1 presents summary statistics for the sample. 683 constituency-elections took place between 2003 and 2013 in constituencies with productive mineral deposits; the average mineral-rich constituency has three mineral deposits. The average candidate has net assets of approximately USD 100,000, and is thus very wealthy by Indian standards; 31% of candidates face pending criminal cases. The candidate-level sample is limited to candidates who contested two elections, whom we were able to match across time.

Causal interpretation of our results rests on the assumption that price shocks are exogenous. We test this assumption by regressing baseline constituency characteristics on forward-looking 5-year price shocks to local minerals. Columns 5 and 6 of Table 1 show the results; none of the coefficients are economically or statistically significant; the p-value of the joint significance test is 0.42. This result shows that constituencies that experienced high and low rent shocks are balanced with respect to baseline characteristics, a requirement of our identification strategy.

VI.B Mineral Wealth and Political Selection

This section describes estimates from Equation 7, which identifies the causal effects of changes in local mineral rents on election results. Table 2 shows the impact of mineral rents on the likelihood that a constituency elects a criminal politician. Column 1 shows the full sample estimate with only state-year-fixed effects. The point estimate of 0.139 indicates that a 100% increase in the value of local mineral wealth over the five year period before an election increases the likelihood of electing a criminal politician by 14 percentage points. This estimate comes from a combination of price shock variation in the same constituencies
over time and cross-sectional price shock variation within states. Columns 2 and 3 respectively add district and synthetic constituency fixed effects. These estimates are derived predominantly from variation within constituencies across time; the point estimates go up slightly and remain highly significant. Columns 4 and 5 perform a complementary exercise by separately estimating Equation 7 for the first and second election in each state—these estimates come strictly from cross-sectional variation in mineral rent shocks within states. The estimates are largely unchanged, though standard errors are larger given the split sample.

As discussed in Section V, our preferred estimate is Column 2. We use this specification going forward, but all results are robust to the other specifications here. Based on this estimate, going from the 25th percentile price shock (+18%) to the 75th percentile (+76%) would lead to a 31% increase in the chance of electing a criminal to office. Results are robust to a range of alternate specifications, described in Section VI.D.

Table 3 tests whether other characteristics of winners change in response to mining booms, using the district and state-year fixed effect specification. We find no change in the share of winners coming from either of India’s major parties (the Indian National Congress (INC) and the Bharatiya Janata Party (BJP)), nor are there changes in winners’ education, age or net assets. The non-effect on net assets rules out the possibility that the selection effect can be explained by a funding advantage of mining-affiliated candidates that comes mechanically from higher mineral rents.\footnote{Appendix Table A1 shows estimates of mineral wealth shocks on the share of candidates facing criminal charges, which is an indicator of entry of criminals into the political arena, with columns ordered as in Table 2. Mineral wealth shocks do not have an impact on the share of candidates facing charges. This result implies that the main result is not strictly driven by entry of criminals into politics. However, the large number of candidates contesting each election makes it difficult to detect a small change in the number of contesting criminals. The mean constituency election is contested by nine candidates.}

In Table 4, we test whether mineral wealth shocks have different effects on the success of candidates charged with certain types of crimes. In Column 1, the dependent variable is an indicator that takes the value one if the elected representative has been charged with a serious violent crime, which we define as an actual or attempted assault, armed robbery, homicide, kidnapping or sexual assault. Column 2 shows the impact of a mineral wealth shock
shock on the probability of electing a candidate charged with a non-violent crime, which we define as all crimes other than those used in Column 1. The criminal selection effect is driven entirely by individuals charged with violent crimes; the difference in estimates between the two columns is significant at \( p < 0.01 \). In Columns 3 and 4, we similarly test for separate impacts on winners with corruption-related crimes and winners with non-corruption-related crimes. We define corruption-related crime as theft from government, manipulation of elections, and illegally influencing or attempting to influence actions of public servants. Effects are marginally stronger for crimes of corruption than for their complement, but the \( p \)-value on the estimate difference is 0.88. The results indicate that high mineral rents cause the election not only of criminal candidates, but specifically of violent candidates.\(^{31}\) While more violent politicians are successful when mineral rents are high, predictions on the actual level of political violence are ambiguous. For example, the threat of violent retribution could lead to a decline in actual violence.

Criminals could win more elections when rents are high because: (i) voters pay less attention during mining booms, perhaps because of good economic fortune; (ii) voters prefer criminal candidates; or (iii) criminal candidates or their agents exert greater effort to win elections (whether legally or illegally). To test whether voters pay less attention during mining booms, we look at standard measures of electoral competitiveness in Table 5. Political competition rises following mining booms: incumbent win advantages fall (albeit without statistical significance), while turnout and the effective number of parties (an inverse herfindahl measure) increase. Voter disinterest thus does not appear to explain the success of criminal candidates. It is difficult to disentangle changes in voter preferences from changes in candidate effort; we observe voter choices from a constrained set that is itself affected by the mining boom (Pande, 2011). This said, the existing literature suggests that, all things equal, voters systematically prefer non-criminal candidates (Banerjee et al., 2014; Chauchard, 2015), and that outcomes

\(^{31}\)Note that the predominant success of violent politicians in constituencies with mining booms does not preclude the possibility that corrupt politicians are also doing well in these areas. First, many violent politicians are also accused of crimes of corruption. Second, corruption may be less likely to lead to formal criminal charges than violence due to the lower severity and visibility of corruption.
are worse under criminal candidates (Chemin, 2012; Prakash et al., 2015). The absence of other changes in winning candidate characteristics (Table 3) also suggests that voter preferences over candidates have not dramatically changed in response to expected mineral rents.

VI.C Mineral Wealth and Behavior of Elected Officials

The results so far describe a selection effect. Criminal politicians, specifically those charged with violent crimes, are more likely to be elected when local mineral rents are high. Table 6 examines how the behavior of a given politician changes when he or she is exposed to high mineral rents. This table examines the impact of mineral wealth shocks that occur after the politician has entered office, and therefore holds constant the selection effect. Column 1 of Table 6 shows the impact of the mineral wealth shock from the first to the fifth and last year of a politician’s electoral term, which is the unexpected price shock during his or her term. The dependent variable is the log change in the elected politician’s assets from the beginning to the end of the electoral term. A doubling of local mineral wealth causes elected politicians’ assets to increase by 35 log points over the electoral term. The estimate indicates that going from the 25th to the 75th percentile price shock would increase leader assets by 20 log points over a five-year electoral term, or an annualized 4.0% growth premium. To rule out the possibility that assets of all individuals are rising during mining booms, we add runners up to the specification in Column 2 and interact the price shock with a dummy variable indicating the election winner. We do not find an impact of mining booms on unelected candidates; the p-value for the difference between winners and non-winners is 0.07.\footnote{The weaker statistical significance of the interaction is in part driven by the small number of runners up that we were able to match across multiple elections. The inclusion of runners up barely changes the coefficient on asset gains of winners, and the point estimate for runners up is very small.}

Motivated by the theory, we test whether asset gains during mining booms are driven by the most criminal politicians. In Column 3, we interact the price shock and winning variables with an indicator for whether the given politician was already charged with a violent crime when first elected. The interaction variable of interest, \textit{PriceShock} $\times$ \textit{Winner} $\times$ \textit{Violent}, is positive but the standard error is large enough that we cannot rule out either large positive
or negative interaction effects.

In Columns 4 and 5, we test whether politicians engage in additional crimes when local rents are high. Specifications are analogous to columns 1 and 2, but the dependent variable is an indicator that takes the value one if the number of charges against a candidate has increased. Column 4 shows that a doubling of local mineral wealth causes elected politicians to be 18 percentage points more likely to face new criminal charges. Column 5 confirms that there is no effect on recontesting candidates who were not elected. These results are robust to alternate deposit and price shock definitions, as well as to the inclusion of pre-election price shocks to control for the selection effect.

The candidate time series results could be biased by politicians’ options to exit, because we only observe winners and runners up who choose to run again. If elected officials who fail to make money during mining booms choose to exit, then the results above could be spurious. Out of all election winners in mining constituencies, 75% were identified in the following term. For our results to be driven by selection bias, it would have to be the case that for the 25% of elected candidates whom we do not observe, mining booms have caused a loss in assets for winners four times larger than the estimates above. This seems implausible, and suggests that selection bias is unlikely to drive the results.

VI.D Robustness

In this section, we show that our results are robust to a range of potential specifications and we rule out several confounding explanations of our results. In Appendix Table A2 Columns 1 through 3, we show that the results are robust to defining production constituencies as those

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33 The clearing of criminal cases (where we would observe a reduction in the number of charges on a candidate’s affidavit) is a function of the candidate’s behavior before entering office, not of the candidate’s behavior in office. We therefore categorize reductions in criminal cases as zeroes. If a candidate receives a new charge and simultaneously clears a charge, we would not be able to observe this in the data. Results are robust to (i) using the log number of criminal cases a candidate is facing as a dependent variable; and (ii) using an indicator variable for any charges faced, limiting the sample to candidates who face no charges at the beginning of their term in office. Only 15% of incumbents report fewer criminal charges when they contest their second election; 75% of these report exactly one fewer charge.

34 These changes could admittedly be driven by prosecution of crime rather than actual instances of crime. This is an inherent concern with all research using crime data as outcome.

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26
with deposits strictly within their borders, rather than within 10km as we do in the main specification. The estimates are marginally larger under all three fixed effect specifications, and have comparable statistical significance. In Columns 4 through 6, we show estimates of the selection effect from all mineral deposit locations, *ignoring production values*, with the price shock in each constituency weighted strictly by the number of deposits of each type of mineral. The point estimates are approximately half of those reported in Table 2 but remain highly statistically significant, reflecting that approximately half of mineral deposits are productive.

In Appendix Table A3 we show results from specifications based on alternate decisions on the construction of the data. In our main result, we defined constituency mineral production as the mean value of mineral production across all pre-sample years (1990-2003). Column 1 shows the main specification using all years of data from the Statistics of Mineral Information (1990-2013), to verify that the choice of years does not drive the result. Column 2 shows results using a price shock calculated from $t = -5$ to $t = 0$ instead of $t = -6$ to $t = -1$, where $t = 0$ is the election year. Results are not changed. We next show robustness to the use of different production thresholds for sample inclusion. Column 3 defines mineral constituencies as those with production of at least $50,000$ in one year; in Column 4 the threshold is $200,000$. As expected, the lower threshold leads to slightly smaller point estimates and the higher threshold to larger point estimates, but all are similar and statistically significant. Column 5 shows the main estimates with standard errors clustered at the state level rather than the district level. The standard errors rise marginally; the p-value is 0.03. In Column 6, we include district-year fixed effects. As discussed above, because similar minerals are colocated and some districts only produce one mineral, this takes away most of the meaningful variation in mineral rents; however, the point estimate remains very similar to those of previous specifications, even if it is no longer statistically significant. In Column 7, we show a placebo estimate from a specification in mineral deposit locations that report *no* production. As expected, the treatment effect on criminal selection here is zero,
and statistically distinguishable from the main estimate in Table 2.

Appendix Table A4 presents comparable specifications for the moral hazard tests. Columns 1 and 2 show the effect of post-election mineral rent shocks on asset and crime accumulation respectively, using only the location of mineral deposits and ignoring production data. Columns 3 and 4 define production using all years of data. Columns 5 and 6 define mineral constituencies at the lower production threshold, and Columns 7 and 8 do so at the higher production threshold. Estimates are all substantively similar to those presented in Table 6 and highly statistically significant.

Next, we test the possibility that results are driven entirely by the two minerals where India may not be a price taker in international markets, iron and coal. In Appendix Table A5, we show that the results are robust to the exclusion of coal and iron (together or separately), which represent 75% of India’s mineral output. We first estimate the main specification using constituency-level price shocks that exclude shocks to coal and/or iron deposits (Columns 1-3). We then drop all constituencies that contain any productive coal and/or iron deposits (Columns 4-6). The effect of mineral price shocks on politician criminality is large, statistically significant, and of similar magnitude in all cases.

A final concern might be that criminal politicians relocate across constituencies, moving to places where rents are high. If this was the case, the SUTVA assumption would be violated and we would be at risk of overestimating the effect of mining shocks on the overall success of criminal politicians. To test whether this is driving our results, we use the candidate time series to identify candidates who change constituencies from one election to the next. We then test for the selection effect in the subset of constituencies where the winning candidate is recontesting the same constituency as in the previous electoral term. Because of the redelimitation of constituency boundaries in 2007, nearly all constituencies have had some boundaries changed. We thus calculate the centroid of each constituency, and measure the distance between the centroid of subsequent constituencies contested by a single candidate. The median candidate has moved 1.3km from one election to the next, relative to an average
constituency diameter of 46km. In the columns of Table A6, we respectively show that the effect of a mining boom on criminality is positive and highly significant in (1) the set of constituencies for which we can identify the winner in the previous electoral term; (2) the subset of constituencies where that winner has moved less than 20km since the last election; and (3) the subset of constituencies where that winner has moved less than 10km. Samples are smaller than those in Table 2 because we could not match every winning candidate in a previous election. Results are similar if we define non-movers as those in constituencies that change less than 50% of their area after the redistricting.

VII Conclusion

This paper extends the literature on the political impact of natural resource wealth in four ways. First, we show that rising mineral rents lead to worse political outcomes, even in the absence of fiscal revenue windfalls. The politicians that we study do not experience budget increases relative to the other politicians in their state, and they have no formal authority over mining firms. To our knowledge, fiscal windfalls are a key factor in all other studies of natural resource wealth and politics.

Second, we show that gains from mineral rents accrue directly to the political players with the most informal influence over the operations of local firms, through their de facto role as local intermediaries between citizens and the state. This finding extends a literature that has identified general deterioration in political outcomes but has not tied them directly to politicians with direct influence over firms.

Third, we separately test for the adverse selection and moral hazard effects, and show that both are statistically significant and economically important. Increases in mineral rents lead more criminal politicians to enter office, and also lead politicians already in office to worse behavior.

Finally, we provide evidence of a direct link between rent-seeking opportunities and the success of violence-using politicians. Our results suggest that violence may be both a tool and a signal of a politicians’ willingness to take illegal actions that benefit their allies.
The illegal operations of many mining firms create a complementarity between the natural resource sector and the political sector. Mining operates at the margins of illegality around the world, and is often associated with human rights abuses, corruption and violence. A better understanding of the complementarities between illegal economic activity and criminal politicians will be valuable to developing countries seeking to translate mineral riches into citizen welfare.
References


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### Table 1
Summary statistics

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<th>Variable</th>
<th>Mean</th>
<th>S.E. Mean</th>
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<th>SE_{ps}</th>
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<td>Number deposits</td>
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<td>Average mineral output (Rs 1,000)</td>
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<td>51892</td>
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<td>People per Primary School</td>
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<td>Representative Faces Charges</td>
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</table>

The table presents mean values for all variables used. The final two columns show coefficient and standard errors from a regression of the row variable on a forward-looking price shock (i.e., the shock that occurs after the value is measured). The estimating equation is $Y_{c,d,s,t} = \beta_0 + \beta_1 \times PriceShock_{c,d,s,t+1,t+6} + \gamma_{s,t} + \nu_d + \epsilon_{c,d,s,t}$, where $t$ is the first period where a given outcome can be observed. All regressions include state-year fixed effects and constituency controls for the number of deposits within 10km of a constituency, a constituency-level mineral dispersion index, and baseline (2001) values of log constituency population, share of the population living in rural areas, share of villages with electricity and the per capita number of primary schools. Standard errors are robust and clustered at the district level.
### Table 2
Effect of mineral price shocks on winning candidate criminality

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price shock (-6, -1)</td>
<td>0.139***</td>
<td>0.167***</td>
<td>0.175**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.051)</td>
<td>(0.063)</td>
<td>(0.071)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price shock (-6, -1)</td>
<td></td>
<td></td>
<td></td>
<td>0.129*</td>
<td></td>
</tr>
<tr>
<td>(2004-2008 only)</td>
<td></td>
<td></td>
<td></td>
<td>(0.069)</td>
<td></td>
</tr>
<tr>
<td>Price shock (-6, -1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.152**</td>
</tr>
<tr>
<td>(2009-2013 only)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.076)</td>
</tr>
<tr>
<td>State-Year F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>District F.E.</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Synthetic Constituency F.E.</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>N</td>
<td>682</td>
<td>673</td>
<td>444</td>
<td>373</td>
<td>309</td>
</tr>
<tr>
<td>r2</td>
<td>0.15</td>
<td>0.35</td>
<td>0.64</td>
<td>0.17</td>
<td>0.14</td>
</tr>
</tbody>
</table>

*p < 0.10, **p < 0.05, ***p < 0.01

The table estimates the impact of a local mineral price shock on the criminality of the local elected politician. The price shock is the change in global mineral prices, weighted by constituency pre-sample production values of each mineral, calculated over the five years preceding the given election. The dependent variable is an indicator that takes the value one if the local election winner is facing criminal charges. Column 1 estimates Equation 7 on the full sample with state*year fixed effects. Columns 2 and 3 respectively add district and synthetic constituency fixed effects. Sample size fall because some constituencies could not be matched across sample periods. In most constituencies, there are two elections. Columns 4 and 5 respectively split the sample into the first and second election in each constituency. We do not include district fixed effects in Columns 4 and 5 as these are cross-sectional regressions with much of the variation across districts. All regressions include state-year fixed effects and constituency controls for the number of deposits within 10km of a constituency, a constituency-level mineral dispersion index, and baseline (2001) values of log constituency population, share of the population living in rural areas, share of villages with electricity and the per capita number of primary schools. Standard errors are robust and clustered at the district level.
Table 3
Effect of mineral price shocks on other winning candidate characteristics

<table>
<thead>
<tr>
<th></th>
<th>BJP (1)</th>
<th>INC (2)</th>
<th>High School (3)</th>
<th>Age (4)</th>
<th>Log Net Assets (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price shock_{−6,−1}</td>
<td>0.022</td>
<td>-0.028</td>
<td>0.024</td>
<td>-1.712</td>
<td>-0.054</td>
</tr>
<tr>
<td></td>
<td>(0.036)</td>
<td>(0.044)</td>
<td>(0.052)</td>
<td>(1.184)</td>
<td>(0.218)</td>
</tr>
<tr>
<td>State-Year F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>District F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>1954</td>
<td>1954</td>
<td>667</td>
<td>673</td>
<td>662</td>
</tr>
<tr>
<td>r²</td>
<td>0.40</td>
<td>0.30</td>
<td>0.32</td>
<td>0.31</td>
<td>0.53</td>
</tr>
</tbody>
</table>

*p < 0.10, ** p < 0.05, *** p < 0.01

This table estimates the impact of a local mineral price shock on characteristics of the local elected leader (as in Table 2). The price shock is the change in global mineral prices, weighted by constituency pre-sample production values of each mineral, calculated over the five years preceding the given election. The dependent variable in the five columns is as follows: (1) an indicator that takes the value of one if the winner is a member of the Bharatiya Janata Party (BJP); (2) an indicator that takes the value one if he/she is a member of the Indian National Congress (INC) party; (3) an indicator that takes the value one if the winner has completed high school; (4) the age of the winning candidate; (5) the log of the net assets of the winning candidate. All regressions include state-year fixed effects, district fixed effects and constituency controls for the number of deposits within 10km of a constituency, a constituency-level mineral dispersion index, and baseline (2001) values of log constituency population, share of the population living in rural areas, share of villages with electricity and the per capita number of primary schools. Standard errors are robust and clustered at the district level.
Table 4

Effect of mineral price shocks on winning candidate criminality by type of crime

<table>
<thead>
<tr>
<th></th>
<th>Violent (1)</th>
<th>Non-violent (2)</th>
<th>Corruption (3)</th>
<th>Not Corruption (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price shock _6,−1</td>
<td>0.220***</td>
<td>-0.065</td>
<td>0.084</td>
<td>0.071</td>
</tr>
<tr>
<td></td>
<td>(0.052)</td>
<td>(0.044)</td>
<td>(0.055)</td>
<td>(0.056)</td>
</tr>
<tr>
<td>p-value from difference</td>
<td></td>
<td>0.00</td>
<td></td>
<td>0.88</td>
</tr>
<tr>
<td>State-Year F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>District F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>669</td>
<td>669</td>
<td>669</td>
<td>669</td>
</tr>
<tr>
<td>r2</td>
<td>0.32</td>
<td>0.30</td>
<td>0.35</td>
<td>0.28</td>
</tr>
</tbody>
</table>

*p < 0.10, ** p < 0.05, *** p < 0.01

The table estimates the impact of a local mineral price shock on the criminality of the local elected leader, focusing on specific types of crime. The price shock is the change in global mineral prices, weighted by constituency pre-sample production values of each mineral, calculated over the five years preceding the given election. In Column 1, the dependent variable is an indicator that takes the value one if the local election winner is facing charges for a violent crime, in which we include actual or attempted assault, armed robbery, homicide, kidnapping and sexual assault. In Column 2, we use an indicator that takes the value one if the election winner is charged with a non-violent crime, which is the set of crimes not used in Column 1. Column 3 estimates the impact on election winners being charged with corruption-related crimes (which include theft from government, manipulation of elections, and illegal influence over actions of public servants). Column 4 estimates the impact on election winners being charged with crimes other than those related to corruption. All regressions include state-year fixed effects, district fixed effects and constituency controls for the number of deposits within 10km of a constituency, a constituency-level mineral dispersion index, and baseline (2001) values of log constituency population, share of the population living in rural areas, share of villages with electricity and the per capita number of primary schools. Standard errors are robust and clustered at the district level.
Table 5

Effect of mineral price shocks on election competitiveness

<table>
<thead>
<tr>
<th>Price shock (-6,-1)</th>
<th>Incumbent</th>
<th>Turnout</th>
<th>ENOP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>0.027***</td>
<td>0.056</td>
<td>0.030***</td>
</tr>
<tr>
<td>(0.055)</td>
<td>(0.072)</td>
<td>(0.010)</td>
<td>(0.018)</td>
</tr>
</tbody>
</table>

State-Year F.E. | Yes | Yes | Yes | Yes | Yes | Yes |
District F.E.    | Yes | Yes | Yes | Yes | Yes | Yes |

Years | All | Post-2003 | All | Post-2003 | All | Post-2003 |
N     | 1482 | 593 | 1558 | 394 | 1549 | 455 |
r2    | 0.12 | 0.10 | 0.53 | 0.45 | 0.37 | 0.43 |

*p < 0.10, **p < 0.05, ***p < 0.01

The table estimates the impact of a local mineral price shock on several indicators of electoral competitiveness. All columns estimate Equation 7 at the constituency-election year level. The price shock is the change in global mineral prices, weighted by constituency pre-sample production values of each mineral, calculated over the five years preceding the given election. In Columns 1 and 2, the dependent variable is an indicator that takes the value one if the local incumbent is re-elected. In Columns 3 and 4, the dependent variable is constituency level turnout. In Columns 5 and 6, the dependent variable is the effective number of parties. Election data is available from 1990 to the present. Results are presented separately for elections for the full data from 1990-2013 and from 2003-2013, a period comparable to other analyses in the paper. All regressions include state-year fixed effects, district fixed effects and constituency controls for the number of deposits within 10km of a constituency, a constituency-level mineral dispersion index, and baseline (2001) values of log constituency population, share of the population living in rural areas, share of villages with electricity and the per capita number of primary schools. Standard errors are robust and clustered at the district level.
Table 6
Effect of mineral price shocks on candidate asset growth and criminal activity
Candidate Panel

<table>
<thead>
<tr>
<th></th>
<th>Change in Assets</th>
<th></th>
<th>Change in Crime</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Price shock+1,+5</td>
<td>0.348***</td>
<td>0.043</td>
<td>0.162</td>
</tr>
<tr>
<td></td>
<td>(0.120)</td>
<td>(0.180)</td>
<td>(0.171)</td>
</tr>
<tr>
<td>Price shock+1,+5 * Winner</td>
<td>0.297*</td>
<td>0.239</td>
<td>0.197**</td>
</tr>
<tr>
<td></td>
<td>(0.167)</td>
<td>(0.171)</td>
<td>(0.099)</td>
</tr>
<tr>
<td>Price shock+1,+5 * Winner * Violent</td>
<td>0.153</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.547)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Violent Crime</td>
<td>0.794</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.480)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winner</td>
<td>-0.241</td>
<td>-0.128</td>
<td>-0.270*</td>
</tr>
<tr>
<td></td>
<td>(0.236)</td>
<td>(0.244)</td>
<td>(0.161)</td>
</tr>
<tr>
<td>Winner * Violent</td>
<td>-0.514</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>(0.691)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State-Year F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>283</td>
<td>376</td>
<td>308</td>
</tr>
<tr>
<td>r2</td>
<td>0.34</td>
<td>0.31</td>
<td>0.31</td>
</tr>
</tbody>
</table>

*p < 0.10, **p < 0.05, ***p < 0.01

The table shows estimates of the impact of mineral wealth shocks on asset growth of elected leaders, and on new criminal charges against them. The dependent variable in columns 1-3 is the change in a candidate’s log net assets over a single electoral term. The price shock is the unanticipated change in mineral wealth in that electoral term, defined as the change in the global prices of the basket of mineral in each constituency, measured from the first year after the politician is elected to the end of the electoral term. Column 1 estimates the regression on elected officials only. In Column 2, the sample includes winners and runners up from the first election, and the price shock is interacted with a dummy variable indicating the election winner. Column 3 is analogous to column 1, but adds an interaction with politicians’ criminal status in the baseline period, to test whether politicians already facing charges systematically gain more assets in response to a positive mineral wealth shock. Columns 4 and 5 run specifications comparable to Columns 1 and 2, where the dependent variable is an indicator for whether the politician is facing more criminal charges at the end of the electoral term than at the beginning. All regressions include state-year fixed effects and constituency controls for the number of deposits within 10km of a constituency, a constituency-level mineral dispersion index, and baseline (2001) values of log constituency population, share of the population living in rural areas, share of villages with electricity and the per capita number of primary schools. Standard errors are robust and clustered at the district level.
The figure shows the first page of a sample affidavit downloaded from the website of the Election Commission of India. Section 1(iii) lists the sections under the Indian Penal Code under which this politician has been charged.
Figure 2
Map of deposit locations and mineral production

Circles indicate the location of mineral deposits, color-coded by mineral type. Shaded polygons show districts that report mineral production, with darker colors indicating higher production deciles. Nearly all states have major mineral deposits. The major exceptions are in the Indo-Gangetic Plain (Punjab, Uttar Pradesh) and in the northeast. Sources: Mineral Atlas of India (Geological Survey of India, 2001) and Statistics of Mines in India.
Figure 3
Mineral price shocks 1998-2003

The map shows constituencies (1976-2007 delimitation) with productive mineral deposits, shaded according to the magnitude of the price shock in the period 1998-2003 (the first shock used in the analysis of crime data). Price shocks are defined as the production-weighted change in global prices of actively mined minerals in a given constituency (see Section V for more information). The darkest constituencies experienced the largest positive price shock. Unmarked constituencies are excluded from our sample because they had no productive mineral deposits, or we were not able to match production to a deposit. Sources: United States Geological Survey (prices); Statistics of Mineral Information, Indian Bureau of Mines (production quantities); MLInfoMap (Constituency boundaries).
The figure shows the histogram of trailing five-year constituency-level price shocks used in the primary analysis sample. A price shock is defined as the production-value-weighted proportional change in the global price of commodities produced in a given constituency from period $t=-6$ to period $t=-1$, where a given election takes place in year $t=0$. See Equation 6 in Section V for more details. The set of election years is 2003 to 2013.
Appendix For Online Publication: Additional figures and tables

Table A1

Effect of mineral price shocks on mean candidate criminality

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price shock_{-6,-1}</td>
<td>0.001</td>
<td>0.017</td>
<td>0.013</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.019)</td>
<td>(0.030)</td>
<td>(0.035)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price shock_{-6,-1} (2004-2008 only)</td>
<td>-0.007</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.023)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Price shock_{-6,-1} (2009-2013 only)</td>
<td>0.014</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.032)</td>
<td></td>
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<td></td>
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<td>State-Year F.E.</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>District F.E.</td>
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<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Synthetic Constituency F.E.</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>N</td>
<td>682</td>
<td>673</td>
<td>444</td>
<td>373</td>
<td>309</td>
</tr>
<tr>
<td>r²</td>
<td>0.31</td>
<td>0.50</td>
<td>0.68</td>
<td>0.35</td>
<td>0.22</td>
</tr>
</tbody>
</table>

*p < 0.10, **p < 0.05, ***p < 0.01

The table estimates the impact of a local mineral price shock on the mean criminality of candidates contesting election. Criminality a candidate-level indicator that takes the value one if the candidate is facing criminal charges; the dependent variable is the mean of this indicator across all candidates contesting election in each constituency-year. The price shock is the change in global mineral prices, weighted by constituency pre-sample production values of each mineral, calculated over the five years preceding the given election. Column 1 estimates Equation 7 on the full sample with state*year fixed effects. Columns 2 and 3 respectively add district and synthetic constituency fixed effects. Sample size fall because some constituencies could not be matched across sample periods. In most constituencies, there are two elections. Columns 4 and 5 respectively split the sample into the first and second election in each constituency. We do not include district fixed effects in Columns 4 and 5 as these are cross-sectional regressions with much of the variation across districts. All regressions include state-year fixed effects and constituency controls for the number of deposits within 10km of a constituency, a constituency-level mineral dispersion index, and baseline (2001) values of log constituency population, share of the population living in rural areas, share of villages with electricity and the per capita number of primary schools. Standard errors are robust and clustered at the district level.
Table A2
Effect of mineral price shocks on winning candidate criminality
Alternate Deposit Definitions

<table>
<thead>
<tr>
<th></th>
<th>Exact Deposit Locations</th>
<th>Deposits Only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Price shock..._6,_1</td>
<td>0.169***</td>
<td>0.195***</td>
</tr>
<tr>
<td></td>
<td>(0.051)</td>
<td>(0.068)</td>
</tr>
<tr>
<td>State-Year F.E.</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>District F.E.</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Constituency F.E.</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>N</td>
<td>473</td>
<td>455</td>
</tr>
<tr>
<td>r2</td>
<td>0.19</td>
<td>0.41</td>
</tr>
</tbody>
</table>

*p < 0.10, ** p < 0.05, *** p < 0.01

This table estimates the impact of a local mineral price shock on the criminality of the local elected leader, with specifications parallel to those in Table 2. The price shock variable is a weighted sum of global price shocks to the minerals present in a constituency. The dependent variable is an indicator that takes the value one if the local election winner is facing criminal charges. Columns 1 through 3 define price shocks using mineral deposits strictly within constituency boundaries, under different fixed effect specifications. (In contract, Table 2 weights price shocks using proximity to deposits that are close to constituencies. Columns 4 through 6 weight price shocks with the number of mineral deposits in a constituency, irrespective of whether production is reported in that constituency, under different fixed effect specifications. In contrast, Table 2 uses pre-sample mineral output values as weights. Sample size is lower than Table 2 as some constituencies are close to deposits but do not contain deposits. All regressions include state-year fixed effects and constituency controls for the number of deposits within 10km of a constituency, a constituency-level mineral dispersion index, and baseline (2001) values of log constituency population, share of the population living in rural areas, share of villages with electricity and the per capita number of primary schools. Standard errors are robust and clustered at the district level.
Table A3
Effect of price shocks on winning candidate criminality
Robustness to alternate price shock definitions

<table>
<thead>
<tr>
<th></th>
<th>Baseline 1990-2013</th>
<th>Shock_{-5,0} Prod above USD 50k</th>
<th>Prod above USD 200k</th>
<th>State Clusters</th>
<th>District * Year Fixed Effects</th>
<th>Placebo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price Shock</td>
<td>0.199***</td>
<td>0.208***</td>
<td>0.200***</td>
<td>0.133**</td>
<td>0.167**</td>
<td>0.176</td>
</tr>
<tr>
<td></td>
<td>(0.067)</td>
<td>(0.063)</td>
<td>(0.072)</td>
<td>(0.061)</td>
<td>(0.074)</td>
<td>(0.126)</td>
</tr>
<tr>
<td>N</td>
<td>610</td>
<td>674</td>
<td>536</td>
<td>771</td>
<td>673</td>
<td>602</td>
</tr>
<tr>
<td>r2</td>
<td>0.33</td>
<td>0.34</td>
<td>0.37</td>
<td>0.33</td>
<td>0.35</td>
<td>0.39</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.45</td>
</tr>
</tbody>
</table>

*p < 0.10, **p < 0.05, ***p < 0.01

This table estimates the impact of a local mineral price shock on the criminality of the local elected leader, under alternate price shock definitions. The price shock is the change in global mineral prices, weighted by constituency pre-sample production values of each mineral, calculated over the five years preceding the given election. The dependent variable is an indicator that takes the value one if the local election winner is facing criminal charges. Column 1 weights mineral deposits based on average district-level mineral output from 1990-2013, instead of 1990-2013. Column 2 defines the price shock from 5 years before the election date to the present date (as opposed to Table 2 which uses 6 years before to 1 year before). Column 3 defines mineral constituencies as those with production of at least $50,000 in one year; in Column 4 the threshold is $200,000. In Table 2, the threshold is $100,000. Column 5 presents the main specification from Table 2, with standard errors clustered at the state level. Column 6 adds district * year fixed effects to the main specification. Column 7 shows estimates from a placebo specification, where the treatment variable is the change in value of mineral deposits in constituencies that report zero production, i.e. constituencies with unproductive mineral deposits. All regressions include state-year fixed effects and constituency controls for the number of deposits within 10km of a constituency, a constituency-level mineral dispersion index, and baseline (2001) values of log constituency population, share of the population living in rural areas, share of villages with electricity and the per capita number of primary schools. Standard errors are robust and clustered at the district level.
Table A4
Effect of mineral price shocks on candidate asset growth and criminal activity
Robustness to alternate price shock definitions

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Price shock</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+1,-5</td>
<td>0.311**</td>
<td>0.302***</td>
<td>0.360***</td>
<td>0.197**</td>
<td>0.331**</td>
<td>0.218**</td>
<td>0.321***</td>
<td>0.209***</td>
</tr>
<tr>
<td></td>
<td>(0.124)</td>
<td>(0.092)</td>
<td>(0.133)</td>
<td>(0.083)</td>
<td>(0.129)</td>
<td>(0.091)</td>
<td>(0.105)</td>
<td>(0.064)</td>
</tr>
<tr>
<td>State-Year F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>195</td>
<td>162</td>
<td>191</td>
<td>157</td>
<td>226</td>
<td>182</td>
<td>330</td>
<td>273</td>
</tr>
<tr>
<td>r2</td>
<td>0.38</td>
<td>0.23</td>
<td>0.39</td>
<td>0.15</td>
<td>0.34</td>
<td>0.15</td>
<td>0.32</td>
<td>0.16</td>
</tr>
</tbody>
</table>

*p < 0.10, **p < 0.05, ***p < 0.01

The table shows estimates of the impact of mineral wealth shocks on asset growth of elected leaders, and on new criminal charges against them. Results are analogous to those in Table 6, but with alternate definitions of price shocks. The dependent variable in columns 1, 3, 5 and 7 is the change in a candidate’s log net assets over a single electoral term. The dependent variable in columns 2, 4, 6 and 8 is an indicator for whether the politician is facing more criminal charges at the end of the electoral term than at the beginning. The price shock is the unanticipated change in mineral wealth in that electoral term, defined as the change in the global prices of the basket of mineral in each constituency, measured from the first year after the politician is elected to the end of the electoral term. Columns 1 and 2 show results based strictly on mineral deposits, ignoring production data. Columns 3 and 4 define production using all years of data. Columns 5 and 6 define mineral constituencies at the lower production threshold, and Columns 7 and 8 do so at the higher production threshold. All regressions include state-year fixed effects, district fixed effects and constituency controls for the number of deposits within 10km of a constituency, a constituency-level mineral dispersion index, and baseline (2001) values of log constituency population, share of the population living in rural areas, share of villages with electricity and the per capita number of primary schools. Standard errors are robust and clustered at the district level.
Table A5

Effect of price shocks on winning candidate criminality
Iron/coal exclusions

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price shock...6,−1</td>
<td>0.143***</td>
<td>0.170***</td>
<td>0.142***</td>
<td>0.167***</td>
<td>0.236***</td>
<td>0.222***</td>
</tr>
<tr>
<td></td>
<td>(0.058)</td>
<td>(0.054)</td>
<td>(0.052)</td>
<td>(0.063)</td>
<td>(0.067)</td>
<td>(0.068)</td>
</tr>
<tr>
<td>Price Shock</td>
<td>No coal</td>
<td>No iron</td>
<td>No coal/iron</td>
<td>No coal</td>
<td>No iron</td>
<td>No coal/iron</td>
</tr>
<tr>
<td>Constituency Sample</td>
<td>All</td>
<td>All</td>
<td>All</td>
<td>No coal</td>
<td>No iron</td>
<td>No coal/iron</td>
</tr>
<tr>
<td>State-Year F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>District F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>655</td>
<td>624</td>
<td>602</td>
<td>606</td>
<td>509</td>
<td>449</td>
</tr>
<tr>
<td>r²</td>
<td>0.34</td>
<td>0.35</td>
<td>0.33</td>
<td>0.33</td>
<td>0.37</td>
<td>0.36</td>
</tr>
</tbody>
</table>

*p < 0.10,** p < 0.05,*** p < 0.01

This table estimates the impact of a local mineral price shock on the criminality of the local elected leader, excluding certain effects in coal- and iron-producing regions. The price shock is the change in global mineral prices, weighted by constituency pre-sample production values of each mineral, calculated over the five years preceding the given election. The dependent variable is an indicator that takes the value one if the local election winner is facing criminal charges. Column 1 calculates price shocks with coal deposits excluded; Column 2 excludes iron deposits from the price shock, and Column 3 excludes both. Columns 4-6 drop constituencies entirely if they have (4) a coal deposit, (5) an iron deposit, or (6) either a coal or iron deposit. All regressions include state-year fixed effects, district fixed effects and constituency controls for the number of deposits within 10km of a constituency, a constituency-level mineral dispersion index, and baseline (2001) values of log constituency population, share of the population living in rural areas, share of villages with electricity and the per capita number of primary schools. Standard errors are robust and clustered at the district level.
Table A6
Effect of price shocks on winning candidate criminality
Fixed candidate location

<table>
<thead>
<tr>
<th></th>
<th>All (1)</th>
<th>Moved &lt; 20km (2)</th>
<th>Moved &lt; 10km (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price shock_{-6,-1}</td>
<td>0.258***</td>
<td>0.298***</td>
<td>0.275***</td>
</tr>
<tr>
<td></td>
<td>(0.085)</td>
<td>(0.100)</td>
<td>(0.101)</td>
</tr>
<tr>
<td>State-Year F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>174</td>
<td>153</td>
<td>133</td>
</tr>
<tr>
<td>r^2</td>
<td>0.20</td>
<td>0.31</td>
<td>0.25</td>
</tr>
</tbody>
</table>

*p < 0.10, **p < 0.05, ***p < 0.01

This table estimates the impact of a local mineral price shock on the criminality of the local elected leader (as in Table 2), but limits the sample to candidates who have not changed constituencies from one electoral period to the next. We define candidates who have not moved as those for whom the constituency centroid is less than a given distance from that in the previous election. A 0km threshold would reject nearly all constituencies due to redelimitation in 2007-08. The mean constituency diameter is approximately 45km. The price shock is the change in global mineral prices, weighted by constituency pre-sample production values of each mineral, calculated over the five years preceding the given election. The dependent variable is an indicator that takes the value one if the local election winner is facing criminal charges. Column 1 includes the full sample of candidates that we are able to observe in the previous electoral term. Column 2 limits to candidates who have moved less than 20km since the previous electoral term. Column 3 limits to candidates who have moved less than 10km. All regressions include state-year fixed effects and constituency controls for the number of deposits within 10km of a constituency, a constituency-level mineral dispersion index, and baseline (2001) values of log constituency population, share of the population living in rural areas, share of villages with electricity and the per capita number of primary schools. Standard errors are robust and clustered at the district level. District fixed effects are intentionally omitted, because we are able to use only the second election in each state.
The figure describes the process for generating the sample of constituencies with valuable mineral deposits. The sample consists of 4090 constituencies with boundaries held constant between 1971 and 2007. These are matched to 2494 mineral deposits (Geological Survey of India 2005), and to district-level production data (229 districts, Statistics of Mineral Information, Indian Bureau of Mines). 1581 constituencies are within 10km of mineral deposits, and 383 of these are in districts that report production of the same mineral between 1990 and 2013. Candidate affidavit information (data on assets and criminal charges) was obtained for 374 constituencies. These constituency boundaries match the sample for elections from 2003-2007. An additional 309 observations come from an identical process applied to post-delimitation boundaries, which are matched to elections from 2008-2013, making up the 683 observations in Column 1 of Table 2.
Appendix For Online Publication: Modeling Electoral Fraud

This section extends the model in Section III by considering the possibility that politicians can use criminal activities or violence to win elections.

The structure is as before, but we assume that crime with the purpose of winning elections, denoted by $a_e$, is distinctly chosen from crime to increase mining output, which we call illegal mining and denote by $a_m$. Both are punished with the same convex increasing cost function $\frac{c(a)}{\theta}$. As above, we use backward induction. We first solve for second period rents and criminal behavior conditional on winning an election. Then, we solve for electoral effort and electoral crime in the first period.

The elected politician earns the following rent, which is unchanged from the original model:

$$g(a_m, \mu, \theta) = \frac{1}{2} (\mu q(a_m) - \frac{c(a_m)}{\theta}).$$

The first order condition for the extent of illegal mining is unchanged:

$$\mu q'(a^*_m) = \frac{c'(a^*_m)}{\theta}.$$ (10)

The politician’s utility function is as follows. We add a choice over electoral crime, and a cost function for electoral crime.

$$U = \pi(e, a_e) \frac{1}{2} (\mu q(a_m) - \frac{c(a_m)}{\theta}) - f(e) - \frac{c(a_e)}{\theta}. $$

As in the primary model, $e$ represents effort to win elections, $a_m$ is the extent of illegal mining, $\mu$ is the mineral markup, $q()$ is the output from illegal mining activities, $\theta$ is a measurement of propensity toward crime, and $f(e)$ is the convex cost of electoral effort. We have added additional terms $a_e$, which denotes the extent of electoral fraud, and $c(a_e)$, the convex cost of electoral fraud, which incorporates both the probability of getting caught and the utility punishment. The probability of winning an election $\pi e, a_e$ now depends positively
on effort and electoral crime. This function is concave in both $e$ and $a_e$, and we assume for simplicity that the cross-partial $\pi_{ea_e}$ is zero.\textsuperscript{35}

Candidates now jointly choose electoral effort and electoral crime. The first order conditions are similar for these two choices, but the amount of electoral crime depends directly on politician type:

$$\frac{\partial f}{\partial e^*} = \frac{1}{2} \frac{\partial \pi}{\partial e^*} (\mu q(a_m^*) - \frac{c(a_m^*)}{\theta})$$

(12)

$$\frac{1}{\theta} \frac{\partial c}{\partial a_e^*} = \frac{1}{2} \frac{\partial \pi}{\partial a_e^*} (\mu q(a_m^*) - \frac{c(a_m^*)}{\theta})$$

(13)

The moral hazard effect remains unchanged, because the decision about how much illegal mining to facilitate happens only conditional upon having been elected:

$$\frac{\partial a_m^*}{\partial \mu} = \frac{q'(a_m^*)}{c''(a_m^*) - \mu q''(a_m^*)}$$

(14)

There are now two adverse selection comparative statics. When the mineral markup $\mu$ rises, candidates can change their effort levels, and they can change their willingness to engage in electoral crime. The expressions for these comparative statics are calculated from the election effort and crime first order conditions:

$$\frac{\partial e^*}{\partial \mu} = \frac{1}{2} \frac{\partial \pi}{\partial e^*} q(a_m^*) - \frac{\partial^2 \pi}{\partial e^*^2} g(a_m^*, \mu, \theta)$$

(15)

$$\frac{\partial a_e^*}{\partial \mu} = \frac{1}{2} \frac{\partial^2 \pi}{\partial a_e^*^2} q(a_m^*) - \frac{\partial^2 \pi}{\partial a_e^* \partial \mu} g(a_m^*, \mu, \theta)$$

(16)

\textsuperscript{35}If the cross-partial is not zero, it is most likely positive, as investment in the capacity to commit one kind of crime (e.g. by hiring thugs or bribing police officers) likely lowers the cost of committing other crimes. A positive cross-partial derivative would further increase the adverse selection effect because it raises the return to electoral crime for politicians already involved in illegal mining.
The first expression is unchanged. The second expression demonstrates a second form of adverse selection: mineral rents increase the return to electoral crime, and do so especially for high $\theta$ politicians. This occurs because these politicians facilitate more illegal mining $q(a^*_m)$ and thus have greater marginal returns to crime when prices are high.

In conclusion, extending the model to give politicians the opportunity to commit crimes to win elections strengthens the predictions on the adverse selection effect.