Rent-Seeking and Criminal Politicians: Evidence from Mining Booms *

Sam Asher
Johns Hopkins SAIS†

Paul Novosad
Dartmouth College‡

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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 politicians charged with serious crimes. We also find a moral hazard effect: politicians commit more crimes and accumulate greater wealth when mineral prices rise during their terms 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.

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†sasher2@jhu.edu
‡paul.novosad@dartmouth.edu

I Introduction

The selection of honest politicians and the prevention of 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 mining 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, which raises the return to rent-seeking by politicians. 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]

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 areas, which may be different on many dimensions.[3] Mandated public disclosures allow us to observe the criminal charges filed against each candidate contesting state-level elections in India, along with their assets.

We document three primary findings. First, increases in local mineral rents cause criminal politicians

[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 Bruckner, 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 (Bruckner 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).

[3]Our use of global price shocks to identify exogenous changes in mineral wealth is similar to Dube and Vargas (2013), Bruckner and Ciccone (2010) and Berman et al. (2017), among others.

to win more elections, in spite of marginal increases in electoral competition.[4] 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 accumulate additional criminal charges. Third, elected politicians gain substantial wealth during mining booms. The increases in crime and wealth are limited to politicians who are in office; we find neither effect on politicians who competed for office but were not elected.

Our basic specification studies the effect of a constituency-level mineral wealth shock driven entirely by changes in the global price of the basket of minerals produced in that constituency. To measure adverse selection, we examine the effect of the change in mineral wealth over the five years before an election on the likelihood that a criminal politician gains office. To measure moral hazard, we examine the effect on political behavior of price shocks that raise the value of local minerals *after* a politician has been elected. All specifications include state–year fixed effects, thus drawing only on variation across small constituencies within Indian states. The selection effect estimates are robust to a specification with constituency fixed effects that relies on changes in mineral wealth only within the same constituency across time. Due to sample size, this specification is not available in the moral hazard estimates, which rely on cross-sectional variation in recent price shocks.[5] These effects are robust to excluding conflict-affected districts and do not appear in placebo tests based on unproductive deposits or price shocks from different years. Positive economic shocks to the manufacturing or agricultural sectors have no effects on the same outcomes, suggesting that our results are driven by a phenomenon specific to the mining sector rather than a general effect of economic activity.

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 (Robinson et al., 2006; Brollo et al., 2013; Martínez, 2015). Mineral taxes and royalties are collected

[4]Following standard practice in India, we describe candidates facing formal criminal charges as "criminal politicians." The vast majority of these cases drag on for years, such that few have been resolved, making it impossible to conduct a similar analysis using convictions. We discuss the possibility that charges misrepresent actual crimes in Section II.B.

[5]A constituency fixed effect analysis would require three observations (hence two changes) for each constituency. While we have three observations for most locations, a redrawing of constituency boundaries at the midpoint of the sample makes it impossible to link places across the entire time period. However, we present several pieces of evidence suggesting that these price shocks are exogenous to constituencies, supporting a causal interpretation of the cross-sectional design.

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 Tesei, 2016; Ferraz and Monteiro, 2014).[6] Our study is distinct and complementary: the direct impact of mining operations that we isolate is a channel that these earlier studies explicitly do not address.

This paper makes two contributions to the 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 provide a distinct test for moral hazard from access to rents while in office; this effect is also economically meaningful. Rent-seeking opportunities that emerge once politicians are already in office cause those politicians to gain assets and engage in new criminal behavior.[7] While these effects may lead to similarly bad outcomes, they have substantially 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.

A key question raised by our study is what form this rent-seeking takes. The illegal behavior

[6]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 Tesei, 2016); 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 mayors to engage in more corruption.

[7]The best empirical evidence to date of these channels is in Brollo et al. (2013), who model the adverse selection and moral hazard effects of fiscal windfalls 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. 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 we do, Fisman et al. (2013) find that Indian politicians gain disproportionate wealth when elected to office. The latter two papers identify returns to political office but do not identify politician behavior response to changes in rent-seeking opportunities.

of politicians could be detrimental or beneficial to mining firms. Models of politicians and firms have usually focused on the case where politicians extract rents by blocking access to government services like licenses and permits (Shleifer and Vishny, 1994). In contrast, firms could benefit from politicians who can facilitate illegal activities, like expanding mines beyond license boundaries, violating environmental laws, or intimidating journalists and activists. Empirically distinguishing between these two scenarios is difficult given the paucity of reliable data on either the profits or revenues of mining firms, and is beyond the scope of this paper. However, qualitative evidence suggests that firms and politicians often have collusive relationships (Bhowmick, 2011; Paul, 2015), as does empirical evidence from other sectors (Lehne et al., 2018). The *de facto* roles of Indian politicians as local fixers make them well-placed to provide services to illegal mining firms, such as enforcing illegal contracts and intimidating whistleblowers (Chopra, 1996; Jensenius, 2017). The importance of violent crimes in explaining our results is also consistent with this interpretation. Violence-using politicians are particularly well-suited to providing the services demanded by mining firms; as emphasized by the literature on mafias, violent actors are often essential to the functioning of black markets (Gambetta, 1996; Bandiera, 2003; Skarbek, 2011; Chimeli and Soares, 2017).

Previous studies of criminal politicians in India have largely ignored the fact that a large share of criminal politicians face charges of serious violent crimes (Prakash et al., 2019; Fisman et al., 2013); our preferred interpretation, in contrast, highlights the politician's ability to coordinate acts of violence as central to his role. We discuss the possible role of violence in Section VI, and formalize these ideas in a political agency model in the spirit of Persson and Tabellini (2000) in Appendix B. However, empirically testing these hypotheses for the specific role of violence in the mining sector is left to future work.

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.[8] 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 affected 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, they will 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 (2003–2017). 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 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

[8] In 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 observation in this study, and no such payments had yet been made in the sample period.

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.[9]

The case of the Reddy brothers in Karnataka encapsulates many features of the relationship 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 ten-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 very existence 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, in practice they play a significant informal role. A central de facto role of local politicians is to help citizens obtain services

[9] 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.

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, environmental 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.

From 2003–2017, 32% of elected politicians at the state and federal level in India were facing formal criminal charges in a court of law; a third of these were for violent crimes (Appendix Table A1). 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);[10] and (iv) criminals are favored by voters because they are better at delivering services from a failing state (Vaishnav, 2017).

Using criminal charges as a measure of criminal behavior is subject to the concerns that changes in reporting of crime are difficult to distinguish from actual crime and that charges may be fabricated by political enemies. This is a difficult problem to address and is faced by many studies on criminal behavior by politicians in developing countries. Most of these charges will not be resolved for decades due to the backlog in the Indian court system; even when they are resolved, the judgment may

[10]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.

be politically biased (Poblete-Cazenave, 2019).

There is empirical evidence that criminally-charged politicians are bad for their constituents, are disliked by voters, and are recognized by parties to be weaker candidates, suggesting that the charges they face are plausibly valid. Chemin (2012) and Prakash et al. (2019) find that average outcomes are worse in constituencies represented by criminally-charged politicians. Vignette studies suggest that, all things equal, voters prefer non-criminal candidates (Banerjee et al., 2014; Chauchard, 2015), and parties are less likely to run criminally-charged candidates in competitive elections (Shaukat, 2019).[11] Anecdotally, many politicians in fact advertise their willingness to flout the law or ability to organize violence (Vaishnav, 2017). Finally, much of our empirical focus is on violent crimes, which are less likely to be entirely fabricated than minor crimes (Iyer et al., 2012). Henceforth, following convention in India, we refer to criminally-charged politicians as criminal politicians.

III Data

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

Data on electoral outcomes from 1990–2017 come from the Election Commission of India (ECI), described in Jensenius (2016) and shared by the Trivedi Center for Political Data. 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

[11] See Pande (2011) for a summary of empirical research on voter preferences for politician quality.

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., 2019; 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 (Prakash et al., 2019; Vaishnav, 2017).

We computed net wealth as assets less liabilities across all family members.[12] 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. We matched 50% of winners and 34% of runners up in our mining constituency sample to future elections.

To verify the accuracy of the ADR-coded affidavits, Prakash et al. (2019) re-entered all of the affidavits for the top two candidates from 2003 to 2007. Comparing the re-entered data to the data posted by ADR shows that fewer than 3% of candidates changed from criminal to non-criminal or vice versa in the recoding. However, the number of crimes increased for about a quarter of candidates, suggesting that the ADR data accurately identifies whether candidates are criminally charged but underestimates the total number of charges. We use the re-entered data where it is available and the ADR data for the remainder of elections. Because our results focus on the presence or absence of criminal charges, the discrepancy in the number of charges does not affect our primary analysis. The analysis sample includes affidavits covering the years 2003–2017.

Geocoded data on the type and size of all known mineral deposits in India is from the Mineral Atlas of India (Geological Survey of India, 2001).[13] Production data are published at the district-

[12] 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.

[13] The Geological Survey of India is a technocratic agency which to date has remained clear of India's many mining

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. We defined local production as the average value of output from 1990–2013, matching the sample of elections to the extent possible. 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.[14] 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 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.

We include both public and private mines, which are not distinguished in any of the data sources that we use. Given the private returns to illegal mining and the key role of politicians, both public and private mining operations create opportunities for rent-seeking.

Appendix Figure A1 shows how we construct our analysis sample of 946 constituency elections, which covers 31 distinct mineral types across 25 Indian states. Figure 2 shows a map of deposit locations, 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. prices from before 1900 to 2017. 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

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.

[14]Specifically, we dropped constituencies where annual production never exceeded USD 100,000. The average exchange rate during the sample period was 45 INR per USD, but the threshold was established in U.S. dollars because we valued output as constituency production multiplied by global price.

constituency-level politics.[15] 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. In the robustness checks, we use constituency-level non-farm employment from the Economic Census of India, a complete enumeration of all formal and informal enterprises in all industries other than agriculture, described in Asher et al. (2019). Precipitation is measured as total rainfall in the month of monsoon arrival, using data from the Climate Hazards Group InfraRed Precipitation with Stations data archive (Funk et al., 2014).

India underwent a national redelimitation of political boundaries in 2007. Since politicians began submitting affidavits with criminal case information only in 2003, the sample in most states includes one election before redelimitation and one or two elections after.[16]

IV 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 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. We test three specific hypotheses. First, we test whether positive mineral wealth shocks *before elections* lead criminal politicians to win more elections, a selection effect. Second, we test whether positive mineral wealth shocks that occur after candidates have been selected into office cause politicians in office to gain wealth and to commit more crimes. We call this a moral hazard effect, as it isolates the effect

[15] India produces 13% of the world's iron; for all other minerals, India produces less than 10% of global value (British Geological Survey 2014). Results are robust to the exclusion of these two minerals (Appendix Table A12).

[16] Two states, Jharkhand and Assam, did not change their constituency boundaries during the sample period.

of mineral wealth on candidate behavior, while holding candidate selection fixed. Third, we test whether the effects of rents are strongest for the most criminal types, as would be expected if they have the most to gain from the mining industry (though this test proves underpowered). These three predictions can be derived from a political agency model in the spirit of Persson and Tabellini (2000); we present such a model in Appendix B.

We first explain how we construct local mineral wealth shocks. We then describe the empirical specifications that test for adverse selection and moral hazard.

IV.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 define a rent shock to a constituency as the change in rents driven by global prices alone; in constituencies with multiple minerals, we weight the mineral-specific price shocks with the constituency's estimated average production during the entire sample period.[17] While the 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.[18] Results are robust to a range of different price shock length and baseline assumptions.

We define a pre-election constituency-level price shock as the change in the global value of the

[17]Results are robust (and in fact are stronger) to using production weights based on pre-sample production (1990–2003, Appendix Table A8). We use a time-invariant average rather than time-varying production for three 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. Third, production changes may be endogenous to local political behavior; by holding production fixed, we isolate the effect of the change in rents.

[18]Cashin and McDermott (2002) estimate the 90% confidence interval of the half-life of commodity price shocks to be between 2.2 and 6 years.

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:

$$PriceShock_{c,s,t-6,t-1} = \frac{\sum_{m \in M} \left(Q_{c,s,m} \cdot \frac{p_{m,t-1}}{p_{m,t-6}} \right)}{\sum_{m \in M} \left(Q_{c,s,m} \right)}, \tag{1}$$

where M is the set of minerals in constituency c, $Q_{c,s,m}$ is the mean 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.[19] Figure 3 shows the mineral-level price changes that precede elections taking place in 2004, (i.e. $p_{m,2003}/p_{m,1998}$). Figure 4 shows a map of sample constituencies, shaded in a gradient corresponding to the same price shock. Figure 5 presents a histogram of the 5-year price shocks generated in all constituency-year pairs in the analysis sample. The mean price shock is above one because the sample period 2003–2017 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 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 that 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

[19] 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.

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 price shock impact.

IV.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 and outcomes 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:

$$Y_{c,d,s,t} = \beta_0 + \beta_1 * PriceShock_{c,t-6,t-1} + \zeta * X_{c,s} + \gamma_{s,t} + \nu_d + \epsilon_{c,t}. \qquad (2)$$

$Y_{c,d,s,t}$ is a political outcome (e.g., an indicator for whether the elected representative is facing criminal charges) in constituency c, district d, state s and year t. $PriceShock_{c,t-6,t-1}$ 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 ν_d respectively. There are about seven constituencies in every district, but in most districts only one or two constituencies have mines. The coefficient β_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; our 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. The inclusion of constituency fixed effects would control further for time-invariant characteristics of places, ensuring that all the variation comes from changes in mineral prices in the same constituencies over time. Unfortunately, the national updating of constituency boundaries that occurred in the middle of the sample period makes it impossible to use this strategy for the whole time period. We show this specification for the subset of constituencies that have two elections after the boundary change for all results, but we prefer the district fixed effect specification as it is more powered and identifies the effect of the same exogenous variation. To take into account the colocation of similar minerals and serial correlation of political outcomes, standard errors are clustered at the district level.[20]

IV.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. 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 unexpectedly increase during the candidate's term in office.[21] We use the following estimating equation:

$$Y_{c,d,s,t+5} = \beta_0 + \beta_1 * PriceShock_{c,d,s,t+1,t+5} + \beta_2 Y_{c,d,s,t} + \zeta * X_{c,d,s} + \gamma_{s,t+5} + \epsilon_{c,d,s,t+5}. \tag{3}$$

The politician is elected in year t and 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

[20] We do not include district-year fixed effects because they take away much of the variation that we want to exploit: similar minerals are colocated and 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. The standard errors under the remaining sample with district-year fixed effects are too large to detect even very large effects.

[21] We exclude politician terms that lasted only one or two years, which results in dropping four runners up from the sample. The remaining politicians in the sample stayed in power for at least four or five years before the next election. We use a five-year price shock even for the four-year electoral terms to avoid conditioning on the dependent variable.

variables are defined as in Equation 2. As before, state-year fixed effects restrict the estimation to within-election variation across constituencies. Because this test necessitates observing politician characteristics 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 or constituency fixed effects, as they would remove nearly all 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.[22]

V Results

V.A Summary statistics

Table 1 presents summary statistics for the sample. We have data on 948 constituency-level elections that took place between 2003 and 2017 in constituencies with productive mineral deposits. The adverse selection sample consists of 182 pre-delimitation constituencies and 411 post-delimitation constituencies; 355 of the latter are observed twice. The moral hazard sample consists of 696 candidates who are observed contesting subsequent elections in the affidavit period. The baseline year in this sample ranges from 2003–2012; the next observation is five years after that.

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; 33% of elected candidates face pending criminal cases; 10% are charged with serious violent crimes. The candidate-level sample is limited to candidates who contested two elections and who could be matched over 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. The moral hazard regressions are based on recent years where forward

[22] Election winners may be different from losers on other unmeasured characteristics. Our identification comes from the exogeneity of the price shock, so we can still infer that price shocks cause increases in the wealth of winners, but it is conceivable that something other than being winners is what sets them apart from runners up. A close election regression discontinuity approach is not feasible here because only a subset of constituencies have productive minerals, and only a fraction of those have close elections. (The share of close elections is similar in mineral-rich and mineral-poor constituencies.)

price shocks are unavailable, so we use lagging price shocks. Columns 5 and 6 of Table 1 show the results. Only one of the coefficients out of 15—winner incumbency— is statistically significant at the 5% level. The p-value of the joint significance test is 0.66. The test shows that there is no relationship between average price shocks and constituency characteristics; our identification strategy relies on this to be the case so that we can attach a causal interpretation to the effects of price shocks.

V.B Mineral Wealth and Political Selection

This section describes estimates from Equation 2, which identifies the causal effect 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 0.114 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 11.4 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. The exogeneity of global price shocks implies causal identification can come from both forms of variation. We can add location fixed effects as a robustness check; by holding location constant, we isolate the variation coming from changes in mineral rents over time only. The fixed effects control for cross-sectional changes in the baseline mineral structure of regions that could be correlated with aggregate changes in the success of criminal politicians. However the statistical power of the test is weakened as we are using only a subset of the variation in prices. We can add district fixed effects for almost the full sample of constituencies; to add constituency fixed effects, we need to restrict the sample to the subset of places that had two elections after the constituencies were redrawn in 2007.[23]

Columns 2 and 3 show the fixed effect specifications. The change in effect size across specifications with and without fixed effects is less than half of a standard error; the coefficient stability supports the price shock exogeneity assumption. The constituency fixed effect point estimate is nearly identical

[23]Because constituencies fall within district boundaries, we can hold districts constant even across the period when constituency boundaries changed, allowing us to include district fixed effects for the full period.

to the Column 1 estimate, but only marginally statistically significant (p=0.08) due to the smaller sample and very large number of fixed effects. Column 4 shows marginal effects from a probit estimation with similar parameters to Column 1; the effect size is unchanged.[24] Because of the more limited power of the constituency fixed effect specification, we use the district fixed effect specification going forward. However, Appendix Table A2 shows all results from Tables 3 through 5 with constituency fixed effects instead of district fixed effects, which are highly similar except where noted.

Based on the point estimate in Column 2, going from the 25th percentile price shock (+22%) to the 75th percentile (+77%) would lead to a 19% increase in the chance of electing a criminal to office. Results are robust to a range of alternate specifications, described in Section V.D.

Table 3 tests whether other characteristics of winners change in response to mining booms. There is 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 or net assets. Winners are on average 2 years younger in constituencies experiencing mining booms. 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.[25]

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 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 charged with corruption-related crimes and winners

[24] The probit regression has fewer observations because our probit implementation excludes 52 observations from state-year pairs where there was no variation in the dependent variable. The regressions in columns 1–3 are not materially affected by excluding these same observations.

[25] Appendix Table A3 shows that mineral wealth shocks do not have an impact on either the share of candidates facing charges (Columns 1–3) or on the likelihood that the runner up faces charges (Columns 4–6). The main result is thus unlikely to be driven by the entry of criminals into politics.

charged with non-corruption-related crimes.[26] The p-value on the difference is 0.88. High mineral rents thus cause the election not only of criminal candidates, but specifically of candidates charged with violent crimes.[27] While more violent politicians are successful when mineral rents are high, note that 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. Changes in political competition are not statistically significant, though point estimates suggest marginal increases in competition following mining booms. Incumbent win advantages fall, while turnout and the effective number of parties (an inverse herfindahl measure) marginally increase.[28] We can rule out even small declines in turnout or the number of parties; 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; Shaukat, 2019). 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 are worse under criminal candidates (Chemin, 2012; Prakash et al., 2019). 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.

[26] We define corruption-related crime as theft from government, manipulation of elections, and illegally influencing or attempting to influence actions of public servants.

[27] The test does not rule out 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.

[28] The positive effect on the effective number of parties becomes statistically significant when we include constituency fixed effects (Appendix Table A2).

V.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. In Table 6, we examine 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 25 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 13 log points over a five-year electoral term, or an annualized 3.3% growth premium.[29]

To test whether this asset gain is unique to winners or is something happening to all members of the political class, 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 0.08.[30]

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. However, the standard error on the interaction variable of interest, $PriceShock{*}Winner{*}Violent$, is too large to rule out either large positive or negative interaction effects; there are too few violent politicians identified in the time series to precisely estimate this effect.

[29]Note that the underlying variation in these tests is cross-sectional, as the test requires data on a candidate in two successive elections with the same constituency boundaries and each constituency appears in our sample at most two times. Nevertheless, these estimates are causally identified as long as price shocks are exogenous to local political matters. The stability of the coefficients in the prior section to district and constituency fixed effects, along with the robustness of these estimates to the inclusion of prior and future price shocks, suggests that these shocks are indeed exogenous and driving political behavior change.

[30]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.

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.[31] Column 4 shows that a doubling of local mineral wealth causes elected politicians to be 21 percentage points more likely to face new criminal charges. Column 5 confirms that there is no effect on recontesting candidates who were not elected. The estimates are robust to alternate deposit and price shock definitions, as well as to the inclusion of pre-election price shocks; the latter implies that the observed effects are not driven by hypothetical serial correlation in price shocks (Appendix Table A4).

A limitation of the moral hazard analysis is that we only observe winners and runners up who choose to run again. The sample is thus selected on unobservables and the results could theoretically be driven by differential attrition. However, the attrition effect would have to be very large. Out of all election winners in mining constituencies, 56% were identified in the following term. For these effects to be driven by selection bias alone, it would have to be the case that the exogenous rent shock has a large differential effect on who chooses to run again, with selection based on recent increases in assets and criminal charges. While it is conceivable that candidates who earned the most in office sought re-election, it is difficult to see why candidates who were charged with new crimes would have been more likely to recontest office. To test whether attrition potentially biases the results, Figure A2 shows the asset and crime change estimates under increasing sample restrictions that exclude state-election pairs with the highest levels of attrition. Both estimates are statistically significant even when we limit the sample to state years where more than 60% of the sample is observed (a sample with only 20% attrition). The moral hazard effect on assets falls from 0.21 to 0.15 under this sample restriction (a statistically insignificant change) and the effect on crimes does not change at all.

However, only about a third of runners up choose to contest election again, making the risk of

[31] 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. The sample is smaller than in Columns 1–3 because those include data from Fisman et al. (2013), which did not record changes in criminal charges.

attrition bias higher for this group. If runners up who earn money during mining booms are more likely to exit politics (but winners are not), then it would be possible for the wealth effect identified here to be an effect on all political candidates rather than winners alone.

V.D Robustness

In this section, we show that the results are robust to a range of alternate specifications and we rule out several confounding explanations.

V.D.1 Alternate Economic Shocks

Are these results specific to mineral wealth, or would they occur with any kind of economic boom? We consider here the political impacts of two alternate types of economic shocks: shocks to industry and shocks to agriculture.

Non-farm employment is a proxy for overall economic activity. Appendix Table A5 shows estimates of the impact of local non-farm employment shocks on politician selection and behavior, using specifications analogous to those in Tables 2 and 6. Panel A defines an employment shock as the log change in constituency non-farm employment. Panel B uses a Bartik (1991) specification to predict the log change in constituency non-farm employment using the sectoral composition of employment in the previous census and the national change in employment in each sector. Because the Economic Census was undertaken intermittently (in 1998, 2005, and 2013), it is not possible to match shocks directly to election years. To test for adverse selection (Column 1), we match 1998–2005 employment growth to elections between 2004 and 2006, and 2005–2013 employment growth to elections between 2012 and 2014. To test for moral hazard (Columns 2–5), we match 2005–2013 employment growth to electoral terms beginning in 2005–09 and ending in 2010–14. The employment shock thus corresponds approximately to the politicians' terms in office. A one point change in the shock variable corresponds to a unit change in log employment growth.

There is no effect of generalized non-farm employment shocks on the propensity of criminal politicians to gain office, nor on the propensity of elected politicians to accumulate assets or new criminal charges during their terms.[32] We find similarly null results if we use wider or narrower sets of outcome years.

We proxy positive agricultural shocks with constituency-level precipitation in the month of monsoon arrival. We confirmed that these precipitation measures were strong predictors of district-level agricultural yields. Rainfall is normalized using the constituency data from 1981–2017, thus point estimates are interpreted as effects of an additional standard deviation of rainfall. Columns 1 and 2 of Appendix Table A6 respectively show the effect of precipitation in the year before election and in the five years before election on the propensity to elect a criminal candidate. The effect sizes are negligible and the standard errors are precise. Good rainfall does not induce criminal politicians to gain office. Columns 3 through 6 test for the effect of within-term agricultural shocks on changes in politician behavior. We do not detect any effect of within-term precipitation on the assets or criminal charges of election winners.

We can thus rule out that the moral hazard and adverse selection effects of mining booms are also experienced with generalized positive economic shocks.[33] This suggests that the primary results of this paper are indeed uncovering political behavior that is specific to the mineral sector.

V.D.2 Additional Robustness Checks

In Appendix Table A7 Columns 1 through 3, we show that the results are robust to defining production constituencies as those 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 A8 we show results from specifications based on alternate decisions on the con-

[32] Runners up (but not winners) are charged with more crime when jobs are growing, but this effect disappears under the Bartik specification.

[33] Vaishnav (2017) similarly finds that economic characteristics or shocks are not good predictors of the election of criminal politicians.

struction of the data. In our main result, we define constituency mineral production as the mean value of mineral production across years 1990–2013. Column 1 shows the main specification using the pre-sample years 1990–2003. This shrinks the sample by excluding constituencies that only began mineral production during the sample period, but the selection effect is in fact stronger in this subsample and is equally robust to inclusion of constituency fixed effects (not shown). 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, 4, and 5 respectively define mineral constituencies as those with (3) any positive production; (4) at least \$50,000 in production in one year; and (5) at least \$200,000 in one year (i.e. half and double the threshold used in Table 2). As expected, the lower thresholds lead to slightly smaller point estimates, but all are similar and statistically significant. Column 6 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 7, we show a placebo estimate from a specification in mineral deposit locations that report *no* production. The treatment effect on criminal selection here is zero, and statistically distinguishable from the main estimate in Table 2.

Appendix Table A9 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.

Appendix Table A10 tests for spatial spillovers. For each mining constituency, we measure the impact of the price shock on the criminality of the winning politician in the set of its nearest neighbors, defining neighbors as the set of constituencies where the centroid-to-centroid distance is less than 50km. The table shows that a constituency's own price shock is closely related to the probability of electing a criminal winner, but the price shocks in neighboring constituencies (controlling for the own-price shock) have no relationship with winner criminality.

Appendix Table A11 shows that the moral hazard and adverse selection effects on crime are robust to alternate definitions of the winner's criminality. Results on the number of crimes and log number of crimes are highly significant in both specifications. A pre-election doubling in mineral prices causes a 20 log point increase in the number of crimes facing the election winner; a post-election doubling in mineral prices causes a 21 log point increase in crimes for the election winner.

Next, we test the possibility that results are driven entirely by iron and coal, the two minerals where India may not be a price taker in international markets, which represent 75% of India's mineral output value. Appendix Table A12 shows estimates from the main specification with 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.

We next test whether conflict could be a driver of our results. The Naxalite insurgency in India during the sample period has been frequently linked by observers to mineral wealth, though Ghatak and Vanden Eynde (2017) note that the empirical data supporting these links remains weak. In Appendix Table A12, we show that there is little effect on the main result of excluding either the four states with the largest Naxalite presence (Column 7), or the set of districts with any Naxalite-related deaths between 2005–10 (from Ghatak and Vanden Eynde (2017), Column 8). We find similar null results when we exclude iron, coal, or Naxalite places from the moral hazard estimations.

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, many 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 A13, we respectively show that the effect of a mining boom on criminality is positive and highly significant in the set of constituencies for which we can identify the winner in the previous electoral term (Column 1), and in the set of constituencies where that winner has moved less than 20km, 10km, and 5km since the last election (Columns 2, 3, and 4).[34]

VI Discussion

We have provided evidence that mineral wealth attracts criminal politicians and that politicians commit more crimes and gain more wealth during mining booms. What exactly is the nature of the interactions between politicians and mining firms? Like many other studies that deal with illegal behavior, we do not have empirical data on what exactly politicians are doing to profit from the mineral sector, nor are we aware of data on mine-specific revenues and profits. However, we can gain some insight into this question from the other literature on firms and politicians in India, as well as the theoretical literature on politics and violence.

Politicians and mining firms have a great deal to offer to each other. State-level politicians' *de facto* primary role is to act as fixers, or as intermediaries between citizens, firms 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 (Jensenius, 2017; Iyer and Mani, 2012; Asher and Novosad, 2017). Mining firms require more of these inputs than other firms due to the inherent nature of their activities: they require land permits and environmental clearances, and frequently contest territory with other land users. Mining firms also frequently operate at the margin of illegality, in India as well as around the world (Africa Progress Panel, 2013), necessitating a relationship with authorities in control of law enforcement.

Politicians in India in turn rely heavily on firms that can generate untraceable cash. Political campaigns are extremely expensive and official campaign spending limits are extremely low; the entire political process thus depends heavily on illegal "black money" contributions (Vaishnav, 2017; Chauchard,

[34]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.

2018). Politicians and influential citizens and firms are thus ubiquitously entwined in illegal contracts.

The prevalence of violence among the criminal charges of so many politicians is also informative. If politicians are extorting mining firms in exchange for government goods like permits and licenses, then it is not clear why violent politicians would be more successful. Indian politicians have a substantial ability to hold up mining firms without recourse to violence. Further, anecdotal review of reports in the Indian media suggests that activists tend to be on the receiving end of violence more often than mining executives.

In contrast, if politicians are colluding with firms to facilitate illegal mining, then the literature suggests a clear role for violence. Illegal business activities often rely upon non-state actors, such as mafias, who can enforce contracts and protect private property with the threat of violence, exactly because the state does not provide these services to black market actors. Mafias can further intimidate public officials and whistle-blowers who could otherwise profit from exposing illegal activity (Gambetta, 1996; Bandiera, 2003; Chimeli and Soares, 2017)[35].

The literature on criminal politicians in India fits well with a theory of politicians as mafiosos. A large share of criminally-accused politicians in our sample face charges for serious violent crimes. Their willingness to resort to violence may make them more effective fixers by helping them to intimidate public officials and other agents (Vaishnav, 2017). Criminal politicians are even known to deliberately engage in public acts of violence, to demonstrate that they are effective at acting outside of the law (Witsoe, 2009; Berenschot, 2011b; Vaishnav, 2017).

The combination of qualitative and quantitative evidence suggests that mining firms and politicians both benefit from their relationship. In this paper, we are only able to provide evidence of the crimes and benefits on the politician side of the ledger. Empirical examination of whether and how mining firms benefit from criminal politicians would be a challenging but worthwhile future research enterprise.

[35] Indian media have described a coal mafia, iron mafia and sand mafia, among others, which have been implicated in dozens of murders (Bhowmick, 2011; Paul, 2015). Skarbek (2011) provides a useful literature review on the essential role of violence to organized crime activity. The notion that politicians use violence to facilitate illegal activity 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. (2019). 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.

VII Conclusion

The hidden nature of the transactions between politicians and mining firms makes it challenging to describe empirically. Our paper shines light on several dimensions of this relationship.

We show that rising mineral rents lead to worse political outcomes, even in the absence of fiscal revenue windfalls. Mineral rents appear to accrue directly to the political players with the most informal influence over the operations of local firms, likely through their *de facto* role as local intermediaries between firms and the state. This finding extends a literature that has identified general deterioration in political outcomes but has not tied them to politicians with direct influence over firms. 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. Our interpretation is that politicians are paid off to illegally facilitate the many aspects of mining operations that require administrative action from government officials, such as permitting, environmental enforcement, and suppression of dissent.

Our study also shows distinct evidence for adverse selection and moral hazard effects of natural resource wealth; both prove to be economically important. Increases in mineral rents lead more criminal politicians to gain office, and they lead politicians already in office to engage in worse behavior.

Finally, we provide evidence of a direct link between rent-seeking opportunities and the success of violence-using politicians. Violence on the part of politicians may be both a tool and a signal of politicians' willingness to take illegal actions that benefit their allies.

Mining operates at the margins of illegality around the world, and is often associated with human rights abuses, corruption and violence. These bad outcomes are likely to be exaggerated when political actors collude with or are captured by the mining industry. Improving the transparency around the interactions between bureaucrats, politicians and firms in this sector will be a useful step on the path to translating mineral riches into citizen welfare.

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Table 1
Summary statistics

Variable	Mean	S.D.	N	Placebo Test Beta$_{ps}$	 SE$_{ps}$
Adverse Selection Constituency-level Time-Invariant Variables					
Number deposits	3.01	3.73	399		
Average annual mineral output (1000 USD)	8470	29718	399		
People per Primary School	1183	655	399		
Constituency Population	247630	141909	399		
Rural Population Share	0.81	0.22	399		
Share Villages with Electricity	0.88	0.22	399		
Adverse Selection Constituency-level Time-Variant Variables)					
Representative Faces Charges	0.33	0.47	948	0.060	0.06
Share Candidates Facing Charges	0.19	0.20	948	0.030	0.03
Representative Faces Violent Charges	0.09	0.29	938	-0.030	0.04
Representative Faces Corruption Charges	0.08	0.26	938	-0.010	0.05
INC Representative	0.32	0.47	863	-0.030	0.06
BJP Representative	0.34	0.47	863	0.060	0.04
Representative High School Graduate	0.75	0.43	918	-0.060	0.06
Representative Age	49.17	9.73	948	0.740	1.12
Representative Log Net Assets	15.75	2.82	948	0.000	0.50
Effective Number of Parties	2.97	0.71	528	-0.060	0.08
Election Turnout	0.69	0.08	447	0.020	0.01
Incumbent Winner	0.44	0.50	664	0.16**	0.07
Win Margin	0.11	0.09	863	0.000	0.01
p-value from F test of joint significance: 0.66					
Moral Hazard Candidate-level Variables					
Log Net Assets (USD) (first term)	15.73	2	696		
Log Net Assets (USD) (second term)	16.70	1	696		
Log Asset Change (placebo test)				-0.050	0.28
Facing Criminal Charges (first term)	1.28	4	629		
Facing Criminal Charges (second term)	0.97	2	629		
Log Crime Change (placebo test)				0.060	0.13

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 $Y_{c,d,s,t} = \beta_0 + \beta_1 * PriceShock_{c,d,s,t+1,t+6} + \gamma_{s,t} + \nu_d + \epsilon_{c,d,s,t}$, 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

	(1)	(2)	(3)	(4)
Price shock$_{-6,-1}$	0.114***	0.097**	0.118*	0.114***
	(0.044)	(0.044)	(0.069)	(0.042)
State-Year F.E.	Yes	Yes	Yes	Yes
District F.E.	No	Yes	Yes	No
Constituency F.E.	No	No	Yes	No
Mean Dep. Var.	0.33	0.33	0.32	0.33
N	948	946	729	896
r2	0.15	0.35	0.67	

$^{*}p<0.10$,$^{**}p<0.05$,$^{***}p<0.01$

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 2 on the full sample with state*year fixed effects. Columns 2 and 3 respectively add district and constituency fixed effects. Sample size falls because constituency boundaries were redefined in 2007 and there is only one observation per constituency for most predelimitation boundaries. Column 4 shows the marginal effect from a probit estimation of a similar specification to that in Column 1. 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

	BJP	INC	High School	Age	Log Net Assets
	(1)	(2)	(3)	(4)	(5)
Price $\text{shock}_{-6,-1}$	0.009	-0.013	0.028	-2.443**	-0.144
	(0.033)	(0.040)	(0.035)	(0.950)	(0.161)
State-Year F.E.	Yes	Yes	Yes	Yes	Yes
District F.E.	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.28	0.33	0.75	49.2	16.1
N	2147	2147	915	946	1007
r2	0.40	0.31	0.31	0.33	0.52

$^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

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

	Violent	Non-violent	Corruption	Not Corruption
	(1)	(2)	(3)	(4)
Price shock$_{-6,-1}$	0.123***	-0.042	0.037	0.043
	(0.042)	(0.044)	(0.040)	(0.050)
p-value from difference		*0.02*		*0.94*
State-Year F.E.	Yes	Yes	Yes	Yes
District F.E.	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.09	0.23	0.08	0.24
N	935	935	935	935
r2	0.31	0.34	0.33	0.32

$^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

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

	Incumbent		Turnout		ENOP	
	(1)	(2)	(3)	(4)	(5)	(6)
Price shock$_{-6,-1}$	-0.036	-0.099	0.010	0.012	0.099*	0.092
	(0.047)	(0.074)	(0.007)	(0.017)	(0.055)	(0.143)
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
Mean Dep. Var.	0.42	0.44	0.66	0.69	2.92	2.96
N	1617	625	1703	386	1695	473
r2	0.23	0.33	0.74	0.75	0.54	0.64

$^{*}p<0.10$,$^{**}p<0.05$,$^{***}p<0.01$

The table estimates the impact of a local mineral price shock on several indicators of electoral competitiveness. All columns estimate Equation 2 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

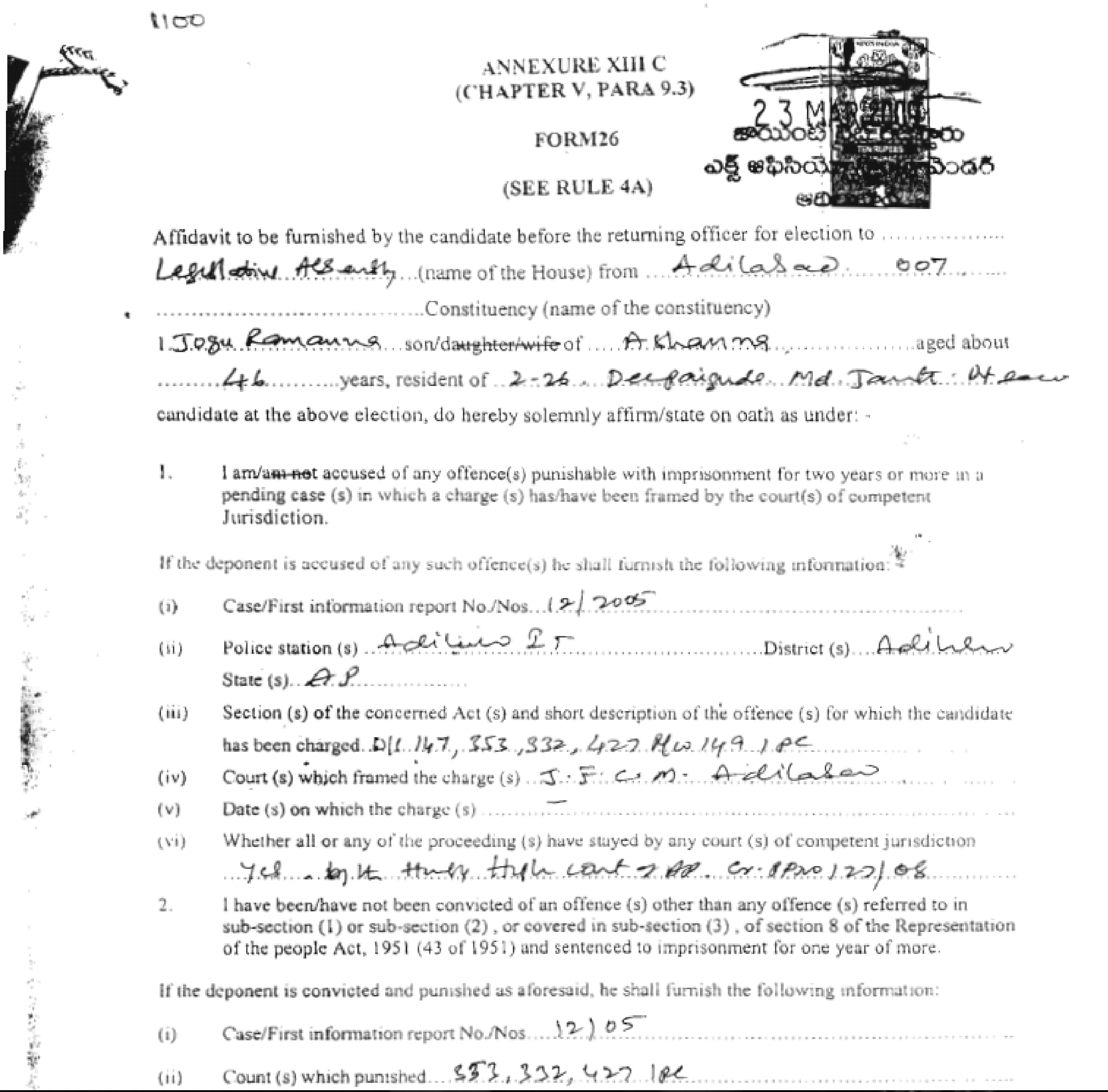
	Change in Assets			Change in Crime	
	(1)	(2)	(3)	(4)	(5)
Price shock$_{+1,+5}$	0.253**	-0.072	-0.061	0.212***	-0.045
	(0.104)	(0.172)	(0.183)	(0.061)	(0.085)
Price shock$_{+1,+5}$ * Winner		0.306*	0.214		0.244**
		(0.169)	(0.191)		(0.100)
Price shock$_{+1,+5}$ * Violent			0.516		
			(0.458)		
Price shock$_{+1,+5}$ * Winner * Violent			-0.703		
			(0.568)		
Violent Crime			-0.674		
			(0.698)		
Winner		-0.256	-0.144		-0.389**
		(0.254)	(0.283)		(0.158)
Winner * Violent			1.018		
			(0.866)		
State-Year F.E.	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	1.02	0.98	0.99	0.18	0.20
N	448	696	583	364	629
r2	0.40	0.33	0.30	0.23	0.18

$^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

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.

Figure 1

Sample election affidavit



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ANNEXURE XIII C
(CHAPTER V, PARA 9.3)

FORM26

(SEE RULE 4A)

Affidavit to be furnished by the candidate before the returning officer for election to ....

Legislative Assembly...(name of the House) from ....Adilabad.......007.........

....Constituency (name of the constituency)

I Jogu Ramanna ...son/~~daughter/wife~~ of .....A Khanna....................aged about

.........46..........years, resident of ..2-26...Deepaiguda Md Jainath Adilabad

candidate at the above election, do hereby solemnly affirm/state on oath as under: -

1. I am/~~am not~~ accused of any offence(s) punishable with imprisonment for two years or more in a pending case (s) in which a charge (s) has/have been framed by the court(s) of competent Jurisdiction.

If the deponent is accused of any such offence(s) he shall furnish the following information:

(i) Case/First information report No./Nos...12/2005...

(ii) Police station (s) ...Adilabad I T..............................District (s)....Adilabad

State (s)...A.P...................

(iii) Section (s) of the concerned Act (s) and short description of the offence (s) for which the candidate has been charged..U/s 147, 353, 332, 427 R/w 149 IPC..................

(iv) Court (s) which framed the charge (s) ...J. F. C. M. Adilabad..............

(v) Date (s) on which the charge (s) .....—...

(vi) Whether all or any of the proceeding (s) have stayed by any court (s) of competent jurisdiction

...Yes...by the Hon'ble High Court of A.P. Cr. R.P.No. 1227/08..........

2. I have been/have not been convicted of an offence (s) other than any offence (s) referred to in sub-section (1) or sub-section (2), or covered in sub-section (3), of section 8 of the Representation of the people Act, 1951 (43 of 1951) and sentenced to imprisonment for one year of more.

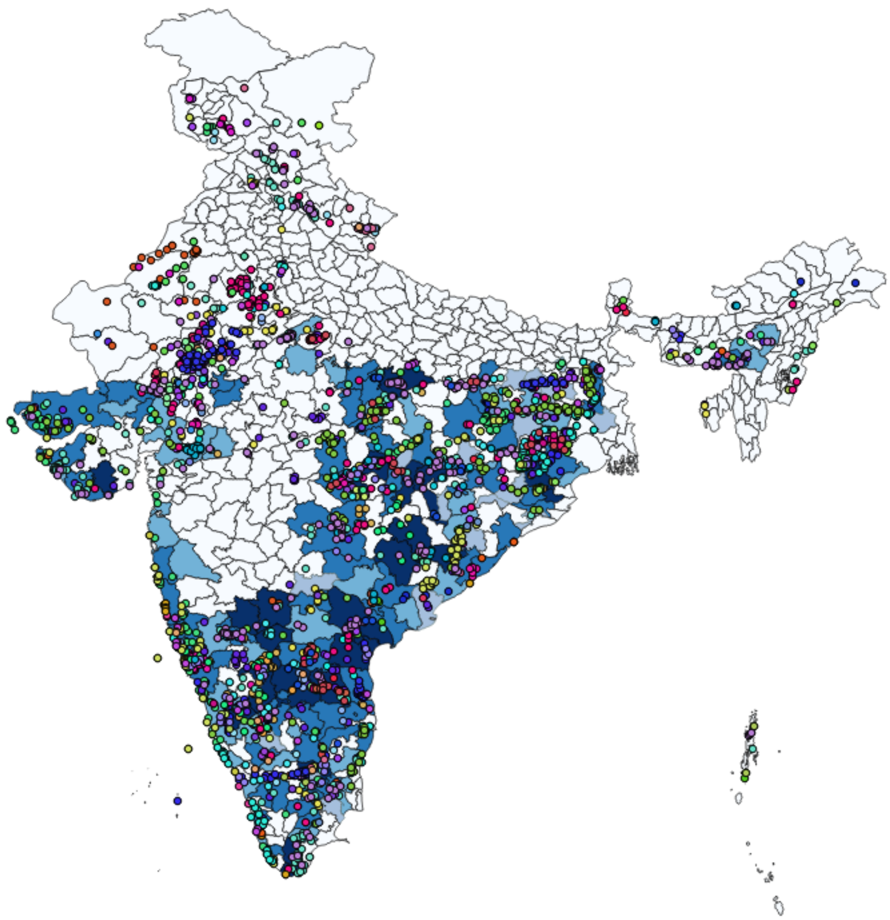
If the deponent is convicted and punished as aforesaid, he shall furnish the following information:

(i) Case/First information report No./Nos.....12/05...

(ii) Count (s) which punished.....353, 332, 427 IPC..

The figure shows the first page of a sample affidavit downloaded from the web site of the Election Commission of India. Section 1(iii) lists the sections under the Indian Penal Code under which this politician has been charged.

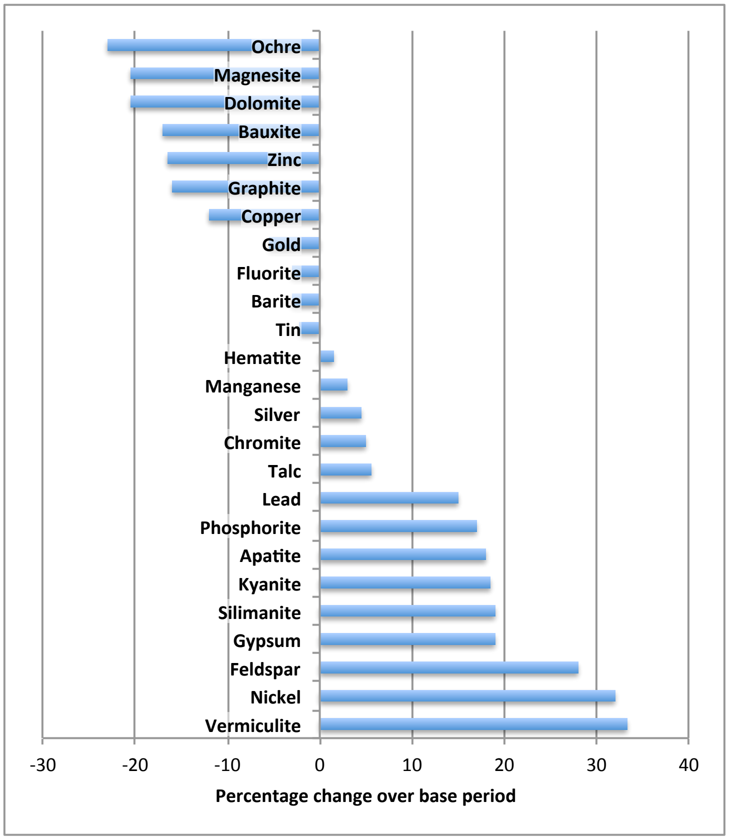
Figure 2
Map of deposit locations and mineral production



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

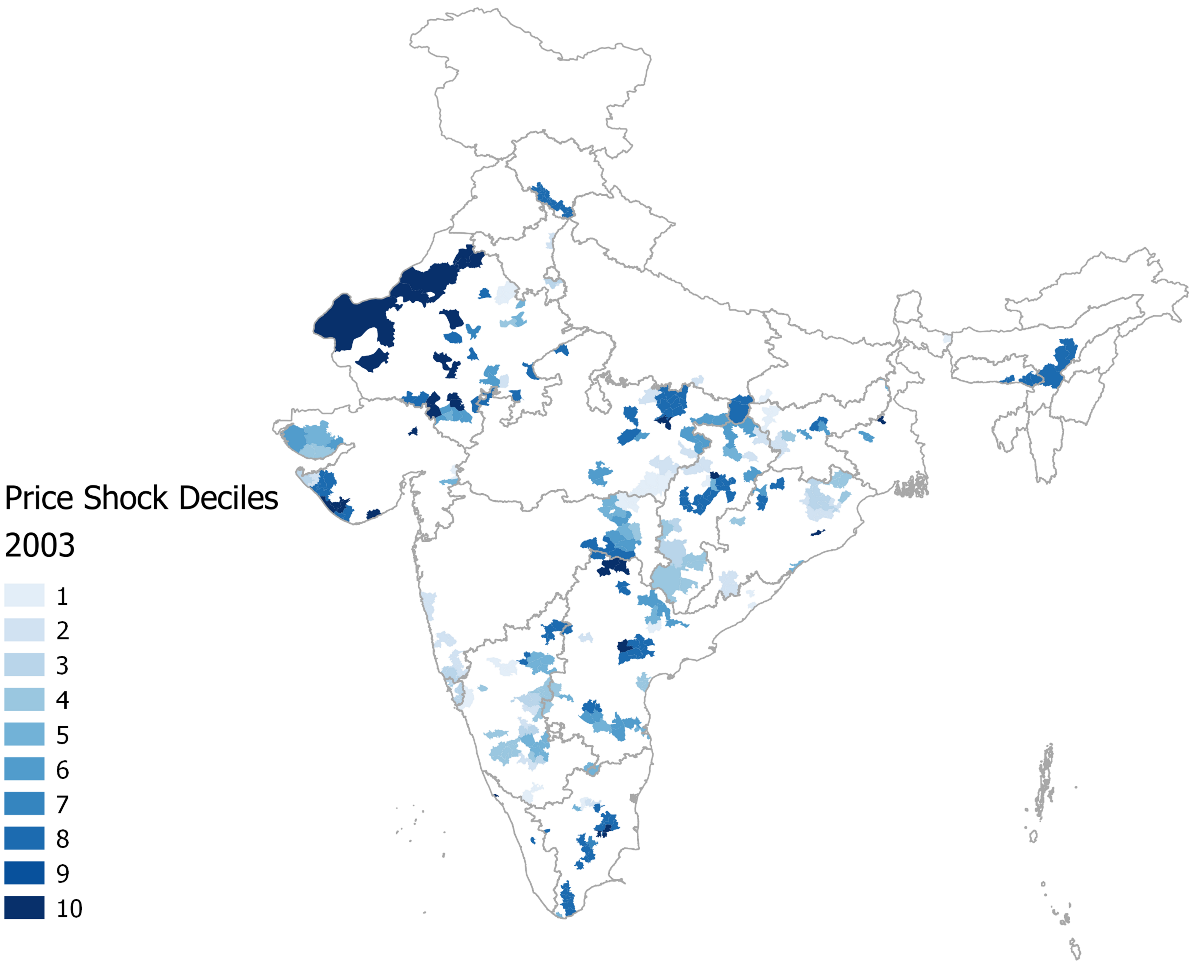
Mineral price shocks 1998-2003



The figure shows mineral-specific price shocks calculated from 1998-2003. The price shock is defined as the price in 2003 divided by the price in 1998. Source: United States Geological Survey.

Figure 4

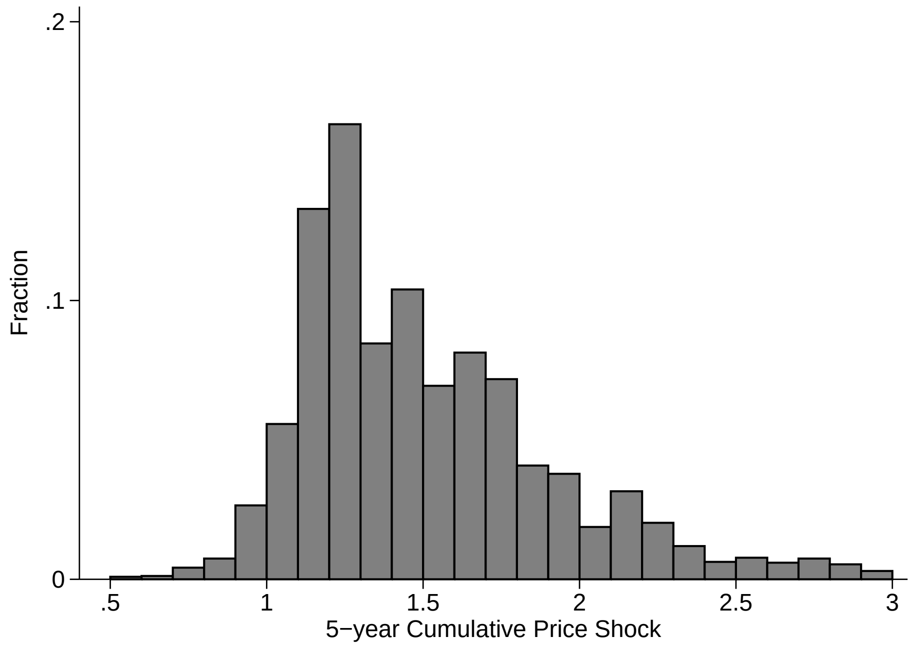
Map of mineral price shocks (1998-2003)



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 IV 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).

Figure 5

Histogram of sample price shocks (2003-2017)



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 1 in Section IV for more details. The set of election years is 2003 to 2017.

A Appendix For Online Publication: Additional figures and tables

Table A1

Criminal Charges Against Politicians Contesting Election:
Summary Statistics

Variable	Mean	(Std. Dev.)	N
Number of open charges listed on affidavit	1.606	(5.181)	9685
Any Charge	0.32	(0.466)	9685
Corruption	0.103	(0.304)	9563
Violent Crime	0.113	(0.317)	9563
Property Crime	0.075	(0.263)	9563
Civil Disorder	0.134	(0.341)	9563
White Collar Crime	0.028	(0.166)	9563
Libel	0.051	(0.221)	9563

The table shows the distribution of charges faced by politicians seeking election in India. The sample period is 2003–2017. 2003 is the first year that candidates were required to file affidavits showing criminal charges. Corruption is defined as theft from a government office, illegally attempting to influence a public servant or an election-related crime. Violent crime includes actual or attempted assault, armed robbery, homicide, kidnapping or sexual assault.

Table A2

Robustness of main results to constituency fixed effects

Panel A: Effect of Price Shocks on Winning Candidate Characteristics

	BJP	INC	High School	Age	Log Net Assets
	(1)	(2)	(3)	(4)	(5)
Price shock$_{-6,-1}$	0.032	-0.049	0.061*	-2.178**	-0.164
	(0.045)	(0.048)	(0.036)	(1.067)	(0.167)
N	1905	1905	682	710	706
r2	0.58	0.52	0.73	0.70	0.80

$^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

Panel B: Effect of Price Shock on Criminality by Type of Crime

	Violent	Non-violent	Corruption	Not Corruption
	(1)	(2)	(3)	(4)
Price shock$_{-6,-1}$	0.135**	-0.023	0.069	0.043
	(0.067)	(0.069)	(0.058)	(0.080)
N	711	711	711	711
r2	0.58	0.61	0.58	0.60

$^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

Panel C: Effect of Price Shock on Election Competitiveness

	Incumbent	Turnout	ENOP
	(1)	(2)	(3)
Price shock$_{-6,-1}$	-0.021	0.005	0.155***
	(0.053)	(0.008)	(0.054)
N	1409	1536	1414
r2	0.47	0.89	0.68

$^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

These three panels shows the robustness of Tables 3, 4, and 5 in the body of the paper to the inclusion of constituency fixed effects. All rows and columns are identical to those tables in the body of the paper, but include constituency fixed effects.

Table A3

Effect of mineral price shocks on non-winner criminality

	(1)	(2)	(3)	(4)	(5)	(6)
Price shock$_{-6,-1}$	0.010	0.007	-0.002	0.005	-0.015	-0.035
	(0.015)	(0.017)	(0.022)	(0.041)	(0.045)	(0.070)
State-Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
District F.E.	No	Yes	No	No	Yes	No
Constituency F.E.	No	No	Yes	No	No	Yes
Mean Dep. Var.	0.19	0.19	0.18	0.28	0.28	0.30
N	987	985	807	855	848	631
r2	0.22	0.39	0.66	0.18	0.34	0.63

$^{*}p<0.10$,$^{**}p<0.05$,$^{***}p<0.01$

The table estimates the impact of a local mineral price shock on the criminality of candidates who contested election but did not win. Criminality is a candidate-level indicator that takes the value one if the candidate is facing criminal charges. The dependent variable in Columns 1–3 is the mean of this indicator across all candidates contesting election in each constituency-year. The dependent variable in Columns 4–6 is the criminality of the second-place candidate 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. Columns 1 and 4 estimate Equation 2 on the full sample with state*year fixed effects. Columns 2 and 5 add district fixed effects and Columns 3 and 6 add constituency fixed effects. 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 lagged price shocks

	Change in Assets		Change in Crime	
	(1)	(2)	(3)	(4)
Price shock$_{+1,+5}$	0.267***	-0.045	0.216***	-0.045
	(0.101)	(0.165)	(0.062)	(0.087)
Price shock$_{+1,+5}$ * Winner		0.302*		0.244**
		(0.168)		(0.100)
Winner		-0.142		-0.420**
		(0.297)		(0.201)
Price shock$_{-5,-1}$ (lagged)	0.095	0.191**	0.023	-0.010
	(0.103)	(0.092)	(0.058)	(0.070)
Price shock$_{-5,-1}$ (lagged) * Winner		-0.073		0.021
		(0.119)		(0.081)
State-Year F.E.	Yes	Yes	Yes	Yes
Mean Dep. Var.	1.02	0.98	0.18	0.20
N	448	696	364	629
r2	0.40	0.33	0.23	0.18

$^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

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 the inclusion of lagged price shocks. The dependent variable in columns 1–2 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. Columns 3 and 4 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.

Table A5

Effect of employment shocks on candidate selection and behavior

Panel A: Constituency-Level Non-Farm Employment Growth

	Crim Winner	Change in Assets		Change in Crime	
	(1)	(2)	(3)	(4)	(5)
Pre-Election Growth	-0.003				
	(0.016)				
Growth in Electoral Term		0.108	0.077	-0.045	0.224***
		(0.211)	(0.136)	(0.046)	(0.071)
Winner			0.190		0.031
			(0.128)		(0.056)
Winner * Growth in Electoral Term			0.029		-0.245***
			(0.207)		(0.072)
Constant	0.339***	1.178***	1.011***	0.224***	0.198***
	(0.009)	(0.085)	(0.104)	(0.030)	(0.047)
State-Year F.E.	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.34	1.21	1.17	0.21	0.25
N	4427	213	335	219	349
r2	0.10	0.12	0.09	0.13	0.14

$^{*}p<0.10, ^{**}p<0.05, ^{***}p<0.01$

Panel B: Bartik-Predicted Constituency-Level Non-Farm Employment Growth

	Crim Winner	Change in Assets		Change in Crime	
	(1)	(2)	(3)	(4)	(5)
Bartik Predicted Pre-Election Growth	0.078				
	(0.103)				
Predicted Growth in Electoral Term		-1.309	-2.442	-0.287	0.142
		(0.950)	(1.584)	(0.316)	(0.668)
Winner			-0.289		0.068
			(0.714)		(0.301)
Winner * Predicted Growth in Electoral Term			1.158		-0.313
			(1.694)		(0.700)
Constant	0.308***	1.757***	2.056***	0.329**	0.227
	(0.039)	(0.397)	(0.656)	(0.138)	(0.281)
State-Year F.E.	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.34	1.21	1.17	0.21	0.25
N	4427	213	335	219	349
r2	0.10	0.13	0.10	0.13	0.12

$^{*}p<0.10, ^{**}p<0.05, ^{***}p<0.01$

The table replicates the main results of the paper using shocks to non-farm sector employment instead of mineral wealth shocks. The independent variable in Panel A is constituency-level non-farm employment growth; in Panel B, it is *predicted* non-farm employment growth from a Bartik specification. Column 1 shows a regression of a criminal winner indicator on employment growth in the period before the election. Columns 2 and 3 show regressions of the change in candidate assets on employment growth during the candidate's term in office. Columns 4 and 5 show regressions of an indicator that takes the value one if a candidate has accumulated additional criminal charges during the electoral term, on employment growth during the candidate's term in office. Columns 2 and 4 are restricted to sitting MLAs (i.e. election winners) only; Columns 3 and 5 include runners-up in the last election as a control group. All regressions include state-year fixed effects and the standard set of constituency controls. Standard errors are robust and clustered at the district level.

Table A6

Effect of rainfall shocks on candidate selection and behavior

	Criminal Winner		Change in Assets		Change in Crime	
	(1)	(2)	(3)	(4)	(5)	(6)
Precip. Year Before Election	0.001					
	(0.009)					
Precip. 5 Years Before Election		-0.017				
		(0.019)				
Precip. During Electoral Term			0.159	0.190	-0.014	0.108
			(0.223)	(0.205)	(0.099)	(0.109)
Winner				0.194**		-0.052
				(0.084)		(0.041)
Precip. During Term * Winner				0.150		-0.023
				(0.161)		(0.081)
Constant	0.306***	0.307***	1.098***	0.949***	0.181***	0.247***
	(0.006)	(0.005)	(0.058)	(0.064)	(0.026)	(0.036)
State-Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.31	0.31	1.08	1.03	0.18	0.20
N	9274	9274	356	596	361	612
r2	0.13	0.13	0.19	0.15	0.17	0.13

$^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

The table replicates the main results of the paper using precipitation shocks instead of mineral wealth shocks. Column 1 shows a regression of a criminal winner indicator on rainfall in the year before the election. Column 2 uses average rainfall in the five years before the election. Columns 3 and 4 show regressions of the change in candidate assets on average rainfall during the candidate's term in office. Columns 5 and 6 show regressions of an indicator that takes the value one if a candidate has accumulated additional criminal charges during the electoral term, on average rainfall during the candidate's term in office. Columns 3 and 5 are restricted to sitting MLAs (i.e. election winners) only; Columns 4 and 6 include runners-up in the last election as a control group. Rainfall in each year is measured as total rainfall in the month of monsoon arrival. All regressions include state-year fixed effects and the standard set of constituency controls. Standard errors are robust and clustered at the district level.

Table A7

Effect of mineral price shocks on winning candidate criminality
Alternate deposit definitions

	Exact Deposit Locations			Deposits Only		
	(1)	(2)	(3)	(4)	(5)	(6)
Price shock$_{-6,-1}$	0.131***	0.107**	0.118**	0.040**	0.038**	0.051*
	(0.039)	(0.041)	(0.056)	(0.016)	(0.016)	(0.028)
State-Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
District F.E.	No	Yes	No	No	Yes	No
Constituency F.E.	No	No	Yes	No	No	Yes
Mean Dep. Var.	0.33	0.33	0.32	0.30	0.30	0.30
N	628	625	484	3280	3270	1905
r2	0.18	0.39	0.69	0.13	0.25	0.66

$^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

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 contrast, 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 A8

Effect of price shocks on winning candidate criminality
Alternate price shock definitions

	Baseline 1990-2003	$\text{Shock}_{-5,0}$	Prod above 0	Prod above USD 50k	Prod above USD 200k	State Clusters	Placebo Fixed Effects
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Price Shock	0.136***	0.134**	0.087***	0.086**	0.120**	0.097**	0.029
	(0.046)	(0.054)	(0.032)	(0.041)	(0.048)	(0.037)	(0.043)
State-Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District-Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.35	0.33	0.32	0.34	0.34	0.33	0.25
N	720	948	1726	1063	780	946	679
r2	0.34	0.34	0.26	0.33	0.36	0.35	0.44

$^{*}p<0.10, ^{**}p<0.05, ^{***}p<0.01$

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 baseline district-level mineral output measured from 1990–2003, 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, 4 and 5 define mineral constituencies as those with production of at least (3) $1 in any one year; $50,000 in one year; or (5) $200,000 in any year. In Table 2, the threshold is $100,000. Column 6 presents the main specification from Table 2, with standard errors clustered at the state level. 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 A9

Effect of mineral price shocks on candidate asset growth and criminal activity
Alternate price shock definitions

	Assets (1)	Crime (2)	Assets (3)	Crime (4)	Assets (5)	Crime (6)	Assets (7)	Crime (8)
Price $\text{shock}_{+1,+5}$	0.279***	0.190**	0.331***	0.141**	0.256**	0.220***	0.222**	0.212***
	(0.105)	(0.078)	(0.118)	(0.067)	(0.117)	(0.070)	(0.100)	(0.063)
State-Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	301	248	291	240	362	290	477	370
r2	0.43	0.29	0.43	0.24	0.41	0.24	0.37	0.24

$^{*}p<0.10, ^{**}p<0.05, ^{***}p<0.01$

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 A10

Effect of mineral price shocks on winning candidate criminality
Spatial Spillovers

	(1)	(2)	(3)	(4)
Price Shock	0.163***	0.194***	0.202***	0.118*
	(0.053)	(0.059)	(0.071)	(0.070)
Price Shock to Neighbors	-0.044	-0.052	-0.050	-0.035
	(0.045)	(0.044)	(0.051)	(0.058)
State-Year F.E.	Yes	Yes	Yes	Yes
District F.E.	No	Yes	Yes	No
Constituency F.E.	No	No	Yes	No
Mean Dep. Var.	0.33	0.33	0.33	0.33
N	865	862	650	786
r2	0.37	0.57	0.75	

$^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

The table estimates the impact of local mineral price shocks on the criminality elected politicians in neighboring constituencies. The dependent variable is the share of neighboring constituencies in which the election winner faces criminal charges. The price shock is the average price shock in the neighboring constituencies. The row marked "Price Shock to Neighbors" is the price shock in the reference constituency. In both cases, the price shock is a 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 2 on the full sample with state*year fixed effects, with the additional neighboring price shock variable. Columns 2 and 3 respectively add district and constituency fixed effects. Column 4 shows the marginal effect from a probit estimation of a similar specification to that in Column 1. 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 A11

Adverse selection and moral hazard tests

Alternate crime definitions

	Adverse Selection		Moral Hazard (Differences)	
	Num Crime	Log Num Crime	Num Crime	Log Num Crime
	(1)	(2)	(3)	(4)
Price shock$_{-6,-1}$	0.646***	0.201***		
	(0.172)	(0.055)		
Price shock$_{+1,+5}$			1.082**	0.209**
			(0.517)	(0.091)
State-Year F.E.	Yes	Yes	Yes	Yes
Mean Dep. Var.	1.33	0.43	-0.55	-0.05
N	948	948	364	364
r2	0.20	0.22	0.56	0.55

$^{*}p<0.10, ^{**}p<0.05, ^{***}p<0.01$

This table tests the robustness of results in Tables 2 and 6 to alternate definitions of the criminality of the winner. Columns 1 and 2 estimate the impact of local pre-election mineral price shocks on the criminality of the local elected politician. The dependent variable in Column 1 is the number of criminal charges faced by the winner; in Column 2 it is the log of the number of criminal charges plus one. Columns 3 and 4 estimate the impact of post-election mineral price shocks on the number of charges faced by the elected leader in a constituency. These columns again show the effect on the number of charges and the log number of charges. All columns include state and year fixed effects. Columns 1 and 2 include district fixed effects. 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 A12

Effect of price shocks on winning candidate criminality

Iron, coal, conflict exclusions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Price shock$_{-6,-1}$	0.100**	0.142***	0.128***	0.118***	0.171***	0.178***	0.129**	0.163***
	(0.040)	(0.043)	(0.040)	(0.045)	(0.054)	(0.055)	(0.057)	(0.047)
Price Shock	No coal	No iron	No coal/iron	No coal	No iron	No coal/iron	All	All
Constituency Sample	All	All	All	No coal	No iron	No coal/iron	No Naxalite States	No Naxalite Districts
State-Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.33	0.33	0.33	0.32	0.33	0.32	0.32	0.32
N	863	891	800	766	738	572	633	660
r2	0.13	0.14	0.14	0.12	0.16	0.16	0.15	0.16

$^{*}p<0.10$, $^{**}p<0.05$, $^{***}p<0.01$

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. Column 7 excludes the four states with the greatest Naxalite presence (Orissa, Andhra Pradesh, Jharkhand and Chhattisgarh). Column 8 excludes districts with at least Naxalite conflict-related death between 2005–2010. 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 A13

Effect of price shocks on winning candidate criminality

Fixed candidate location

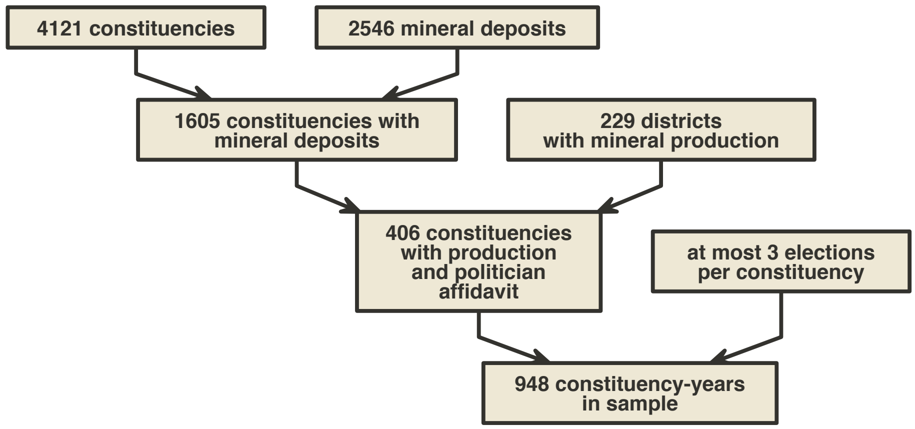
	All	Moved < 20km	Moved < 10km	Moved < 5km
	(1)	(2)	(3)	(4)
Price shock$_{-6,-1}$	0.197**	0.177**	0.149*	0.164*
	(0.079)	(0.076)	(0.077)	(0.091)
State-Year F.E.	Yes	Yes	Yes	Yes
Mean Dep. Var.	0.43	0.43	0.43	0.43
N	294	275	266	254
r2	0.19	0.27	0.25	0.27

$^{*}p<0.10$,$^{**}p<0.05$,$^{***}p<0.01$

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. 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, and Column 4 to 5km. 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.

Figure A1

Sample construction

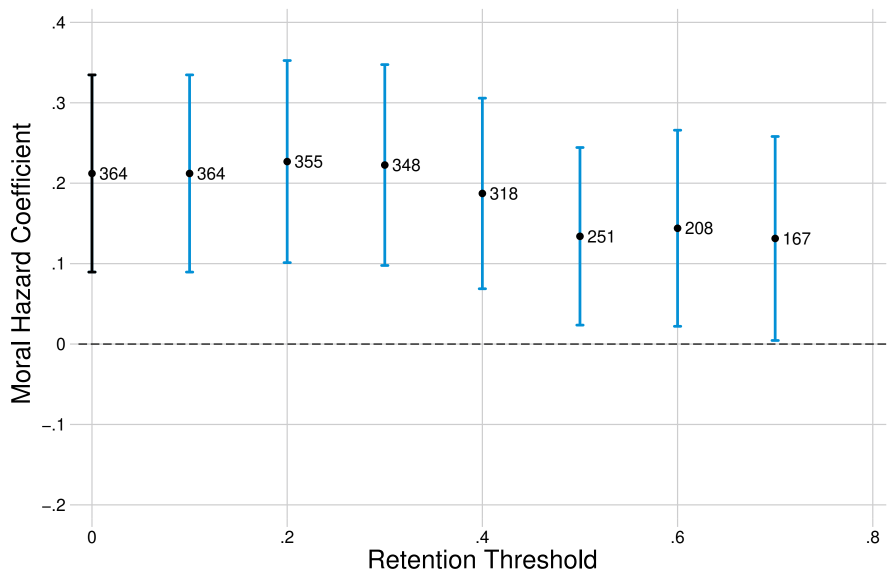


The figure describes the process for generating the sample of constituencies with valuable mineral deposits, based on predelimitation constituencies. The sample consists of 4121 predelimitation constituencies. These are matched to 2546 mineral deposits (Geological Survey of India 2005), and to district-level production data (229 districts, Statistics of Mineral Information, Indian Bureau of Mines). 1605 constituencies are within 10km of mineral deposits, and 406 of these are in districts that report production of the same mineral between 1990 and 2013. Each constituency has either two or three elections in the sample period, leading to a main sample size in Table 2 of 948 constituency-years.

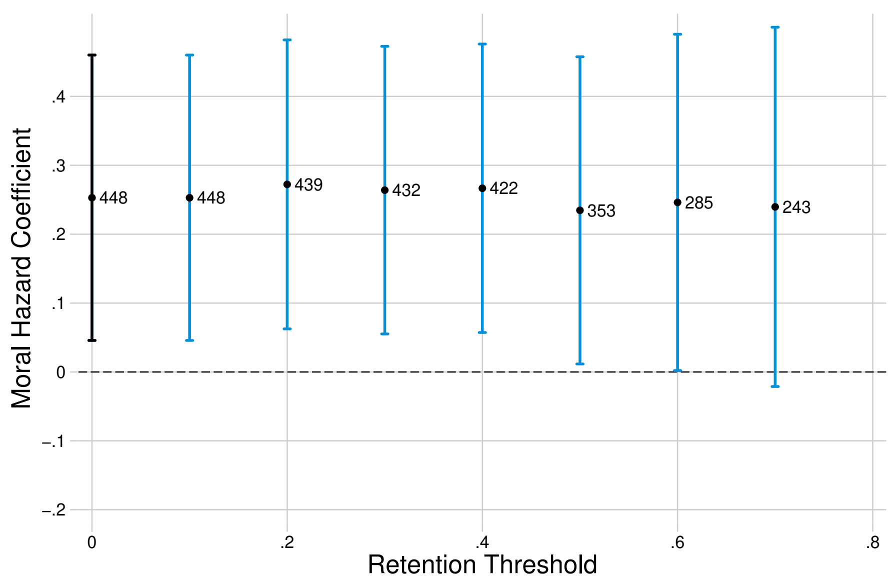
Figure A2

Moral Hazard Estimates: Robustness to Attrition

Panel A: Log Asset Growth



Panel B: Criminal Charge Growth



The figure shows alternate estimations of the moral hazard effects in Columns 1 and 4 of Table 6. The retention threshold on the X axis is a state-election-level variable defined as the minimum share of constituencies in that election for which we were able to observe the winner again in the following election. The estimate at X=0 is the estimate in the paper. The remaining estimates increasingly shrink the sample to a set of elections where candidate attrition is less of a concern. The aim is to show the sensitivity of the estimates to potential attrition. The outcome variable is candidate change in assets in Panel A and change in criminal charges in Panel B. The regression estimate shows the effect of a change in local mineral wealth that occurs after an election on the change in assets or crime of the political representative serving that constituency. The points show the point estimate of each estimation along with the sample size.

B Appendix For Online Publication: A Model of Collusion Between Firms and Politicians

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 collusion between politicians and firms because that relationship is suggested by the other literature on mining firms in India and indeed in many other places around the world. Models of politicians and firms have more commonly focused on the case where politicians extract rents from firms to the detriment of those firms (Shleifer and Vishny, 1994). A model in that spirit would generate similar predictions to those that we describe below, but it fits less well with the qualitative evidence from India. Further, the facilitation of black markets is widely associated in the literature with the presence of violent actors (Tilly, 1985; Gambetta, 1996; Bandiera, 2003; Chimeli and Soares, 2017; Skarbek, 2011).

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 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 θ 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.[36] Politicians who are caught in illegal activities pay a formal legal punishment and

[36] We do not take a stand in the model on the relationship between θ and the politician's ability to provide services to constituents. Brollo et al. (2013) assume that corrupt politicians provide worse services to citizens; Vaishnav

may face worse odds of re-election.[37]

We intentionally treat θ 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:

$$U = \pi(e)g(\cdot) - f(e), \tag{4}$$

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.[38] The action raises the firm's output by an increasing concave function $q(a)$; more serious crimes (with higher a) have bigger effects on output.[39] The action increases the firm's profit by $\mu q(a)$, where μ 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

(2017) argues they are better at providing services, in part because the formal state does such a poor job.

[37] 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.

[38] While the action itself may be legal or illegal, the exchange of the action for payment is illegal. Other 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).

[39] 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 θ; this strengthens the predictions below because the politician trades off the increase in $q()$ against the cost of crime, which is decreasing in θ.

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 θ politicians pay a lower utility cost for committing a given crime.

Equation 5 summarizes the politician's net utility from the illegal action:

$$g(a,\mu,\theta)=\frac{1}{2}\big(\mu q(a)-\frac{c(a)}{\theta}\big). \tag{5}$$

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:

$$\mu q'(a^*)=\frac{c'(a^*)}{\theta}. \tag{6}$$

Under Inada conditions, any politician with θ strictly greater than zero will choose $a^*>0$ and commit at least some illegal action.[40]

If the price of mineral output, and thus the mineral markup μ rises, then crime severity a^* must rise according to Equation 6.[41] Since μ and a^* are rising, the politician's rents in Equation 5 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:

$$f'(e^*)=\frac{1}{2}\pi'(e^*)\big(\mu q(a^*)-\frac{c(a^*)}{\theta}\big). \tag{7}$$

[40] 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).

[41] Specifically, $\frac{\partial a^*}{\partial \mu}=\frac{q'(a^*)}{\frac{c''(a^*)}{\theta}-\mu q''(a^*)}$.

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

$$\frac{\partial e^*}{\partial \mu} = \frac{1}{2}\frac{\pi'(e^*)\cdot q(\mu,\theta)}{f''(e^*) - \pi''(e^*)\cdot g(\mu,\theta)}. \tag{8}$$

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 θ 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.[42] 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 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.

B.A Modeling Electoral Fraud

This subsection extends the model 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,

[42] 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.

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 model above:

$$g(a_m,\mu,\theta)=\frac{1}{2}(\mu q(a_m)-\frac{c(a_m)}{\theta}). \tag{9}$$

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

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

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

$$U=\pi(e,a_e)\frac{1}{2}(\mu q(a_m)-\frac{c(a_m)}{\theta})-f(e)-\frac{c(a_e)}{\theta}. \tag{11}$$

As in the primary model, e represents effort to win elections, a_m is the extent of illegal mining, μ is the mineral markup, $q()$ is the output from illegal mining activities, θ 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 π_{ea_e} is zero.[43]

Candidates now jointly choose electoral effort and electoral crime. The first order conditions are

[43] 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.

similar for these two choices, but the amount of electoral crime depends directly on politician type:

$$\frac{\partial f}{\partial e^*} = \frac{1}{2}\frac{\partial \pi}{\partial e^*}\big(\mu q(a_m^*) - \frac{c(a_m^*)}{\theta}\big) \tag{12}$$

$$\frac{1}{\theta}\frac{\partial c}{\partial a_e^*} = \frac{1}{2}\frac{\partial \pi}{\partial a_e^*}\big(\mu q(a_m^*) - \frac{c(a_m^*)}{\theta}\big) \tag{13}$$

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

$$\frac{\partial a_m^*}{\partial \mu} = \frac{q'(a_m^*)}{\frac{c''(a_m^*)}{\theta} - \mu q''(a_m^*)} \tag{14}$$

There are now two adverse selection comparative statics. When the mineral markup μ 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:

$$\frac{\partial e^*}{\partial \mu} = \frac{1}{2}\frac{\frac{\partial \pi}{\partial e^*} q(a_m^*)}{f''(e^*) - \frac{\partial^2 \pi}{\partial e^{*2}} g(a_m^*, \mu, \theta)} \tag{15}$$

$$\frac{\partial a_e^*}{\partial \mu} = \frac{1}{2}\frac{\frac{\partial \pi}{\partial a_e^*} q(a_m^*)}{\frac{1}{\theta}\frac{\partial^2 c}{\partial a_e^{*2}} - \frac{\partial^2 \pi}{\partial a_e^{*2}} g(a_m^*, \mu, \theta)} \tag{16}$$

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 θ 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.