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Resource Discovery and the Political Fortunes of National Leaders[1]

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Abstract: We investigate how giant and supergiant oil and mineral discoveries shape the political fortunes of national leaders using a large dataset of 1255 leaders in 158 countries over the period 1950 to 2010. We depart from the existing literature by using both 'single risk' and 'multiple risk' discrete time proportional hazard models. We find that mineral discoveries reduce risk for the incumbent in a 'single risk model' especially in a non-election year. In contrast oil discoveries reduce risk disproportionately more for the incumbent in countries with weak political institutions. The effects appear to be induced by actual income or rent rather than income expectations. In a 'multiple risk model' oil discovery significantly reduces the risk of losing office via military coup while resource (oil and minerals) discovery in general reduces the risk of resignation. Resource discovery does not seem to have any impact on the risk of election loss.

JEL classification: D72; O11

Key words: resource discovery; leaders; political survival

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1 Introduction

The extent to which national leaders shape the destiny of a country is widely debated by scholars. Some scholars view leaders as Great Men influencing the evolution of history through idiosyncratic causative influences (Carlyle, 1837, 1859; Jones and Olken, 2005). Others disagree and view leaders as either slaves of history (Tolstoy, 2007; Berlin, 1978) or substantial individuals acting within the confines of existing social norms and institutions (Marx, 1852; Weber, 1947).

As important as it is to investigate the role of leaders in shaping national history, an equally important issue is to investigate the destiny of national leaders. Survival in office is one of the key objectives of leaders. However, political survival is not an easy task. Leaders can continue holding office if and only if they have enough political power. Political power is primarily derived from their access to resources and the support of their core constituency in the society. These two determinants of political power however are interlinked and somewhat locked in an interactive relationship. For example, access to a sizeable amount of resources provide the leader with sufficient economic power to buy off support, increase the size of the core constituency, and suppress opposition (Robinson et al., 2006; Caselli and Cunningham, 2009).[3] Alternatively, a large pool of resources induce more competition among political elites for access which could in fact diminish the size of the core constituency of the incumbent national leader and shorten her duration in office (Caselli, 2006).

Resources that enhance or reduce political power of national leaders could take multiple forms. Some common examples are natural resource rent, foreign aid, lobbying contributions, and tax revenue. In fact, the existing literature on political survival of leaders study the role of many of these factors. On the theory side seemingly conflicting models highlight the role of natural resource rent induced political patronage, rebel threats, and elite

[3] This is commonly known as the *rentier state theory*. See Robinson et al. (2006) for a review of this theory.

fragmentation in influencing the duration of a political leadership.[4] On the empirical side, several studies test the effect of resource wealth on political survival. However, they are heavily focused on certain country groups (Omgba, 2008), leaders type (Cuaresma et al., 2011), and regimes (Wright et al., 2013; Andersen and Aslaksen, 2013). We observe some nuanced differences across studies. For example, Wright et al. (2013) focus on regime (authoritarianism and democracy) survival whereas Andersen and Aslaksen (2013) examine regime change only when the chief executive loses office along with her political party. Bueno de Mesquita and Smith (2010) use a global sample of leaders but they only estimate a 'single risk model'. Most of the existing studies use resource rent or primary products export as explanatory variables, thus making them vulnerable to the issue of reverse causality.

In this study we take a new approach towards the question of leader survivability. We test the effect of giant oil[5] and mineral discovery news shocks on leader survivability using a discrete time proportional hazard model with no restriction on the baseline hazard. The use of discovery news shocks offer a cleaner identification strategy than 'resource rent' or 'primary products export' variables typically used by the existing literature. Moreover, we also estimate our model using 'first discovery' which offers an even cleaner identification strategy. In all specifications we control for 'past discoveries' as a proxy for 'exploration effort' to account for the view that giant discoveries are essentially exploration driven. Unlike previous studies, we recognise that a leader in office faces multiple risks. Therefore, we estimate 'competing risk models' along with 'single risk models'. The existing literature solely relies on the 'single risk model'. We also recognise that the nature of risk faced by the leader during election and non-election years could very well be different. Furthermore, leaders with term limits face different type of risks relative to leaders without term limits. Therefore, we account for these nuances in our model using a large dataset of 1255 leaders

[4] See Caselli and Cunningham (2009) for a review of this literature.
[5] Throughout the paper 'oil and gas' is referred to as 'oil'. More on this in section 2.

distributed across 158 countries over the period 1950 to 2010.

We start with an observational plot of the raw data. Figure 1 plots the Kaplan-Meier survival function[6] comparing leaders with (dashed line) and without (solid line) resource discoveries. We consider two types of resource discoveries: oil and minerals. We find that the average survival rate for incumbent leaders with resource discoveries is higher than the average survival rate for the same without resource discoveries at any given point in time. Survival function plot is not very informative about confounding factors and the baseline estimates (Andersen and Aslaksen, 2013). In particular, one would expect that the relationship between resource discovery and leaders' survival is conditional on the quality of institutions (Acemoglu et al., 2004; Robinson and Torvik, 2005). Hence we estimate discrete time proportional hazard models next.

Using a 'single risk model' and pooled sample of election as well as non-election years we find that mineral discovery reduces risk for the incumbent. This result survives in the non-election year sample. In contrast we do not observe any effect of oil discoveries on risk in an aggregate sample. However, interacting oil discoveries with institutional quality reveal that the former reduces risk disproportionately more in countries with weak political institutions (low democracy score, low executive constraint, and low level of competition in the executive recruitment process).

A 'single risk model' as estimated by several existing studies aggregate the different reasons of leaving office. In contrast a 'competing risk model' accounts for the diversity of reasons behind a leader's exit. Hence, we account for the risk of resignation and military coup during non-election years and the risk of losing election during election year. We find

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[6] The Kaplan-Meier survival estimate is the conditional probability of survival beyond time t, given survival up to time $t: S(t) = \Pi_{j|t_j \le t}\left(\frac{n_j - d_j}{n_j}\right)$, where n_j is the number of leaders in office at time t_j and d_j is the number of failures at time t_j. (Andersen and Aslaksen, 2013).

that resource discovery significantly reduces the risk of losing office via resignation and military coup. In particular, both oil and mineral discoveries appear to be 'resignation risk' reducing. However, a reduction in 'military coup risk' is exclusively associated with oil discovery shocks. The latter result perhaps reinforces the association between oil and authoritarianism under which military coups typically occur. Resource discovery does not seem to have any impact on the risk of election loss. We tackle the contentious issue of 'term limits' by excluding all term limit years from the non-election year sample for leaders with term limits.

We make the following contributions to the literature. First, to the best of our knowledge this is the first study to analyse the effect of resource discovery news shocks on the political fortunes of national leaders. In doing so we marry a novel geocoded dataset on resource discoveries with a dataset on national leaders. In contrast, existing empirical studies on the political fortunes of national leaders tend to focus on resource rent or resource income. Second, the geocoded dataset on resource discoveries is able to distinguish between minerals[7] and oil discoveries. This allows us to analyse the effects of oil and minerals on national leaders separately which yields new results of heterogeneous effects by resource type. Third, the existing literature estimates 'single risk models' whereas we estimate 'single risk' as well as 'multiple risk' models. This creates new knowledge of the types of risk that respond to a resource discovery shock. Finally, establishing causality is a key motivation in this literature and this paper offers a credible and cleaner identification strategy using the resource discovery variable.

Our identification strategy is similar to Cotet and Tsui (2013), Bhattacharyya et al. (2017), and Arezki et al. (2017). It relies on the stochastic nature of the discovery dates of giant and supergiant mineral and oil discoveries. A mineral deposit is coded as giant if it has

[7] The minerals are gold, silver, platinum group elements (PGE), copper, nickel, zinc, lead, cobalt, molybdenum, tungsten, uranium oxide.

the capacity to generate at least USD 0.5 billion of annual revenue for 20 years or more accounting for fluctuations in commodity price. A giant oil or/and gas (including condensate) field is a deposit that contains at least a total of 500 million barrels of ultimate recoverable oil or gas equivalent. This would be able to generate an annual revenue stream of approximately USD 0.4 billion under the assumptions that over the sample period the average gestation lag between production and discovery is 5 years, the average price of a barrel is USD 25, and the average discount rate including the country specific risk premium is 10 percent.[8] Therefore, it is reasonable to assume that both the giant oil and mineral discovery shocks are approximately of the same size on average. However, it is important to note that the value of discoveries are estimates and the projections are reliant on the estimation of the value at the time of the discovery. These estimates are often revised in subsequent years. The 'ultimate recoverable deposit' could also change if there is a major shift in technology. Therefore, discoveries are better treated as exogenous news shock rather than a projection based expected revenue shock.

Our working argument is that accurately predicting the timing of a giant or supergiant discovery is almost impossible because it is a rare event. How about politicians and the government manipulating the announcement of the precise timing to gain political mileage? This is unlikely in our dataset as the reported dates are independently verified using multiple industry sources and not just government records. Nonetheless, we also use 'first discovery' as an exogenous shock which offers even cleaner identification.

Exploration effort could drive resource discovery in a country. Therefore, not controlling for exploration effort could introduce a source of bias. We follow Cotet and Tsui (2013) and Bhattacharyya et al. (2017) and control for wildcat drilling as a measure of exploration intensity and our results are robust. Note that wildcat drilling is the number of oil

[8] Some studies claim that the risk premium augmented discount rate should be as high as 14-15 percent. Arezki at al. (2017) presents a more sophisticated analysis of net present value of giant oil discoveries and find that the median size of a giant discovery is approximately 5-6 percent of GDP.

wells drilled in an area where no oil production exists. The inclusion of the wildcat variable reduces the sample size by more than half and therefore we use it as robustness test and not a main result. These results are reported in the Supplementary Material file and discussed further in section 4.

Resource discovery could be driven by factors other than exploration effort. Hence, we estimate logit models with resource discovery as the dependent variable and find that no macroeconomic and political variables predict resource discovery. These issues are discussed further in section 2.

Our result could be interpreted as high income induced political risk reduction for the incumbent leader following a resource discovery. We observe on average risk reduction takes effect 6-8 years after mineral discovery and 11 years plus after oil discovery. Therefore, by then these discoveries are likely to be operational as it takes 8-10 years to develop a deposit. In case of mineral discoveries the risk reduction effect is uniform across regime type. In contrast, oil discoveries reduce risk in non-democratic countries. This is perhaps suggestive that minerals have relatively more forward and backward linkages with the rest of the economy. Therefore, it improves the income of both the incumbent and the challengers increasing the likelihood of cooperation in non-election years. Cooperation without doubt significantly reduces risks for the incumbent. Higher income in general could also create an atmosphere of optimism, good will, and national unity which could also benefit the incumbent. In contrast, oil has more of an 'enclave' character which could disproportionately increase the income of the incumbent. This could reduce the possibility of cooperation in a competitive political system thereby increasing risk. However, under a coercive and uncompetitive political system the opposite could happen as the incumbent could use coercion or patronage to reduce risk.

Our paper is related to a literature on the political consequences of natural resources.

The most prominent among them is the ‘rentier state theory’ dating back to Mahdavy (1970). The ‘rentier state theory’ stipulates three mechanisms through which resource wealth reduces democratic pressure on the incumbent and thereby extending her tenure. The first mechanism is the ‘taxation effect’ whereby the incumbent in a resource rich country is less reliant on her citizens for revenue. In return the citizens demand less accountability from the incumbent. The second mechanism is the ‘spending effect’ whereby the incumbent could engage in the extension of patronage and strategic social spending using resource wealth to remain in power. The third mechanism is the ‘coercion effect’ whereby the incumbent engages in coercion using resource wealth to disrupt the formation of opposition political groups.

Several theoretical and empirical studies have used these mechanisms to explain political survival. Acemoglu et al. (2004) and Acemoglu et al. (2010) emphasize the coercion mechanism. The former argue that an incumbent would disrupt the formation of an opposition critical mass by using resource wealth funded coercion. The latter emphasize the role of the military as an agent of the incumbent to carry out coercion. Robinson and Torvik (2005), Robinson et al. (2006), and Cuaresma et al. (2011) are examples where the taxation and patronage mechanisms are used.

Our paper is also related to the resource curse literature. Auty (2001), Gylfason (2001) and Sachs and Warner (2001, 2005) note that resource rich countries on average grow much slower than resource poor countries. Subsequent studies have argued that natural resources may lower the economic performance because they strengthen powerful groups, weaken legal frameworks, and foster rent-seeking activities (e.g., Tornell and Lane, 1999; and Besley, 2006). Others have argued whether natural resources are a curse or a blessing depends on country-specific circumstances especially institutional quality (eg., Mehlum et al., 2006; Robinson et al., 2006; Bhattacharyya and Hodler, 2010, 2014; Bhattacharyya and Collier, 2014), natural resource type (Isham et al., 2005) and ethnic fractionalisation (Hodler, 2006).

The remainder of the paper is structured as follows: Section 2 discusses the data and empirical strategy. Section 3 presents evidence on the effects of resource discovery on the political fortunes of national leaders and discusses the mechanism. It separately examines the effect on different risk types (resignation, military coup, and election loss) using multiple risk models. It also reports the heterogeneous effects of oil and minerals. Section 4 deal with robustness and section 5 concludes.

2 Data and Empirical Strategy

We create a large dataset covering 1255 leaders in 158 countries over the period 1950 to 2010[9] by marrying the leaders' database with the database on natural resource discovery. In what follows, we illustrate the nature and source of our data which is followed by a description of the empirical strategy.

2.1 Data

Leader Duration

A key variable in our analysis is the duration of a national leader staying in power. We source this data from the Archigos dataset compiled by Goemans et al. (2009). The dataset provides information on the entry and exit dates of the effective leader of a country. An effective leader is defined as the person who *de facto* exercises power in the country. Hence, this definition covers for cases whereby one person holds a formal title but is not able to exercise power to make political decisions. For example, the tenure of Saudi Arabia's King Fahd is considered to have lasted 13 years from 1982 to 1995, when he suffered a stroke and wasn't able to govern the country anymore, even though officially he remained the head of state till his death in 2005. The binary 'leader duration' variable takes the value 1 in the event of an exit and 0 otherwise.

[9] The final year of the sample is dictated by our resource discovery data.

A typical challenge with an analysis of this nature is right censoring whereby a leader leaves the study before an event occurs (Jenkins, 2005). For example, a leader could leave office because of health reasons or natural death. In the absence of illness or death she could have stayed longer in office. This is taken care of by right censoring where the leader leaves the sample on the death or illness year. The 'leader duration' variable takes the value 0 for the entire duration of such leaders including the death or illness year. We also right censor leaders who are in office in the year 2010, the final year in our sample. Note that leaders leaving office due to death by assassination is not right censored as we consider these assassinations politically motivated. Nevertheless, our results do not change even if we right censor the 8 assassinations that we have in our sample. We discuss more on this in section 4. Information on the reasons for leaving office is sourced from the Archigos database.

The tenure start date could be different for different leaders. Following Andersen and Aslaksen (2013) and Omgba (2008) we only count the years when the leader was in power as of the 1st of January. Using all the available information allows us to use the 'leader duration' variable in a discrete time survival model along with resource discovery.

In our dataset of 1255 leaders, the mean time in office for a national leader is 6.1 years. Several leaders leave office after 1 year and the maximum duration is 49 years due to the Cuban leader Fidel Castro. Figure 2 depicts the distribution of leaders' duration. We note that around 20% of leaders leave office after 1 year and that number jumps to 53% after 4 years. The corresponding hazard rate is depicted in figure 3. The distribution appears to be lognormal or log logistic which have been used by the existing studies such as Andersen and Aslaksen (2013) and Omgba (2008) in their parametric survival models to determine the underlying baseline hazard. However, the spikes in years 4, 5, 8, 10 and 11 in figure 2 are not well accounted for by the conventional parametric method. These spikes are a reflection of 4 or 5 year election cycles in most countries. We depart from the conventional parametric method by following a semiparametric approach to estimate the baseline hazard. Furthermore, we divide the sample into election and non-election years which allows us to estimate separate hazard rates for the same.

Reasons for Exit

In order to estimate the competing risk model, we would need to know why a leader leaves office. Archigos codes regular and irregular leader changes (Goemans et al., 2009). A regular change is defined as a change in compliance with prevailing rules, provisions, conventions and norms of the country whereas an irregular change is defined as removal in contravention to explicit rules and conventions. The former includes resignation, term limits and lost elections. Note that the Archigos database do not differentiate between the causes of regular leader change. Hence we collect additional data from Lentz (1994), http://www.rulers.org, and http://www.worldstatesmen.org to code for resignation, elections or term limits.

Archigos differentiate irregular leader changes into six categories[10]: removal due to domestic popular protest, domestic rebels, military coups, other government actors, foreign force, and others. The left hand graph in figure 4 depicts the distribution of leaders exiting due to all possible causes. In the right hand graph we aggregate irregular leader changes with the exception of military coups because they are extremely rare events in the sample not reaching the threshold of 20 events individually. In particular, we pool domestic popular protest, domestic rebels, other government actors, foreign force, and other into one category and call it 'other'. The distribution appears to be as follows: 18% are censored, 20% lose elections and leave, 12% hit term limits and leave, and 31% resign. Regular leader change is represented by the sum of the categories elections, term limits and resignations (792 or 63%). The remaining 231 (19%) changes are irregular out of which 148 (12%) are military coups and 83 (7%) 'others'.

[10] Archigos provides an even more detailed coding for all irregular categories. Separating all categories into removal of leaders with or without foreign support. We do not take this fine coding into account because most irregular categories are very rare events and would not affect results.

Resource Discovery

We obtain the mineral discovery data from MinEx Consulting. Oil and gas discovery data come from Horn (2004). Both datasets provide geocoded information about the location and the year of discovery. A giant mineral deposit has the capacity to generate at least USD 0.5 billion of annual revenue for 20 years or more whereas a giant oil or/and gas (including condensate) deposit has the capacity to generate an annual revenue stream of approximately USD 0.4 billion under certain assumptions which we have already mentioned in section 1.

To capture the effect of resource discovery we construct a dummy variable which takes the value 1 in the year of discovery till the end of the incumbent leader's tenure. This approach of coding discovery offers a treatment control perspective over the entire post-discovery period of a leader's time in office. In other words, this approach compares leaders with discovery treatment with leaders without discovery treatment throughout their tenure.

In addition to capturing the aggregate effect of discovery treatment, we also track the time path. Later in section 3 using alternative specifications we are able to track how many years it takes for the effect of discovery on leaders' tenure to kick in.

We code the mineral and oil discoveries separately. Note that the outcome of a resource discovery could be different depending on their level of appropriability (Andersen and Aslaksen, 2013) and connectedness. For example, oil is viewed as non-appropriable because of the high technology threshold for extraction, whereas minerals are relatively more appropriable due to a lower threshold of the same. More appropriable resources could be captured relatively easily by the opposition and used against the incumbent leader shortening her tenure. Furthermore, minerals as opposed to oil are more likely to have backward and forward linkages which could benefit both the incumbent and the challengers.

Figure 5 shows the geographic distribution of oil and mineral discoveries covered in the dataset. Overall the dataset covers 740 giant and supergiant oil discoveries in 63 countries and 453 giant and supergiant mineral discoveries in 61 countries. Table 1 reports the time distribution of resource discoveries.

Institutions

The resource curse literature reports that the effect of natural resources on economic and political outcomes are conditional on the institutional quality (Mehlum et al., 2006; Bhattacharyya and Hodler, 2010; Andersen and Aslaksen, 2013). Therefore, it is worthwhile exploring any institutions based heterogeneity in the relationship between resource discovery and leaders' tenure. For this reason we include component variable from the Polity index provided by Marshall and Jaggers (2014) in our regressions to look at interaction effects. Following Vreeland (2008) we use the adjusted *x-Polity* index to measure the overall level of democracy or autocracy. The *x-Polity* index is a combination of executive constraints (*xconst*), recruitment competition (*xrcomp*), and recruitment openness (*xropen*). The index ranges from 1 to 14 with 1 indicating an autocratic country and 14 a democratic country. We use the *x-Polity* index as opposed to the Polity2 index because the former excludes component variables such as political hostility and turmoil. The degree of political hostility and turmoil could be influenced by the incumbent leader thereby creating endogeneity challenge for our specification (Vreeland, 2008).

We also use *xconst* which is a measure of the level of "institutional constraints on the decision-making powers of the chief executive" (Marshall and Jaggers, 2002, p. 63). The index runs on a scale of 1 to 7, with 1 indicating unlimited power for the leader while 7 indicating maximum legislative constraints on the leader.

Finally, we use *xrcomp* which measures the competitiveness of executive recruitment, i.e. "how institutionalized, competitive and open are the mechanisms for selecting a political leader" (Marshall and Jaggers 2002, p. 49). This index ranges from 1 to 4, with 1 indicating no competition (for example, a leader is chosen by the right of descent) while 4 indicating competitive elections. Between these two extremes are situations characterized by the forceful seizure of power and/or rigged elections.

Other Control Variables

We control for *log of population*, *entry age*, *first leader since independence*, *mineral discovery*$_{t-10}$ and *oil discovery*$_{t-10}$ in every regression. *Log of population* is included in every specification because it predicts to a certain extent the likelihood of a resource discovery. This issue is further discussed in section 3. Furthermore, *log of population* accounts for the size of a country which could influence leaders' tenure. Robinson (1960) and Cuaresma et al. (2011) argue that large countries are difficult to govern and longer tenure for national leaders in these locations provide economic stability. The *log of population* data is sourced from the Penn World Tables.

We control for leaders' *entry age* because younger leaders could potentially stay longer in power (Bienen and van de Walle, 1992). The *entry age* data is sourced from Archigos. In addition, every specification also includes a dummy variable taking the value 1 if the leader is the *first leader since independence*. The first leader post-independence is often viewed as the progenitor of the newly independent country coming out of the shackles of colonialism. Therefore, they typically enjoy high popularity and have an obvious advantage in terms of staying longer in power. This data is sourced from the website http://chartsbin.com/view/2295.

Lei and Michaels (2014) and Bhattacharyya et al. (2017) argue that past discoveries influence the likelihood of current discoveries. Therefore, we include *mineral discovery*$_{t-10}$ and *oil discovery*$_{t-10}$ in all specifications to control for past giant and supergiant resource discoveries. These indicator variables take the value 1 for ten years if a deposit was discovered in the last ten years of the predecessor's term. Note that this definition takes into account past discoveries during the previous leader's tenure as well as spill over effects of past discoveries on the current leader.

We use information on elections and term limits from Archigos. Parliamentary and presidential election dates for every leader up to the year 2006 is sourced from Archigos. The remaining four years till 2010 is sourced from the website of the International Foundation for Electoral Systems http://www.electionguide.org/. Finally, the information on rules, changes and length of term limits is sourced from the Comparative Constitutions Project http://comparativeconstitutionsproject.org/#.

2.2 Empirical Strategy

We aim to estimate the probability of a leader leaving office conditional on the same leader holding office up to that point in time. Hence, we focus on the time spent in office rather than the calendar time. Note that a leader's term in office is characterised by her staying in office independently from the start of her term. Irrespective of the start date, our specification treats two leaders the same if they stay in power for the same number of years.

A basic survival model assumes that a failure could occur at any time. In contrast, this is not a given in our setting mainly due to the fact that a significant proportion of leaders leave office because of election defeats and term limits. Elections occur during election years and the probability of election defeat is zero in non-election years. Therefore, the underlying continuous time duration variable would have a distribution that is continuous between elections with probability mass points in election years. A similar logic also applies to term limits. Due to data limitations we do not deal with term limits in the main specification. The main specification deals with non-election and election years and exclude term limit years. We deal with term limit years separately in section 3.

To address the issue of elections we follow the approach of Narendranathan and Stewart (1993a) and use a discrete time survival model.[11] The discrete time model estimates specific hazard rates for specific years and therefore could be used to estimate separate hazard rates for election and non-election years.

Finally, a leader could leave office due to resignation, rebellion, political protests, military coup or foreign invasion. The general assumption under a continuous time hazard model that the exit can occur at any time would be relevant here. We deal with these issues in section 3.

The Single Risk Model

We estimate both single risk and competing risk models. We start by describing the single risk model first. The model follows Cox (1972) and Narendranathan and Stewart (1993a) and defines the conditional probability of leader i leaving office in year t, as

$$h_i(t) = \lambda(t)\exp(x'(t)\beta) \quad (1)$$

where $\lambda(t)$ is the baseline hazard representing the underlying risk for all leaders, $x(t)$ is a vector of leader and country characteristics including *oil* and *mineral discoveries*, *leader's entry age*, *log of population*, *first leader after independence, institutions, mineral discovery*$_{t-10}$ and *oil discovery*$_{t-10}$, and β is the vector of unknown parameters. Note that the vector of leader and country characteristics do not include a constant.

The discrete-time model is estimated in a semi-parametric setting imposing no restrictions on the shape of the baseline hazard following Meyer (1990). This can be achieved by introducing time dummies for each recorded time interval avoiding to make an assumption about the shape of the baseline hazard. As discussed earlier, varying covariates are measured annually and therefore the duration of a leader's stay in office is recorded to the full year completed. A recorded duration of t whole years indicate duration on a continuous time scale

[11] Note that this is in sharp contrast to other existing studies in the literature who typically use continuous time duration models. See for example, Andersen and Aslaksen (2013).

between $t-1$ and t years. The probability of leaving office in a non-election[12] year t conditional on $x(t)$ given that the leader is still in office at year $t-1$, is given by

$$q_{ne,i}(t \mid x(t)) = Prob(T_i < t \mid t-1 \leq T_i) = 1 - \exp\left\{-\int_{t-1}^{t} h_i(\tau)d\tau\right\}$$

$$= 1 - \exp\left\{-\int_{t-1}^{t} \lambda(\tau)\exp(x'(t)\beta)d\tau\right\}$$

The above assumes that $x(t)$ is constant for $t \leq u < t+1$, i.e. the changes in the time-varying variables occur at integer points. Therefore, the discrete time hazard could be written as

$$= 1 - \exp[-\exp\{x'(\beta) + \delta(t)\}] \text{ where } \delta(t) = \ln\left\{\int_{t-1}^{t} \lambda(\tau)d\tau\right\}$$

The model has an extreme value form for the failure probability in discrete time with an unrestricted baseline hazard (Narendranathan and Stewart 1993a, 1993b).

As explained earlier, elections can only occur in the election year. To account for the different circumstances in these years we assume that these point probabilities take the same extreme value form as before but with different coefficients. Hence, the probability of failure in an election year is parameterized as

$$q_{e,i}(t|x(t)) = Prob(failing\ in\ election\ \ year|survival\ up\ to\ election\ \ year, x(t))$$

$$= 1 - \exp[-\exp\{x'(t)\alpha + \delta(t)\}]$$

where $\delta(t)$ is defined as above and $x'(t)$ consists of the same control variable as explained before and α is the vector of unknown coefficient.

Let T_i be the time in years a leader i stays in office. The likelihood contribution for leader i in non-election years is then given by

$$L_i = q_{ne,i}(T_i)\Pi_{t=1}^{T_i}\{1 - q_{ne,i}(t-1)\} \qquad (2)$$

and the likelihood contribution by leader i in election years is then given by

[12] The subscript ne stands for non-election years and e for election years.

$$L_i = q_{e,i}(T_i)\Pi_{t=1}^{T_i}\{1-q_{e,i}(t-1)\} \tag{3}$$

The first term on the right hand side of equations (2) and (3) is the probability of leaving office at time T and the second term represents the probability of staying in office up to time T. Equations (2) and (3) allows us to estimate separate hazards for election and non-election years.

The above model could be illustrated in a binary response model framework. In the case of non-election years (q_{ne}) the binary dependent variable is equal to 1 in the year the leader leaves office and equal to 0 in the remaining years. In the case of election years (q_e) the model uses only the subsample of leaders who proceed to an election year. Here the binary dependent variable in an election year is equal to 1 if the leader leaves office and 0 if the leader proceeds to the next year. The 0 code here signifies election wins and not failures due to any other reason.

One advantage of the binary variable framework is that the extreme value assumption could be relaxed and coefficients could be estimated in a logit model (Arulampalam and Smith, 2004). The conditional probabilities $q_{ne,i}$ and $q_{e,i}$ could then be specified as

$$q_{ne,i}(t) = \frac{\exp\{x'(\beta)+\delta(t)\}}{1+\exp\{x'(\beta)+\delta(t)\}}$$

and

$$q_{e,i}(t) = \frac{\exp\{x'\alpha+\delta(t)\}}{1+\exp\{x'\alpha+\delta(t)\}}$$

This could be used in equations (2) and (3) to estimate the hazard for election and non-election years.

Competing risk model

The above model only considered a single risk of leaving office, but it could be expanded to a competing risk model. This is what we illustrate next which is a value addition to the existing literature.[13]

Consider K different reasons for a leader to leave office. In our case, the identified reasons to leave office are elections, term limits, resignation, military coup and other irregular reasons. Each k relates to a j th $(j = 1, 2, 3, ..., J)$ cause-specific hazard $h_{ji}(.)$ for leader i. Then the likelihood contribution of leader i with an observed duration T_i and failure type k is given by

$$L_i = q_{k,i}(T_i)\Pi_{t=1}^{T_i}[\Pi_{j=1}^{J}\{1 - q_{k,i}(t-1)\}]$$

Similar to the single risk model the sample could be separated into election years $q_{e,k,i}$ and non-election years $q_{ne,k,i}$. The assumption of independence across different risk types allows us to estimate the above likelihood function in a logit model by choosing one risk type which becomes 1 in a particular year when the event occurs while setting all other risk types equal to 0 and repeating this exercise for each risk type (Jenkins 2005).

3 Evidence

3.1 How Random is Resource Discovery?

Our identification strategy relies on the exogeneity of giant and supergiant resource discoveries. Therefore, it is important to establish how random these discoveries are. In table 2 we test to what extent giant oil discoveries this year are predicted by socio, political and economic factors of the previous year after controlling for country and year fixed effects. We do not find any evidence that pre-existing conditions affect giant oil discoveries. In table 3 we repeat the same exercise for giant mineral discoveries and find similar results. The only

[13] See Jenkins (2005) for a survey of competing risk models.

exception is the statistical significance of population which we include as a control in all models.

3.2 Single Risk Models

In table 4 we start by estimating the effect of a giant resource discovery on the hazard rate of a national leader while controlling for institutions, population, leader's entry age, first leader after independence and past resource discoveries. We use a simple single risk model without interactions. The coefficient estimates here could be interpreted as follows. A positive coefficient implies an increase in the hazard rate and hence a leader is more likely to leave office earlier. Alternatively, a negative coefficient implies a leader is likely to stay longer in office. The magnitude of the coefficient is expressed by the hazard ratio $HR = \exp(\beta)$ and $HR - 1$ represents the percentage change in the hazard rate (Jenkins, 2005).

In column 1, we use the full sample treating election and non-election years equally. We do not find any effect of giant oil discovery however giant mineral discovery appears to be risk reducing. A coefficient estimate of -0.33 translates into exp (-0.33) = 0.72 indicating a (1-0.72)×100 = 28 percent decline in hazard or risk. In columns 2 and 3 we distinguish between non-election years and election years respectively. We find that mineral discovery is risk reducing in non-election years while does nothing to help or hinder the chances of an incumbent in elections.[14] Oil discoveries does not seem to matter for the incumbent in both election and non-election years.

The political economy literature finds that the economic and political consequences of natural resources are often conditional on the quality of institutions. Therefore, in table 5 we further examine the effect of giant resource discovery on political survival in a non-election year conditional on the quality of political institutions. Column 1 is identical to column 2 of table 2. In column 2 we interact the oil and mineral discovery variables with the *x-polity*

[14] This is contrary to Andersen and Aslaksen's (2013) finding that mineral rent increases risk.

index which measures the overall level of democracy. Oil discovery appears to be risk reducing for leaders in countries with an average *x-polity* score under 9.9. Note that the average *x-polity* score in Qatar and Saudi Arabia is 2, in Romania it is 7, and in Norway it is 13. Our estimates predict that the probability of leaving office for a complete autocratic leader (*x-polity*=1) is reduced by 5.7 percent, while the same for a moderately autocratic leader with *x-polity* score 7 is 3.3 percent. Columns 4 and 6 reports interaction effects with executive constraints (*xconst*) and recruitment competition (*xrcomp*) which are measures of constraints on the chief executive and competitiveness in executive recruitment respectively. Similar to the *x-polity* result in column 2, we find oil discovery to be risk reducing for the incumbent in non-election years in states with weak *xconst* and *xrcomp*. Figure 6 plots the average marginal effects of oil discovery. We do not find any effect of *mineral discovery* once interacted with institutions.

Next we ask the question whether the risk reducing effects are motivated by income or income expectations. To ascertain we need to observe how long it takes a resource discovery to have an impact on risk. If the effect is instantaneous then it is most likely to be driven by expectations. Anything to the contrary would point towards actual income to be the driving force. Table 6 finds risk reduction takes effect 5-8 years after a mineral discovery. It typically takes 5-8 years post discovery to construct a mine and perhaps the incumbent reaps benefit during the construction phase from the new employment and infrastructure. However, this appears to be short-lived as it disappears over the 9-16 year period. The risk reducing effect returns again 16 years after discovery when the incumbent starts enjoying rent from the extracted deposits.

Table 7 focuses on oil. Since oil is risk reducing only in countries with weak political institutions, we restrict our sample here to *x-polity<8*, *xconst<4*, and *xrcomp<3*. We find that the risk reducing effect of oil appears 11-20 years after a giant or supergiant discovery.

Unlike minerals the effects here is much delayed and appears only after a deposit is fully developed. Perhaps this is indicative that oil rig development is highly capital intensive and therefore creates very little employment during the construction phase. Once the deposit is fully developed 11-20 years after discovery, the incumbent mainly benefits from rent.[15]

So far we have used giant and supergiant resource discoveries as exogenous news shocks to identify the effect of resources on leaders' tenure. Next we use an even cleaner identification strategy using first discovery in resource poor countries in 1950. Leaders in countries with a history of resource discoveries could expect giant discoveries in the future. In contrast, the first giant discovery in a resource poor country in 1950 is unexpected and likely to be exogenous. We follow Smith (2015) in defining a resource poor country and table 8 presents a list.[16] Table 9 reports the effects of first discovery shocks on tenure in a non-election year in a resource poor country and the results are similar to table 5. This however is a much smaller sample compared to the sample with all giant and supergiant discoveries. The average marginal effects plot are not reported here but are included in the long appendix.

Next in table 10 we turn our attention to a single risk model in an election year. Columns 1 and 3 include the resource discovery variables and institutions without the interaction terms and columns 2 and 4 interacts *oil* and *mineral discoveries* with *x-polity* and *xconst*. Executive recruitment competition (*xrcomp*) is omitted here because it is endogenous in an election year. Countries with elections systematically score higher *xrcomp* than countries without elections. We find that *mineral discovery* and its interaction with institutions does not seem to have any effect on tenure in an election year. *Oil discovery* appears to be risk reducing for a leader in an election year in a country with less legislative

[15] This is consistent with the findings of Andersen and Aslaksen (2013) and Bueno de Mesquita and Smith (2010) who use oil rent as their explanatory variable.

[16] Smith (2015) defines a country as resource poor if her annual oil and gas production per capita in 1950 was less than one oil barrel energy equivalent. He converts natural gas production to its oil barrel equivalent in terms of energy generation using the conversion rate of 0.00586152 oil barrels per terajoule. Countries that produced more than one barrel per capita at the start of the period, or already had significant mineral wealth are dropped from his sample as unsuitable comparison countries.

control on the executive. In particular, the average marginal effect plot in figure 7 reveals that *oil discovery* reduces the risk of leaving office by 9.6 - 10.7 percent for a leader with *xconst* score of less than 4. For example, Mexico and Mozambique has average *xconst* score of 4 while Myanmar has 2.

The results are similar if we use the cleaner identification strategy of first discovery. These results are reported in the long appendix table A1.

3.3 Competing Risk Models

The single risk models discussed above show that resource discoveries influence the overall risk of a leader leaving office in non-election years. The effect is somewhat muted during election years. Using competing risk models we investigate to what extent the effect of discoveries differ by risk types. In particular, we focus on the risk of resignations, military coups, and others[17] in non-election years and the risk of losing elections in election years. Furthermore, we also treat term limit years separately for leaders with term limit. Note that these results are entirely new.

Table 11 shows the impact of resource discoveries and institutions on the probability of resignation in a non-election year. Resignation here is defined as a leader leaving office in a regulated manner, but does not participate in an election. The reasons for resignation could be numerous ranging from satisfactory agenda fulfilment to being pushed out by her political party or cronies. Oil discovery appears to be resignation risk reducing for leaders in countries with weak institutions. In particular, oil discovery reduces the risk of resignation by 2.3-3.1 percent for leaders with *x-Polity* score between 1 and 8 and by 2.8 - 3.5 percent with *xconst* score between 1 and 4. Leaders in countries without any institutionalised regulation on executive selection (*xrcomp*=1) face a 4 percent reduced risk of resignation following a giant

[17] The category others is an aggregated residual of leaders leaving office because of: domestic protest, domestic rebels, other government actors, foreign force and assassination by unsupported individuals.

oil discovery. Mineral discovery is resignation risk reducing by approximately 38 percent in a non-election year independent of the institutional quality.

Table 12 examines the effect of discoveries on military coups in non-election years. Note that these are successful military coups that lead to leader changes. In addition to the military grabbing power, these transitions also include struggle within the military whereby a current leader of a military regime is replaced by another member of the military junta by irregular means (a coup within a coup). We find mineral discovery has no role in military coups. In contrast, oil discoveries significantly reduce military coup risk especially in countries with weak political institutions. The risk is reduced by 1.3-5.5 percent for leaders in countries with *x-polity* score lower than 7. This is perhaps indicative of the link between oil and authoritarianism.

We also estimate the model with the 'others' (domestic protest, domestic rebels, other government actors, foreign force and assassination by unsupported individuals.) risk category during non-election years and find no effect of resource discovery. These results are not reported here.

Next we turn to competing risks in election years. In an election year the risk of losing election dwarfs any other threats. There are only 8 resignations, 7 military coups and 3 leaders leaving for other reasons compared to 255 lost elections in election years. The small sample size of resignations, military coups and other reasons is insufficient for the estimation of separate models. Therefore, we focus only on the risk of election loss in an election year in table 13. Unsurprisingly, strong political institutions and checks and balances increase the risk of election loss for an incumbent but we do not find any effect of resource discovery with or without interactions.

3.4 Term Limits

So far we did not include term limit years in our analysis. This implies that in the non-election year specifications we include all the non-term limit years of leaders in countries with term limit but exclude the term limit years. This is because term limits represent a special case which requires exclusive treatment. This is what we intend to do next in table 14 by estimating a single risk model for leaders with term limit in term limit years.

Figure 8 presents a breakdown on leaders with term limits. From the 369 leaders with term limits only 196 reach their term limit year, 173 leave office before their term limit year, and 44 leaders stay longer than their term limit. Table 14 shows that resource discovery does not seem to have any significant impact on the tenure of leaders with term limits in term limit years in a single risk model. Nonetheless, these results should be interpreted with caution as we have a sample size of 206 observations.

4 Robustness

We perform a battery of robustness tests of the empirical relationship between resource discovery and leaders tenure. They deal with nuanced issues relating to exploration effort, term limits, leaders who do not face elections, pre-election years, assassinated leaders, and resource dependence. These results are reported in the long appendix to save space. Following is a discussion of these results.

Exploration effort could be the main driver of discoveries. Therefore a potent question is to what extent leaders' time in office influence exploration effort thereby influencing the likelihood of giant and supergiant discoveries? To take account of this issue we use data from Cotet and Tsui (2013) on the number of *Wildcat*s drilled in a country in a year. *Wildcat*s are explorative boreholes drilled with the expectation of finding oil and therefore is a good proxy for exploration effort. Cotet and Tsui (2013) provide *Wildcat* data for 57 countries for the period 1946 to 2003. This reduces the sample by about 60 percent. We re-estimate the baseline results with the observations for which *Wildcat* data is available and find little difference from original results in a single risk model. Therefore, our results are robust to the inclusion of exploration effort. Table A2 in long appendix reports these results.

Our non-election year specifications include all the non-term limit years of leaders in countries with term limits along with non-election years of leaders without term limits. This could be a challenge if leaders with term limits systematically behave differently from leaders without term limits in non-election years. We therefore test the robustness of our results by dropping leaders with term limits from the non-election year sample and our result survives. Table A3 in long appendix reports these results.

We estimate the probability of leaving office separately for election and non-election years but we do not distinguish between leaders who do or do not face elections. For example, a monarch who do not face the risk of an election could behave differently in a non-election year from a leader who do. Therefore, we drop leaders who do not face elections from the non-election year sample and re-estimate the single risk models. The results are robust. Table A4 in long appendix reports these results. Note that we do not run interaction with *xrcomp* here as the exclusion of non-election leaders from the sample creates endogeneity issues.

Non-election years especially the year before election could have a disproportionate impact on the outcome variable in election years. For example, a leader could use certain policies in the year before election to influence election outcome. We test the potential of such spillovers in a single risk model for election years using one year lagged covariates and the results are robust. Table A5 in long appendix reports these results.

Recall that leaders leaving office due to death by assassination is not right censored in our sample as we treat these assassinations to be politically motivated. Next we test the robustness of our results by right censoring the 8 assassinations that we have in the sample. The results are robust and table A6 in long appendix reports it. The assassinated leaders are:

Palme of Sweden, Verwoerd of South Africa, Rabin of Israel, Faisal of Saudi Arabia, Bandarcenaike S.W.R.D. of Sri Lanka, Kennedy of USA, Castillo Armas of Guatemala and Remon Cantero of Panama.

Our analysis includes countries which are resource dependent and therefore we could be picking up the effect of resource dependence rather than resource discovery. To check indeed we are picking up the effect of resource discovery, we follow Smith (2015) and use his sample of resource poor countries in 1950. Under this approach we are solely picking up the effect of resource discoveries[18] in resource poor countries thereby ruling out the confounding influence of 'resource dependence'. The results are robust with the additional feature of interaction between *mineral discovery* and institutions now statistically significant. Long appendix table A7 lists the countries fitting Smith's definition of resource poor countries. Tables A8 and A9 reports results of single risk models in non-election and election years respectively.

5 Conclusions

A large literature focuses on how leaders could impact on the economic and institutional performance of a country. However, surprisingly little is known about the link between natural resources and the political fortunes of a national leader. We take a fresh look here using a new dataset of giant oil and mineral discoveries. We combine this with a large dataset of 1255 leaders in 158 countries over the period 1950 to 2010 and empirically explore how leaders are affected by giant resource discoveries. We innovate by using both 'single risk' and 'multiple risk' discrete time proportional hazard models. We find that mineral discovery reduces risk for the incumbent in a 'single risk model' especially in a non-election year. In contrast oil discoveries reduce risk disproportionately more for the incumbent in countries with weak political institutions.

[18] Note that these are all giant and supergiant discoveries in resource poor countries and not just first discoveries as in table 9.

The effects appear to be induced by actual income or rent rather than income expectations. We track the evolution of risk for the incumbent after a discovery news shock and find that risk reduces significantly during the construction and extraction stages of a mine. The construction stage brings employment and new infrastructure and therefore is beneficial for the incumbent. In contrast, oil discovery reduces risk almost a decade after a giant discovery when the deposit is likely to be fully operational. Therefore, oil rent appears to be a powerful political tool for the incumbent in oil countries with weak political institutions.

We also observe that in a 'multiple risk model' oil discovery significantly reduces the risk of losing office via military coup while resource (oil and minerals) discovery in general reduces the risk of resignation. Resource discovery does not seem to have any impact on the risk of election loss and on leaders with term limits.

Theory suggests several mechanisms through which natural resources influence the incumbents' time in office. Such mechanisms include taxation, group formation, patronage, power struggle, armed conflict, and civil war. A logical extension of this study would be to test these mechanisms which we leave for the future.

Appendices

A1. List of Countries in the Sample of Table 4 Column 1:

Albania, Algeria, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Belarus, Belgium, Benin, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Central African Republic, Chad, Chile, China, Colombia, Congo Dem. Rep., Congo Rep., Costa Rica, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Finland, France, Gabon, Gambia, Georgia, Ghana, Greece, Guatemala, Guinea, Guinea Bissau, Haiti, Honduras, Hungary, India, Indonesia, Iran, Iraq, Ireland, Israel, Italy, Ivory Coast, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Korea South, Kuwait, Kyrgyz Republic, Laos, Latvia, Lebanon, Lesotho, Liberia, Lithuania, Luxembourg, Macedonia, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Rwanda, Saudi Arabia, Senegal, Sierra Leone, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sudan, Swaziland, Sweden, Syria, Taiwan, Tajikistan, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, United Arab Emirates, United Kingdom, USA, Uganda, Ukraine, Uruguay, Uzbekistan, Venezuela, Vietnam, Yugoslavia, Zambia, Zimbabwe.

A 2: Countries and number of giant oil discoveries

Russia (139), Iran (64), Saudi Arabia (55), China (36), USA (33), Australia (32), Brazil (32), Iraq (28), Nigeria (27), Norway (27), Libya (26), United Kingdom (22), Canada (20), Indonesia (16), Egypt (14), Mexico (14), Kuwait (13), Venezuela (13), Angola (11), Malaysia (8), Colombia (7), United Arab Emirates (7), India (5), Myanmar (5), Oman (5), Pakistan (5), Algeria (4), Argentina (4), Bolivia (4), Congo Rep (4), Kazakhstan (4), Thailand (4), Netherlands (3), Peru (3), Tunisia (3), Turkmenistan (3), Vietnam (3), Yemen (3), Azerbaijan (2), Ecuador (2), France (2), Ghana (2), Italy (2), Mozambique (2), Qatar (2), Sudan (2) Trinindad and Tobago (2), Afghanistan (1), Bangladesh (1), Denmark (1), Ethiopia (1), Gabon (1), Germany (1), Hungary (1), Israel (1), Ivory Coast (1), Morocco (1), New Zealand (1), Philippines (1), Romania (1), Sierra Leone (1), Spain (1), Syria (1)

A 3: Countries and number of giant mineral discoveries

Australia (48), Canada (46), USA (43), Chile (37), Russia (37), South Africa (33), Brazil (18), Peru (18), China (16), Indonesia (14), Argentina (11), Philippines (10), Mexico (9), Colombia (7), Tanzania (7), Turkey (6), Congo Dem Rep (5), Finland (5), Ghana (5), Greece (5), Ecuador (4), Mongolia (4), Botswana (3), Guatemala (3), Iran (3), Mali (3), Panama (3), Poland (3), Romania (3), Venezuela (3), Burkina Faso (2), Congo Rep (2), Guinea (2), Iraq (2), Ivory Coast (2), Madagascar (2), Mauritania (2), Mozambique (2), Niger (2), Saudi Arabia (2), Afghanistan (1), Angola (1), Bolivia (1), Bulgaria (1), Burundi (1), Cameroon (1), Egypt(1), Hungary (1), India (1), Japan (1), Myanmar (1), Namibia (1), New Zealand (1), Norway (1), Pakistan (1), Portugal (1), Sierra Leone (1), Sudan (1), Sweden (1), Zambia (1), Zimbabwe (1)

A4. Data Appendix:

List of variable used in Tables 2 and 3, for others see section 2:

(log of) GDP p.c., the natural logarithm of real GDP at constant national prices, obtained from national accounts data for each country divided by population (Source: Penn World Table),
economic growth, the yearly percentage change of GDP p.c. (Source: Penn World Table),
Trade (% of GDP): Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product (Source: World Development Indicators).
Wildcat**:** Number of explorative boreholes drilled in a country in a year, serves as a proxy for exploration effort (Source: Cotet and Tsui (2013))
Crude oil price**:** Real crude oil price measured in 1990 US Dollar (Source: Cotet and Tsui (2013))
Metal index**:** Price index for bauxite, copper, lead, zinc, nickel, iron ore, tin. Base year 2010. (Source: World Bank)
Precious metal index**:** Price index for gold and silver. Base year 2010 (Source: World Bank)
Land area: Measures the size of a country in square kilometres (Source: Cotet and Tsui (2013))
Human capital**:** Human capital is measured using the average years of schooling for the population aged 15 and older and the rates of return for completing different sets of years of education. (Source: Penn World Table)

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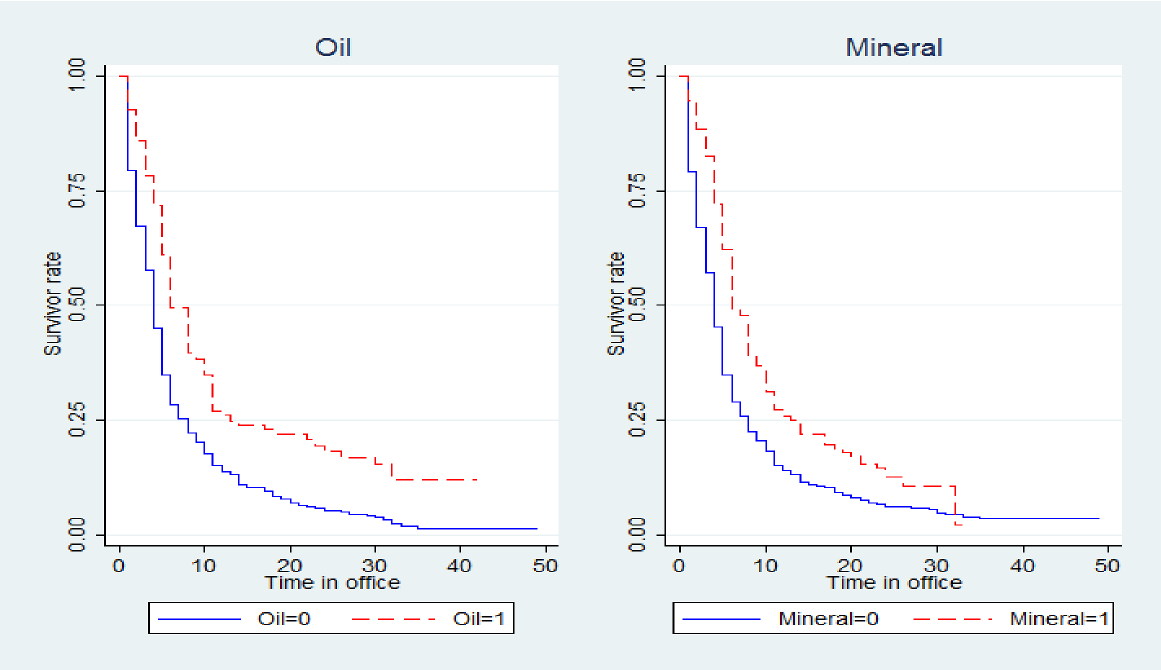
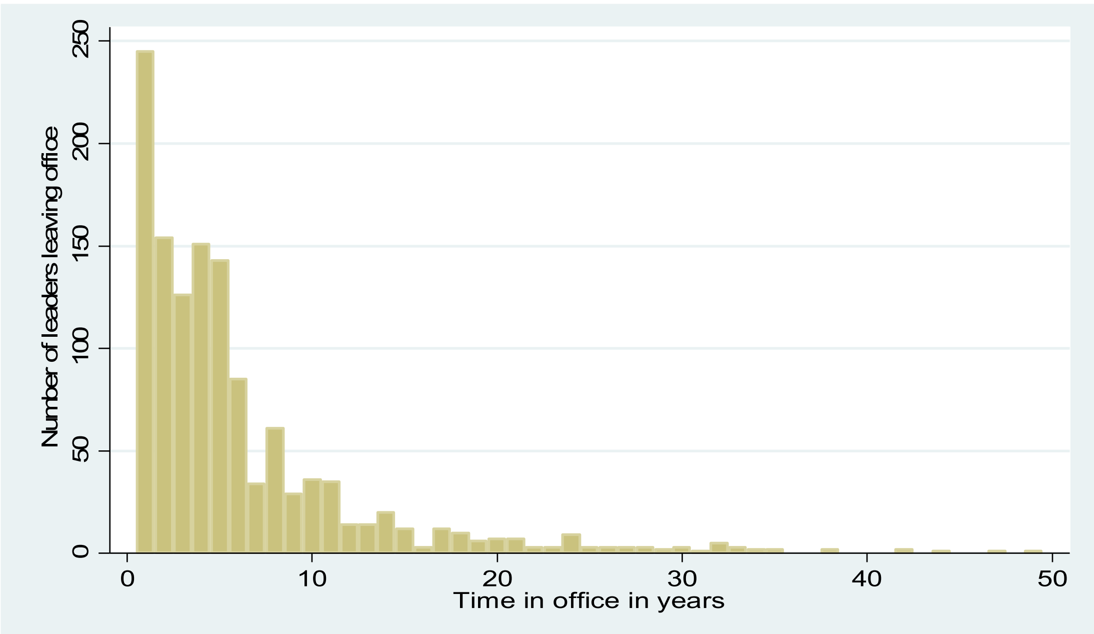
Figure 1: Kaplan-Meier survival function by resource discoveries



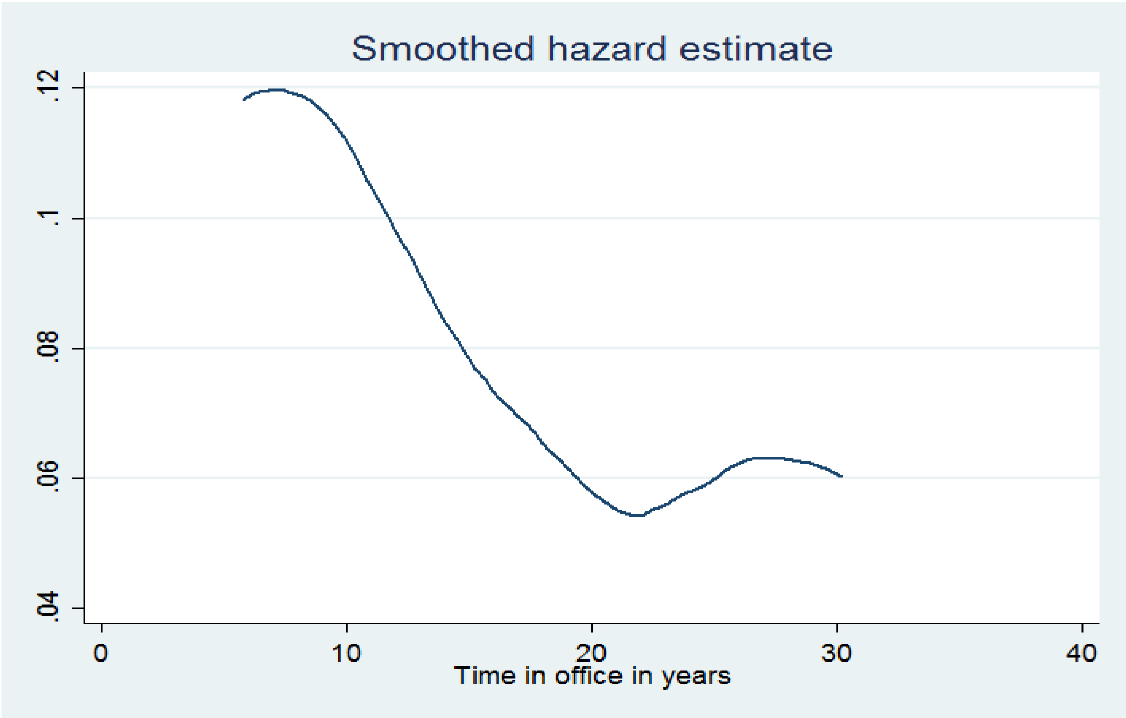
Notes: Figure 1 compares in the left graph the Kaplan-Meier survivor function for leaders with oil discoveries (dashed line) while in office with leaders without oil discoveries (solid line). The right graph compares the Kaplan-Meier survivor function for leaders with mineral discoveries (dashed line) while in office with leaders without mineral discoveries (solid line). In both graphs the average survivor rate for leaders with resource discovery is above the survivor rate for leader without discoveries at any time, i.e. leaders with resource discovery while in office seem to have a reduced probability of failure compared to leaders without resource discovery.

Figure 2: Distribution of failure time by leaders



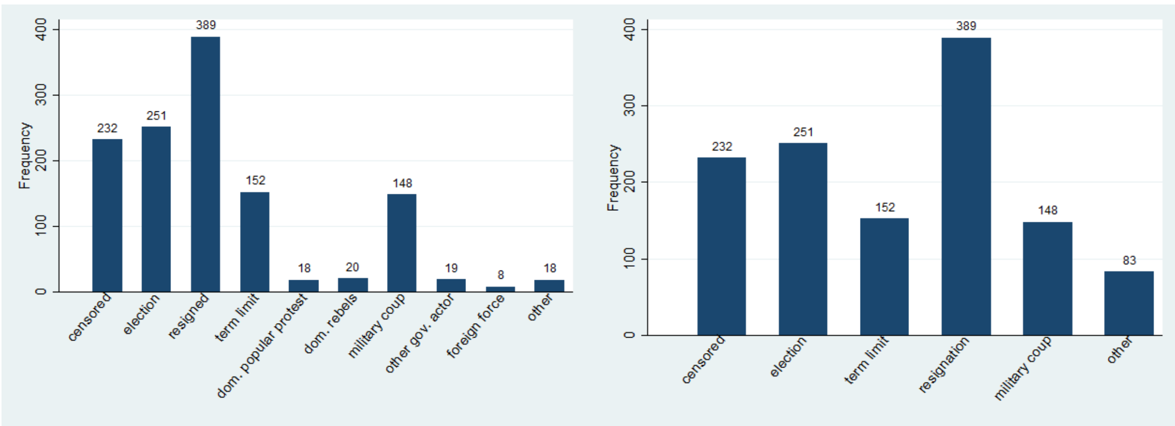
Notes: Figure 2 shows the distribution of leaders' time in office for 1255 leaders from 1950-2010.

Figure 3: Smoothed Hazard Estimate



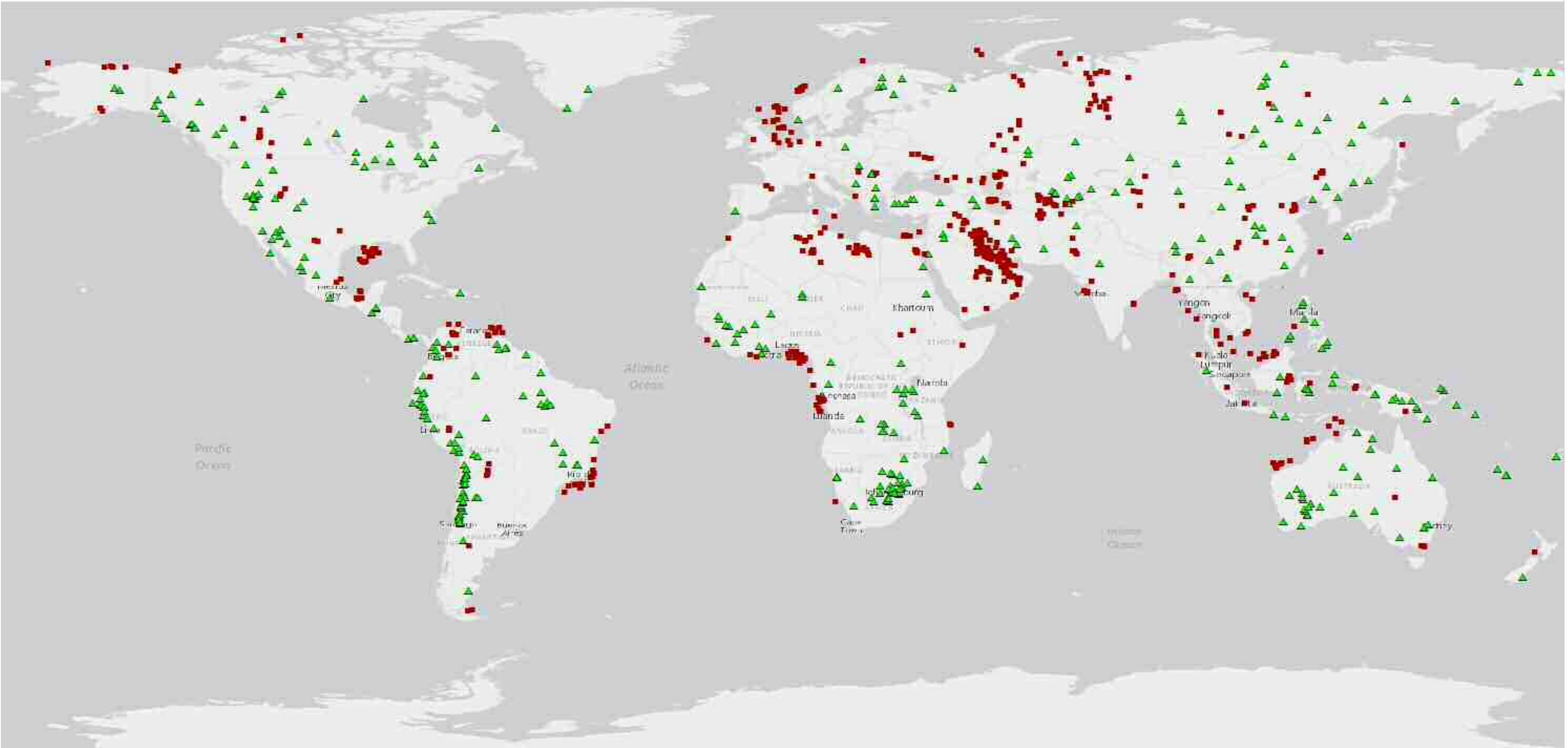
Notes: Figure shows the estimated smoothed (Nelson-Aalen) hazard function for all 1255 leaders.

Figure 4: Failure Distribution by Reason



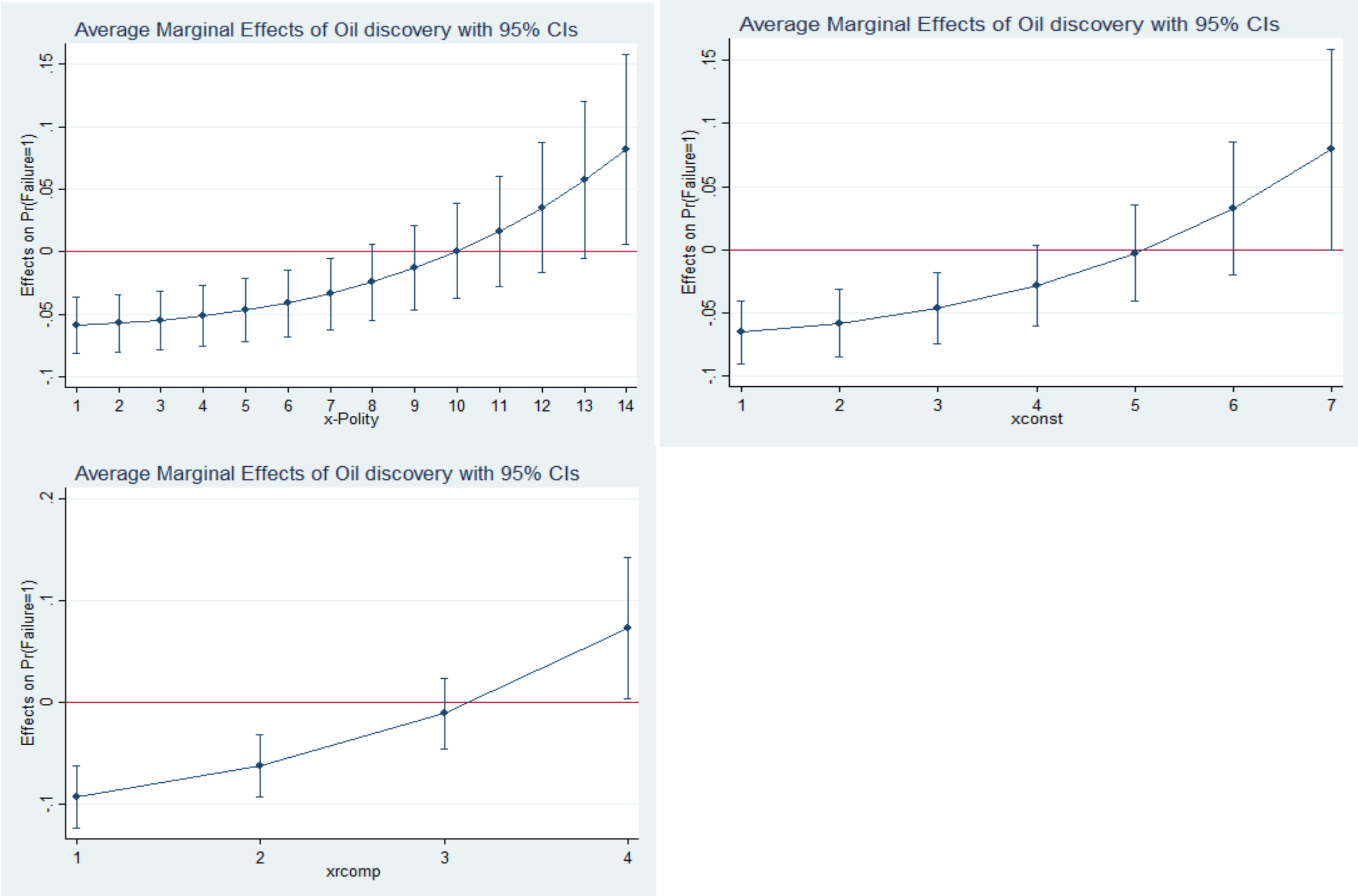
Notes: The left graph shows the number of leaders leaving office by all possible reasons. The right graph shows the number of leaders leaving office because of elections, term limits, resignation, military coup and other reasons. The category "other" is the sum of domestic popular protest, domestic rebels, other government actors, foreign force and other in the left graph.

Figure 5: Resource discoveries 1950-2010

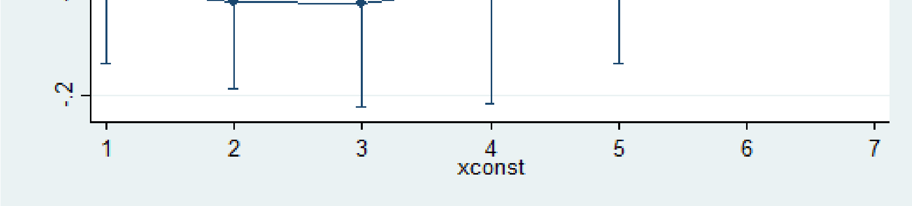


Notes: ▲= mineral discoveries; ■ = oil/gas discoveries. All discoveries represent giant and supergiant resource discoveries. Information about oil and gas are from (Horn 2004) and about minerals are from Minex Consulting.

Figure 6: Oil discoveries, political institutions and survival in non-election years: Average marginal effects

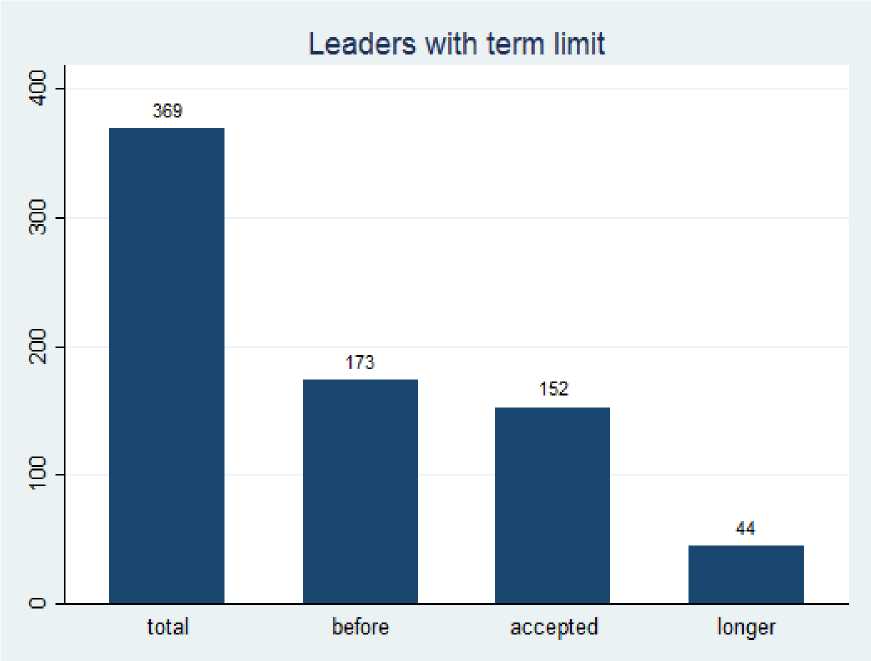


Notes: The graphs a, b, and c show the average marginal effect of oil discovery on leaders' time in office conditional on the level of democracy (*x-polity*), the competition a leader faces (*xrcomp*), and the constraints a leader faces (*xconst*). They correspond to Models 2, 3, and 4 in non-election years respectively.



Notes: The graph shows the average marginal effect of oil discovery on leaders' time in office conditional on the constraints a leader faces (*xconst*) and corresponds to Model 4 in Table6.

Figure 8: Leaders with Term Limits



Notes: The graph shows leaders who face term limits and if they left office before, on or after the maximum term.

Table 1: Time distribution of resource discoveries

Years	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2010	**Sum**
Oil	58	166	203	94	94	125	**740**
Mineral	45	77	83	70	102	76	**453**

Table 2: How random are giant and supergiant oil discoveries?

	(1) Oil discovery	(2) Oil discovery	(3) Oil discovery	(4) Oil discovery	(5) Oil discovery	(6) Oil discovery	(7) Oil discovery	(8) Oil discovery	(9) Oil discovery
(log of) GDP pc. $_{t-1}$	0.369								
	(0.319)								
Economic growth $_{t-1}$		-0.000							
		(0.008)							
x-Polity $_{t-1}$			-0.010						
			(0.039)						
Wildcat $_{t-1}$				0.056					
				(0.205)					
Int. crude oil price $_{t-1}$					0.008				
					(0.022)				
Trade (% of GDP) $_{t-1}$						-0.008			
						(0.005)			
Human capital $_{t-1}$							-0.889		
							(0.852)		
(log of) Population $_{t-1}$								-0.351	
								(0.475)	
Area (in 1000 sq. km)									0.000
									(0.000)
Observations	2,304	2,295	2,524	1,768	2,529	1,949	2,238	2,304	2,352
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Notes: The table shows a logit model with country and year fixed effects, the dependent variable is giant and supergiant oil discovery year. The independent variable is lagged by one year to see if an observable variable can predict oil discovery in the following year. Standard errors are robust and clustered at the country level; The symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table 3: How random are giant and supergiant mineral discoveries?

	(1) Mineral discovery	(2) Mineral discovery	(3) Mineral discovery	(4) Mineral discovery	(5) Mineral discovery	(6) Mineral discovery	(7) Mineral discovery	(8) Mineral discovery
(log of) GDP pc. $_{t-1}$	-0.380							
	(0.404)							
Economic growth $_{t-1}$		0.012						
		(0.021)						
x-Polity $_{t-1}$			0.015					
			(0.032)					
Metal pr. index $_{t-1}$				-0.007				
				(0.040)				
Precious metal pr. index $_{t-1}$				0.028				
				(0.024)				
Trade (% of GDP) $_{t-1}$					0.000			
					(0.007)			
Human capital $_{t-1}$						0.225		
						(0.760)		
(log of) Population $_{t-1}$							1.759**	1.417
							(0.864)	(0.882)
Area (in 1000 sq. km)								-0.000
								(0.000)
Observations	2,365	2,356	2,551	2,330	1,989	2,318	2,365	2,315
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES

Notes: The table shows logit models with country and year fixed effects, the dependent variable is giant and supergiant mineral discovery year. The independent variable is lagged by one year to see if an observable variable can predict oil discovery in the following year. Standard errors are robust and clustered at the country level. The symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table 4: Resource Discovery and Political Survival: Election vs. non-election years

	(1) all years	(2) non-election years	(3) election years
Oil discovery	-0.187	-0.281	-0.056
	(0.195)	(0.254)	(0.275)
Mineral discovery	-0.330**	-0.342**	-0.456
	(0.129)	(0.163)	(0.316)
x-Polity	0.103***	0.059***	0.176***
	(0.015)	(0.017)	(0.028)
(log of) Population	0.026	0.032	-0.005
	(0.052)	(0.067)	(0.077)
Leader entry age	-0.025***	-0.027***	-0.029***
	(0.004)	(0.005)	(0.007)
First leader after independence	-0.650***	-0.461**	-1.860***
	(0.188)	(0.209)	(0.497)
Mineral discovery $_{t-10}$	-0.216	-0.248	-0.084
	(0.183)	(0.227)	(0.329)
Oil discovery $_{t-10}$	0.099	0.119	0.005
	(0.151)	(0.189)	(0.325)
Observations	6,034	5,211	823
# of leader	1124	1053	526
# of countries	143	143	127
LL	-2172	-1598	-447

Notes: The table shows the impact of resource discoveries and institutions on the hazard of leaving office for the whole sample (Model 1), for only non-election years (Model 2) and for only election years (Model 3). The corresponding baseline hazard is semi-parametrically defined.
Standard errors are robust and clustered at the country level; the symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table 5: Resource Discovery, Political Institutions and Survival in non-election years

Institution	(1) x-Polity	(2) x-Polity	(3) xconst	(4) xconst	(5) xrcomp	(6) xrcomp
Oil discovery	-0.281	-1.584***	-0.323	-1.715***	-0.346	-2.569***
	(0.254)	(0.437)	(0.259)	(0.512)	(0.265)	(0.699)
Mineral discovery	-0.342**	-0.413	-0.326*	-0.483	-0.283	-0.915
	(0.163)	(0.468)	(0.169)	(0.474)	(0.174)	(0.608)
Institution	0.059***	0.040**	0.084**	0.048	-0.029	-0.100
	(0.017)	(0.017)	(0.036)	(0.036)	(0.070)	(0.071)
Oil # Institution		0.159***		0.337***		0.811***
		(0.039)		(0.094)		(0.211)
Mineral # Institution		0.005		0.026		0.207
		(0.045)		(0.092)		(0.194)
Observations	5,211	5,211	5,211	5,211	5,211	5,211
# of leader	1053	1053	1053	1053	1053	1053
# of countries	143	143	143	143	143	143
LL	-1598	-1584	-1605	-1591	-1611	-1593

Notes: The table shows the impact of resource discoveries, institutions and their interactions on the hazard of leaving office in non-election years. A negative coefficient means that an increase in the variable decreases the hazard and the leader stays longer in office, a positive coefficient means that an increase in the variable increases the hazard and the leader stays less time in office. Included control variable: *(log of) Population*, *leader entry age, first leader after independence*, *oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$.
Standard errors are robust and clustered at the country level; the symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table 6: The effect of mineral discovery over time

Institution	(1) x-Polity	(2) xconst	(3) xrcomp
Mineral discovery $_{1\text{-}4\ years}$	-0.285	-0.268	-0.239
	(0.184)	(0.185)	(0.180)
Mineral discovery $_{5\text{-}8\ years}$	-0.943**	-0.914**	-0.835*
	(0.448)	(0.452)	(0.459)
Mineral discovery $_{9\text{-}12\ years}$	0.692	0.727	0.792*
	(0.455)	(0.463)	(0.482)
Mineral discovery $_{13\text{-}16\ years}$	-0.916	-0.940	-0.915
	(0.656)	(0.661)	(0.666)
Mineral discovery $_{>16\ years}$	-0.971**	-0.978**	-0.934**
	(0.464)	(0.463)	(0.456)
Oil discovery	-0.277	-0.317	-0.340
	(0.255)	(0.260)	(0.266)
Institution	0.059***	0.083**	-0.027
	(0.017)	(0.036)	(0.070)
Observations	5,211	5,211	5,211
# of leader	1053	1053	1053
# of countries	143	143	143
LL	-1592	-1599	-1605

Notes: The table shows the impact of mineral discoveries over time on the hazard of leaving office for leaders in non-election years. Included control variable: *(log of) Population*, *leader entry age, first leader after independence*, *oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$.
Standard errors are robust and clustered at the country level. The symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table 7: The effect of oil discovery over time

Institution	(1) x-Polity<8	(2) xconst<4	(3) xrcomp<3
Oil discovery $_{year\ 1\text{-}5}$	-0.447	-0.306	0.144
	(0.382)	(0.374)	(0.423)
Oil discovery $_{year\ 6\text{-}10}$	-0.358	-0.299	0.158
	(0.453)	(0.458)	(0.480)
Oil discovery $_{year\ 11\text{-}15}$	-2.150**	-2.160**	-1.700
	(1.057)	(1.056)	(1.282)
Oil discovery $_{year\ 16\text{-}20}$	-1.848**	-1.770*	-0.899
	(0.940)	(0.924)	(1.040)
Oil discovery $_{year\ >20}$	-1.329	-1.059	-0.102
	(0.949)	(0.869)	(0.718)
Mineral discovery	0.195	0.169	0.081
	(0.302)	(0.276)	(0.301)
Institution	-0.187**	-0.648***	-1.912***
	(0.085)	(0.129)	(0.256)
Observations	2,550	2,691	2,543
# of leaders	353	372	348
# of countries	100	104	99
LL	-595.8	-606.9	-524.8

Notes: The table shows the impact of oil discoveries over time on the hazard of leaving office for leaders in non-election years. Included control variable: *(log of) Population*, *leader entry age, first leader after independence*, *oil discovery* $_{t\text{-}10}$ and *mineral discovery*$_{t\text{-}10}$.
Standard errors are robust and clustered at the country level. The symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table 8: Resource poor countries in 1950

Albania	Ireland	**Philippines (m)**
Algeria (o)	Israel	**Poland (m)**
Bangladesh (o)	**Italy (o)**	**Portugal (m)**
Belgium	**Ivory Coast (o/m)**	Rwanda
Benin	Jamaica	Senegal
Botswana (m)	**Japan (m)**	Singapore
Bulgaria	Jordan	**Spain (o)**
Burkina Faso (m)	Kenya	Sri Lanka
Burundi (m)	Korea South	**Sudan (o/m)**
Cambodia	Laos	Swaziland
Cameroon (m)	Lebanon	**Sweden (m)**
Central African Republic	Lesotho	**Syria (o)**
Chad	Liberia	Taiwan
China (o/m)	**Madagascar (m)**	**Tanzania (m)**
Congo Rep (o/m)	Malawi	Thailand
Costa Rica	**Malaysia (o)**	Togo
Czech Republic	**Mali (m)**	**Tunisia (o)**
Denmark (o)	**Mauritania (m)**	**Turkey (m)**
Dominican Republic	Mauritius	**UK (o)**
Ecuador (o/m)	**Mongolia (m)**	Uganda
Egypt (o/m)	**Morocco (o)**	Uruguay
El Salvador	**Mozambique (o/m)**	**Vietnam (o)**
Finland (m)	**Namibia (m)**	**Zambia (m)**
France (o)	Nepal	**Zimbabwe (m)**
Gabon (o)	**Netherlands (o)**	
Gambia	**New Zealand (o/m)**	
Ghana (o/m)	Nicaragua	
Greece (m)	**Niger (m)**	
Guatemala (m)	**Nigeria (o)**	
Guinea (m)	**Norway (o/m)**	
Honduras	**Oman (o)**	
Hungary (o/m)	**Pakistan (o/m)**	
India (o/m)	Panama	
Indonesia (o/m)	Paraguay	

Notes: Bold countries are treatment countries which had their first resource discovery between 1950 and 2010; (o), (m) and (o/m) indicate an oil, mineral or both sort of discovery between 1950 and 2010, respectively.

Table 9: First Resource Discovery, Political Institutions and Survival in non-election years

Institution	(1) x-Polity	(2) x-Polity	(3) xconst	(4) xconst	(5) xrcomp	(6) xrcomp
F. oil discovery	-0.872*	-2.546***	-0.921*	-2.944***	-0.927*	-3.916***
	(0.477)	(0.708)	(0.478)	(0.869)	(0.474)	(1.228)
F. mineral disc.	-0.677**	-0.715	-0.671**	-0.645	-0.640**	-1.049
	(0.325)	(0.684)	(0.326)	(0.780)	(0.326)	(0.960)
Institution	0.050***	0.041**	0.069*	0.055	-0.060	-0.079
	(0.018)	(0.018)	(0.038)	(0.038)	(0.082)	(0.082)
F. oil # Institution		0.272***		0.601***		1.262***
		(0.067)		(0.172)		(0.393)
F. mineral # Inst.		0.009		-0.001		0.176
		(0.080)		(0.188)		(0.355)
Observations	3,670	3,670	3,670	3,670	3,670	3,670
# of leader	745	745	745	745	745	745
# of countries	92	92	92	92	92	92
LL	-1187	-1176	-1191	-1181	-1193	-1184

Notes: The table shows the impact of first (F.) resource discoveries in initially resource poor countries on the hazard of leaving office for leaders in non-election years. Included control variable: *(log of) Population*, *leader entry age, first leader after independence*, *oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$.
Standard errors are robust and clustered at the country level. The symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table 10: Resource Discovery, Political Institutions and Survival in election years

	Election years			
Institution	(1) x-Polity	(2) x-Polity	(3) xconst	(4) xconst
Oil discovery	-0.056	-1.958	-0.091	-2.085*
	(0.275)	(1.374)	(0.273)	(1.086)
Mineral discovery	-0.456	-1.520	-0.481	-1.083
	(0.316)	(0.962)	(0.322)	(0.885)
Institution	0.176***	0.156***	0.314***	0.278***
	(0.028)	(0.028)	(0.056)	(0.057)
Oil # Institution		0.163		0.354**
		(0.106)		(0.172)
Mineral # Institution		0.094		0.110
		(0.080)		(0.150)
Observations	823	823	823	823
# of leader	526	526	526	526
# of countries	127	127	127	127
LL	-447	-443.1	-451.5	-447.7

Notes: The table shows the impact of resource discoveries, institutions and their interactions on the hazard of leaving office for leaders in election years. Included control variable: *(log of) Population*, *leader entry age, first leader after independence*, *oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$.
Standard errors are robust and clustered at the country level; the symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table 11: Resource Discovery and the Risk of Resignation in non-election years: Competing Risk Model

	Risk of resignation in non-election years					
	(1)	(2)	(3)	(4)	(5)	(6)
Institution	x-Polity	x-Polity	xconst	xconst	xrcomp	xrcomp
Oil discovery	-0.260	-2.292***	-0.342	-2.564***	-0.396	-4.030***
	(0.316)	(0.642)	(0.328)	(0.728)	(0.345)	(0.954)
Mineral discovery	-0.482**	-1.492**	-0.483**	-1.589**	-0.368	-2.380***
	(0.208)	(0.689)	(0.219)	(0.733)	(0.229)	(0.889)
Institution	0.162***	0.134***	0.298***	0.246***	0.328***	0.229**
	(0.026)	(0.026)	(0.051)	(0.053)	(0.104)	(0.106)
Oil # Institution		0.211***		0.463***		1.203***
		(0.054)		(0.122)		(0.264)
Mineral # Institution		0.093		0.203		0.616**
		(0.058)		(0.125)		(0.251)
Observations	5,211	5,211	5,211	5,211	5,211	5,211
# of leader	1053	1053	1053	1053	1053	1053
# of countries	143	143	143	143	143	143
LL	-1957	-1936	-1947	-1926	-1940	-1906

Notes: The table shows the impact of resource discoveries and institutions on the hazards of leaving office because of resignation in non-election years. Included control variable: *(log of) Population*, *leader entry age, first leader after independence*, *oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$.
Standard errors are robust and clustered at the country level; the symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table 12: Competing risk model: Risk of military coups in non-election years

	Risk of military coups in non-election years					
	(1)	(2)	(3)	(4)	(5)	(6)
Institution	x-Polity	x-Polity	xconst	xconst	xrcomp	xrcomp
Oil discovery	-1.097**	-1.794***	-0.949**	-1.463**	-0.590	-0.145
	(0.426)	(0.548)	(0.422)	(0.737)	(0.391)	(1.279)
Mineral discovery	-0.120	0.177	-0.112	-0.020	-0.191	-1.085
	(0.320)	(0.618)	(0.314)	(0.608)	(0.317)	(0.823)
Institution	-0.198***	-0.206***	-0.552***	-0.564***	-1.464***	-1.522***
	(0.031)	(0.031)	(0.078)	(0.083)	(0.210)	(0.243)
Oil # Institution		0.172***		0.245		-0.306
		(0.062)		(0.264)		(0.707)
Mineral # Institution		-0.062		-0.051		0.529
		(0.099)		(0.230)		(0.434)
Observations	5,211	5,211	5,211	5,211	5,211	5,211
# of leader	1053	1053	1053	1053	1053	1053
# of countries	143	143	143	143	143	143
LL	-1957	-1936	-1947	-1926	-1940	-1906

Notes: The table shows the impact of resource discoveries and institutions on the hazards of leaving office because of military coups in non-election years. Included control variable: *(log of) Population*, *leader entry age, first leader after independence*, *oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$.
Standard errors are robust and clustered at the country level; the symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table 13: Competing risk model: Risk of losing elections in election years

	Risk of losing election			
	(1)	(2)	(3)	(4)
Institution	x-Polity	x-Polity	xconst	xconst
Oil discovery	-0.024	-1.526	-0.059	-1.761
	(0.294)	(1.473)	(0.289)	(1.162)
Mineral discovery	-0.520	-1.704	-0.555	-1.040
	(0.352)	(1.064)	(0.361)	(1.024)
Institution	0.212***	0.195***	0.372***	0.343***
	(0.027)	(0.028)	(0.058)	(0.058)
Oil # Institution		0.127		0.299
		(0.113)		(0.183)
Mineral # Institution		0.101		0.086
		(0.087)		(0.169)
Observations	823	823	823	823
# of leader	526	526	526	526
# of countries	127	127	127	127
LL	-423.2	-420.6	-429	-426.6

Notes: The table shows the impact of resource discoveries and institutions on the hazards of leaving office because of elections. Included control variable: *(log of) Population*, *leader entry age, first leader after independence*, *oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$. Standard errors are robust and clustered at the country level; the symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

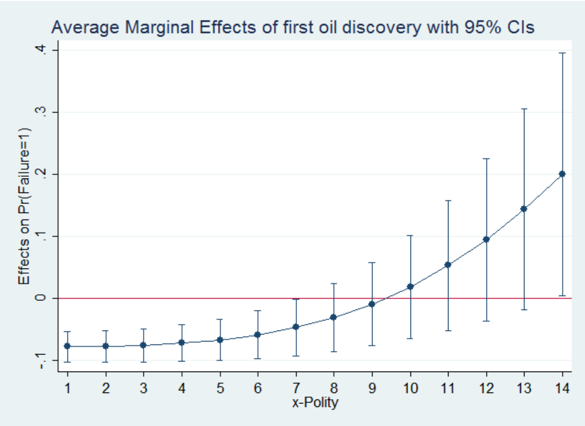
Table 14: Resource Discovery and Survival: Single risk model in term limit years

	(1)	(2)	(3)	(4)
Institution	x-Polity	x-Polity	xconst	xconst
Oil discovery	0.214	1.805	0.150	1.693
	(0.699)	(1.315)	(0.600)	(1.331)
Mineral discovery	-1.149	0.486	-1.027	1.146
	(0.716)	(1.048)	(0.761)	(1.096)
Institution	0.387***	0.529***	0.789***	1.169***
	(0.068)	(0.102)	(0.158)	(0.243)
Oil # Institution		-0.216		-0.403
		(0.143)		(0.296)
Mineral # Institution		-0.200*		-0.565**
		(0.116)		(0.245)
Observations	206	206	206	206
# of leader	196	196	196	196
# of countries	65	65	65	65
LL	-63.78	-60.98	-64.43	-61.07

Notes: The table shows the impact of resource discoveries, institutions and their interactions on the hazard of leaving office for leaders in term limit years. Included control variable: *(log of) Population*, *leader entry age, oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$.
Standard errors are robust and clustered at the country level; standard errors are robust and clustered on country level. The symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

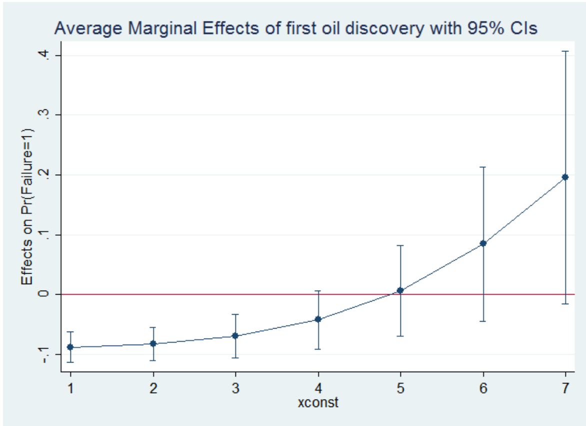
Long Appendix: Not for Publication

Figure A1: Average marginal effect of first oil discovery conditional on x-Polity



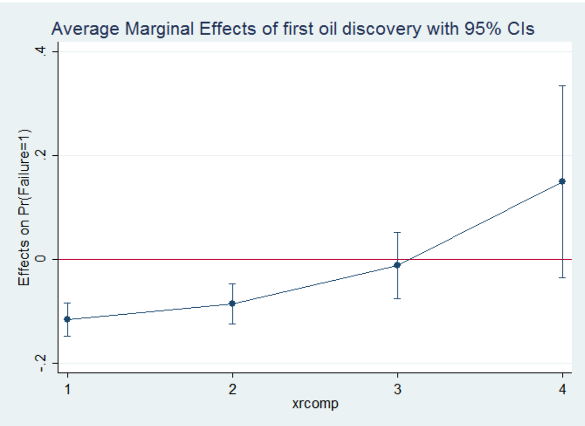
Notes: Corresponds to Model 2 in Table7

Figure A2: Average marginal effect of first oil discovery conditional on xconst



Notes: Corresponds to Model 4 in Table7

Figure A3: Average marginal effects conditional on xrcomp



Notes: Corresponds to Model 6 in Table7

Table A1: First resource discovery in resource poor countries in election years

	(1)	(2)	(3)	(4)
Institution	x-Polity	x-Polity	xconst	xconst
F. oil discovery	-0.839	-44.394***	-0.923	-35.048***
	(0.627)	(4.015)	(0.625)	(2.830)
F. mineral disc.	-1.239**	-2.093	-1.296**	-2.948
	(0.588)	(2.204)	(0.576)	(2.277)
Institution	0.205***	0.194***	0.380***	0.354***
	(0.032)	(0.033)	(0.067)	(0.068)
F. oil # Institution		3.187***		5.037***
		(0.308)		(0.426)
F. mineral # Inst.		0.091		0.340
		(0.197)		(0.402)
Observations	596	596	596	596
# of leader	371	371	371	371
# of countries	83	83	83	83
LL	-300.9	-297.5	-304	-299.9

Notes: The table shows the impact of first (F.) resource discoveries in initially resource poor countries on the hazard of leaving office for leaders in election years. Included control variable: *(log of) Population*, *leader entry age, first leader after independence*, *oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$.

Standard errors are robust and clustered at the country level. The symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table A2: Exploration effort, single risk model in non-election years

	(1) original	(2) tsui and cotet	(3) tsui and cotet	(4) original	(5) tsui and cotet	(6) tsui and cotet	(7) original	(8) tsui and cotet	(9) tsui and cotet
Institution	x-Polity	x-Polity	x-Polity	x-Polity	x-Polity	x-Polity	xconst	xconst	xconst
Oil discovery	-0.281	-0.401	-0.389	-1.584***	-1.531***	-1.554***	-0.323	-0.431	-0.422
	(0.254)	(0.274)	(0.278)	(0.437)	(0.444)	(0.442)	(0.259)	(0.278)	(0.282)
Mineral discovery	-0.342**	-0.174	-0.156	-0.413	-0.357	-0.474	-0.326*	-0.178	-0.163
	(0.163)	(0.218)	(0.221)	(0.468)	(0.643)	(0.654)	(0.169)	(0.221)	(0.223)
Wildcat			-0.061			-0.185***			-0.051
			(0.051)			(0.067)			(0.053)
Institution	0.059***	0.071**	0.071**	0.040**	0.033	0.031	0.084**	0.102*	0.104*
	(0.017)	(0.029)	(0.029)	(0.017)	(0.027)	(0.027)	(0.036)	(0.057)	(0.057)
Oil # Institution				0.159***	0.139***	0.147***			
				(0.039)	(0.043)	(0.042)			
Mineral # Institution				0.005	0.015	0.035			
				(0.045)	(0.068)	(0.069)			
Observations	5,211	1,839	1,839	5,211	1,839	1,839	5,211	1,839	1,839
# of leader	1053	396	396	1053	396	396	1053	396	396
# of countries	143	57	57	143	57	57	143	57	57
LL	-1598	-589.6	-589.4	-1584	-580.7	-579.5	-1605	-593.3	-593.2

Notes: The table shows the impact of resource discoveries, institutions and their interactions on the hazard of leaving office for the single risk model in non-election years. Model 1, 4 and 7 uses all leaders from the results section. Model 2, 5 and 8 re-estimate the regression with the data available from (Cotet and Tsui 2013) and Model 3, 6 and 9 includes Wildcat variable as measure of exploration effort. Included control variable: *(log of) Population*, *leader entry age, first leader after independence*, *oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$. Standard errors are robust and clustered at the country level. The symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table A2 (cont'd): Exploration effort, single risk model in non-election years

	(10) original	(11) tsui and cotet	(12) tsui and cotet	(13) original	(14) tsui and cotet	(15) tsui and cotet	(16) original	(17) tsui and cotet	(18) tsui and cotet
Institution	xconst	xconst	xconst	xrcomp	xrcomp	xrcomp	xrcomp	xrcomp	xrcomp
Oil discovery	-1.715***	-1.637***	-1.675***	-0.346	-0.446	-0.442	-2.569***	-2.389***	-2.469***
	(0.512)	(0.500)	(0.500)	(0.265)	(0.285)	(0.289)	(0.699)	(0.755)	(0.749)
Mineral discovery	-0.483	-0.379	-0.521	-0.283	-0.154	-0.148	-0.915	-0.996	-1.209
	(0.474)	(0.623)	(0.641)	(0.174)	(0.225)	(0.229)	(0.608)	(0.946)	(0.990)
Wildcat			-0.183***			-0.021			-0.193***
			(0.069)			(0.054)			(0.071)
Institution	0.048	0.032	0.027	-0.029	0.050	0.051	-0.100	-0.099	-0.111
	(0.036)	(0.054)	(0.054)	(0.070)	(0.109)	(0.110)	(0.071)	(0.108)	(0.107)
Oil # Institution	0.337***	0.298***	0.316***				0.811***	0.714***	0.759***
	(0.094)	(0.099)	(0.098)				(0.211)	(0.241)	(0.235)
Mineral # Institution	0.026	0.029	0.075				0.207	0.264	0.360
	(0.092)	(0.131)	(0.133)				(0.194)	(0.319)	(0.332)
Observations	5,211	1,839	1,839	5,211	1,839	1,839	5,211	1,839	1,839
# of leader	1053	396	396	1053	396	396	1053	396	396
# of countries	143	57	57	143	57	57	143	57	57
LL	-1591	-584.6	-583.5	-1611	-597	-596.9	-1593	-585.4	-584

Notes: Continuation from Table A2**.** The table shows the impact of resource discoveries, institutions and their interactions on the hazard of leaving office for the single risk model in non-election years. Model 10, 13 and 16 uses all leaders from the results section. Model 11, 14 and 17 re-estimate the regression with the data available from (Cotet and Tsui 2013) and Model 12, 15 and 18 includes Wildcat variable as measure of exploration effort. Included control variable: *(log of) Population*, *leader entry age, first leader after independence*, *oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$. Standard errors are robust and clustered at the country level. The symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

eral # Institution			0.005	0.050		
			(0.045)	(0.047)		
ervations	5,211	3,513	5,211	3,513	5,211	3,513
`leader	1053	684	1053	684	1053	684
`countries	143	124	143	124	143	124
	-1598	-1120	-1584	-1103	-1605	-1130

Table A 3 (cont'd): Single risk model excluding term limit leaders in non-election years

	(7) all leaders	(8) excluding term limit leaders	(9) all leaders	(10) excluding term limit leaders	(11) all leaders	(12) excluding t limit lead
itution	xconst	xconst	xrcomp	xrcomp	xrcomp	xrcomp
discovery	-1.715***	-1.962***	-0.346	-0.326	-2.569***	-3.368
	(0.512)	(0.560)	(0.265)	(0.302)	(0.699)	(0.856
eral discovery	-0.483	-1.047*	-0.283	-0.366*	-0.915	-1.606
	(0.474)	(0.557)	(0.174)	(0.211)	(0.608)	(0.744
itution	0.048	0.096**	-0.029	0.023	-0.100	-0.073
	(0.036)	(0.040)	(0.070)	(0.086)	(0.071)	(0.087
# Institution	0.337***	0.397***			0.811***	1.099
	(0.094)	(0.099)			(0.211)	(0.253
eral # Institution	0.026	0.132			0.207	0.430
	(0.092)	(0.100)			(0.194)	(0.219
ervations	5,211	3,513	5,211	3,513	5,211	3,513
`leader	1053	684	1053	684	1053	684
`countries	143	124	143	124	143	124
	-1591	-1113	-1611	-1145	-1593	-1119

Notes: The table shows the impact of resource discoveries, institutions and their interactions on the hazard of leaving office in non-election for the whole sample and for leaders without term limits. Included control variable: *(log of) Population*, *leader entry age, first leader after independence* and *oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$.
Standard errors are robust and clustered at the country level. The symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table A 4: Single risk model excluding non-election leaders

	(1)	(2)	(3)	(4)	(5)	(6)
	all leaders	excluding non-election leader	all leaders	excluding non-election leader	all leaders	excluding non-election leader
Institution	x-Polity	x-Polity	x-Polity	x-Polity	xconst	xconst
Oil discovery	-0.281	0.016	-1.584***	-1.075**	-0.323	0.003
	(0.254)	(0.246)	(0.437)	(0.511)	(0.259)	(0.247)
Mineral discovery	-0.342**	-0.492***	-0.413	-0.758	-0.326*	-0.497***
	(0.163)	(0.170)	(0.468)	(0.493)	(0.169)	(0.173)
Institution	0.059***	0.046***	0.040**	0.031*	0.084**	0.079**
	(0.017)	(0.018)	(0.017)	(0.018)	(0.036)	(0.037)
Oil # Institution			0.159***	0.117***		
			(0.039)	(0.044)		
Mineral # Institution			0.005	0.030		
			(0.045)	(0.046)		
Observations	5,211	4,687	5,211	4,687	5,211	4,687
# of leader	1053	1016	1053	1016	1053	1016
# of countries	143	132	143	132	143	132
LL	-1598	-1510	-1584	-1502	-1605	-1512

Notes: The table shows the impact of resource discoveries, institutions and their interactions on the hazard of leaving office in non
use all leaders, Model 2, 4, 6 and 8 exclude leaders without elections. Included control variable: *(log of) Population*, *leader entry a*
oil discovery $_{t-10}$ and *mineral discovery*$_{t-10}$.
Standard errors are robust and clustered at the country level. The symbols *, ** and *** stand for significant at the 10%, 5% and 1

Table A5: Single risk model in election year with lagged variable

	Election years			
	(1)	(2)	(3)	(4)
Institution	x-polity	x-polity	xconst	xconst
Oil discovery $_{t-1}$	-0.015	-1.723	-0.036	-2.073*
	(0.311)	(1.258)	(0.315)	(1.079)
Mineral discovery $_{t-1}$	-0.365	-1.284	-0.381	-1.246
	(0.312)	(0.915)	(0.314)	(0.946)
Institution $_{t-1}$	0.116***	0.096***	0.211***	0.170***
	(0.025)	(0.026)	(0.053)	(0.054)
Oil # Institution $_{t-1}$		0.154		0.374**
		(0.099)		(0.170)
Mineral # Institution $_{t-1}$		0.084		0.158
		(0.072)		(0.150)
Observations	785	785	785	785
# of leader	505	505	505	505
# of countries	126	126	126	126
LL	-448	-443.8	-449.8	-444.6

Notes: The table shows the impact of resource discoveries, institutions and their interactions on the hazard of leaving office for leaders in election years with lagged variable. Included control variable: *(log of) Population*, *leader entry age, first leader after independence*, *oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$.
Standard errors are robust and clustered at the country level. The symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table A 6: Single risk model in non-election years treating assassinated leader as censored

Institution	(1) x-Polity	(2) x-Polity	(3) xconst	(4) xconst	(5) xrcomp	(6) xrcomp
Oil discovery	-0.312	-1.655***	-0.354	-1.783***	-0.377	-2.624***
	(0.261)	(0.452)	(0.266)	(0.532)	(0.273)	(0.727)
Mineral discovery	-0.378**	-0.500	-0.362**	-0.560	-0.319*	-0.968
	(0.166)	(0.474)	(0.172)	(0.484)	(0.176)	(0.624)
Institution	0.059***	0.040**	0.083**	0.047	-0.031	-0.102
	(0.018)	(0.017)	(0.037)	(0.036)	(0.071)	(0.072)
Oil # Institution		0.163***		0.345***		0.820***
		(0.041)		(0.098)		(0.220)
Mineral # Institution		0.011		0.035		0.213
		(0.046)		(0.096)		(0.203)
Observations	5,211	5,211	5,211	5,211	5,211	5,211
# of leader	1053	1053	1053	1053	1053	1053
# of countries	143	143	143	143	143	143
LL	-1582	-1566	-1588	-1574	-1594	-1576

Notes: The table shows the impact of resource discoveries, institutions and their interactions on the hazard of leaving office for leaders in non-election years treating assassinated leaders as censored. Included control variable: *(log of) Population*, *leader entry age, first leader after independence*, *oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$.
Standard errors are robust and clustered at the country level. The symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table A7: Resource poor countries in 1950 according to Smith (2015)

Asia and Pacific	Latin America and the Caribbean	Middle East and North Africa	Europe	Sub-Sahara Africa	
Afghanistan	Costa Rica	Algeria	Albania	Benin	Mauritius
Bangladesh	Dominican Rep.	Egypt	Belgium	Botswana	Mozambique
Cambodia	Ecuador	Israel	Bulgaria	Burkina Faso	Namibia
China	El Salvador	Jordan	Czech Republic	Burundi	Niger
India	Guatemala	Lebanon	Denmark	Cameroon	Nigeria
Indonesia	Honduras	Libya	Finland	Central African Rep.	Rwanda
Japan	Jamaica	Morocco	France	Chad	Senegal
Laos	Nicaragua	Oman	Germany	Congo, Rep. of	Somalia
Malaysia	Panama	Syria	Greece	Ivory Coast	Sudan
Mongolia	Paraguay	Tunisia	Hungary	Gabon	Swaziland
Nepal	Uruguay	Turkey	Ireland	Gambia	Tanzania
New Zealand		Yemen	Italy	Ghana	Togo
Pakistan			Netherlands	Guinea	Uganda
Philippines			Norway	Kenya	Zambia
Korea, Rep. of			Poland	Lesotho	Zimbabwe
Singapore			Portugal	Liberia	
Sri Lanka			Spain	Madagascar	
Taiwan			Sweden	Malawi	
Thailand			UK	Mali	
Vietnam				Mauritania	

Table A8: Single risk model in non-election years for resource poor countries in 1950

Institution	(1) x-Polity	(2) x-Polity	(3) xconst	(4) xconst	(5) xrcomp	(6) xrcomp
Oil discovery	-0.281	-1.783***	-0.316	-1.877**	-0.319	-2.581***
	(0.347)	(0.607)	(0.356)	(0.729)	(0.365)	(0.914)
Mineral discovery	-0.585**	-1.239**	-0.587**	-1.543**	-0.591**	-1.975**
	(0.227)	(0.559)	(0.233)	(0.616)	(0.242)	(0.777)
Institution	0.051***	0.029	0.069*	0.028	-0.069	-0.138*
	(0.018)	(0.018)	(0.038)	(0.038)	(0.082)	(0.083)
Oil # Institution		0.192***		0.392***		0.871***
		(0.052)		(0.126)		(0.261)
Mineral # Institution		0.094*		0.252**		0.568**
		(0.050)		(0.114)		(0.239)
Observations	3,670	3,670	3,670	3,670	3,670	3,670
# of leader	745	745	745	745	745	745
# of countries	92	92	92	92	92	92
LL	-1191	-1176	-1195	-1181	-1197	-1181

Notes: The table shows the impact of resource discoveries, institutions and their interactions on the hazard of leaving office for leaders in non-election years for countries considered as resource poor according to Smith (2015). Included control variable: *(log of) Population*, *leader entry age, first leader after independence*, *oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$.

Standard errors are robust and clustered at the country level. The symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.

Table A9: Single risk model in election years for resource poor countries in 1950

Institution	(1) x-Polity	(2) x-Polity	(3) xconst	(4) xconst
Oil discovery	-0.518	-2.693	-0.555*	-3.030**
	(0.343)	(2.105)	(0.334)	(1.512)
Mineral discovery	-0.891**	-2.862	-0.956**	-2.939*
	(0.429)	(1.818)	(0.428)	(1.537)
Institution	0.200***	0.181***	0.369***	0.327***
	(0.032)	(0.033)	(0.066)	(0.068)
Oil # Institution		0.193		0.447*
		(0.160)		(0.234)
Mineral # Institution		0.197		0.414
		(0.159)		(0.280)
Observations	596	596	596	596
# of leader	371	371	371	371
# of countries	83	83	83	83
LL	-301.1	-297.9	-304.1	-300.2

Notes: The table shows the impact of resource discoveries, institutions and their interactions on the hazard of leaving office for leaders in election years for countries considered as resource poor according to Smith (2015). Included control variable: *(log of) Population*, *leader entry age, first leader after independence*, *oil discovery* $_{t-10}$ and *mineral discovery*$_{t-10}$.
Standard errors are robust and clustered at the country level. The symbols *, ** and *** stand for significant at the 10%, 5% and 1% level.