Corruption and the Curse: The Dictator's Choice*

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14th June 2012

Abstract

We develop a dynamic discrete choice model of a self-interested and unchecked ruler making decisions regarding the exploitation of a resource-rich country. This dictator makes the recursive choice between either investing domestically to live off the productivity of the country while facing the risk of being ousted, or looting the country's riches by liquefying the resources and departing. We demonstrate that important parameters determining this choice include the level of resources, liquidity and indebtedness. An empirical analysis on available data relating to dictatorships demonstrates that the dictator's choice regarding the timing of departure is significantly related to external lending, investment and debt. We then argue that this looting phenomenon and the factors that contribute to it, provides an explanation for the generation of corrupt economies in resource-rich countries. An empirical analysis of the available corruption indices demonstrates that irregular turnover provides a more fundamental explanation of perceived corruption than do various social and cultural indicators or the economic theory of internal political competition. The policy implication is that external agents should be very careful about presenting outside options to autocrats in resource-rich countries. Corruption is endogenous to the availability of outside options to dictators of resource-rich economies.

Keywords: Corruption; Dictatorship; Lending and Indebtedness; Looting; Natural Resource Curse.

JEL Classification: O11; O13; O16

1 Introduction: Corruption and the Curse

In a companion paper we demonstrated how the resource curse was related to the availability of liquidity within autocratic countries (Sarr et. al. 2011). We presented empirical evidence that linked liquidity to reduced growth prospects, by reason of induced political instability. Autocratic resource-rich countries were more likely to experience political instability when liquidity was available, and this instability was shown to reduce growth significantly in those countries. This empirical analysis was consistent with much of the literature linking the curse with institutional weaknesses.[1]

*We are indebted to Erwin Bulte and Chris Meissner for helpful discussions on earlier versions of the paper. We would also like to thank seminar audiences at ETH-Zurich, University College London, University of Venice,....and conference audiences at SURED-Locarno, ... The usual disclaimer applies.

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[1]An extensive literature documents that resource wealth can be a curse rather than a blessing for many countries and that this is closely linked with institutional weaknesses (Sachs and Warner, 1995). There are at least three different explanations for this so-called resource curse. Reduced growth in resource-rich countries has been associated with (i) increased indebtedness (Manzano and Rigobon, 2001), (ii) domestic conflict and political instability (Collier and Hoeffler, 2004), and with (iii) autocratic regimes and poor institutions (Ross, 2001; Isham et al., 2004; Robinson et. al. 2006; Bulte et. al. 2005). Clearly there are political and institutional dimensions to resource-related development problems that need to be unraveled.

In this paper we wish to explain in greater detail the nature of the institutional weaknesses that link autocracies to the curse. We argue that the problem inherent in autocracy (i.e. centralised political control and resource ownership) is that it presents the autocrat with a decision each day on whether to continue in power, or to simply "loot" its own assets and depart the country.[2] We provide a model of this decision making process by the autocrat - *the dictator model* - which demonstrates how this decision is determined in large part by outside factors and forces. This places the focus of our enquiry squarely upon the external agents who provide the external options (that liquidity represents) to incumbent autocrats.

In short, we argue that autocratic leaders who stay and invest in the development of such countries must first make the decision not to engage in immediate looting, and it is the availability of looting that determines that corruption prevails in a country. The hypothetical we suggest to illustrate "the Dictator's Choice" is that of the son of a local goat herder turned air force lieutenant turned head of state. Why would such a person elect to remain in office for longer than the length of time required to open a foreign bank account and transfer the available liquidity to that account? Surely the marginal benefits to such a person from having a few hundred million more dollars must pale next to the value of the first hundred million expropriated. Whatever are the incentives to stay and invest, it would be expected that centralised autocratic regimes afforded the external option represented by offers of liquidity would translate control into little other than a series of such looting incidents. Thus it is our argument that it is this capacity for looting that turns resource-richness into economic disaster. There are plenty of real-world examples. States evidencing long-standing looting behaviour include countries such as Nigeria, in which long-running disastrous economic and political performance can be easily traced to the ongoing predatory behavior of a series of autocratic regimes.[3]

We see our dictator model as providing a link between the political economy literatures that have examined the phenomenon of corruption (Serra 2006; Treisman 2000) and the resource curse literature that has examined how macroeconomic outcomes are linked to resource endowments and institutions (Sachs and Warner 1995; Robinson et. al. 2006; Mehlum et al. 2006; Kolstad and Soreide 2009). There is evidence suggesting that institutional quality is one of the main drivers of economic development in general (Acemoglu et al., 2001; Rodrik et al., 2004), and the fates of resource-rich economies in particular (Robinson et al., 2006; Mehlum et al., 2006). There is also evidence that resource-rich countries are particularly prone to corruption (Treisman 2000; Ades and di Tella 1999). Our first goal is to bridge these two literatures with a micro-economic model of resource looting that helps to explain the resulting macroeconomic phenomena of both general corruption and the resource curse.

Our second goal is to provide a clear depiction of how these conditions combine to produce corruption. There have been two distinct veins of literature in the explanation of corruption. There is the more sociological vein, focusing upon historical, social and cultural factors (Serra 2006; Treisman 2000; Paldam 2002). Then there has been the more economic vein of literature, focusing more on the role of political patronage and rent-seeking. (Blackburn et. al. 2005; Kolstad and Soreide 2009; Rose-Ackerman 1999). We argue here that corruption is primarily an economic phenomenon, that it should be viewed as a crucial component of the explanation of the resource curse, and that the key component for its explanation in our context lies in the role of external agents in supplying outside options. Our argument comes closest to a theory describing Rose-Ackerman's phenomenon of "Grand Corruption": the corruption resulting when external agents make pay-offs to leaders in exchange for the transfer of rights in state resources. (Rose-Ackerman 1999, 2002, 2010)[4] We provide the micro-model of the dictator's choice environment that

[2]This term refers to the voluntary liquidation - or "looting" - option first modeled by Akerlof and Romer (1994) and discussed in the context of African economies by Bates (2008).

[3]Many economic and political studies list examples of such resource-inspired looting-type behaviour (e.g. Jayachandran and Kremer, 2006; Bates, 2008; Rose-Ackerman 2002; Kolstad and Soreide 2009).

[4]As with Rose-Ackerman, our modelling provides a fairly clear contribution to the debate on the impact of corruption in development. The form of corruption we analyse represents the purest form of deadweight loss to the societies it affects. There may be other more internal forms of corruption that represent a simple "means of doing business", but looting represents the most dire form of "grand corruption" and has not positive impacts (Rose-Ackerman 2002). For this reason it is important to analyse the extent to which looting explains the perceived level of corruption that exists across developing economies.

illustrates how outside interventions substantially influence how and when autocrats of resource-rich countries elect to loot their own economies. Specifically we demonstrate here that there is one set of institutional failures that can combine to create irresistible incentives for the looting of nations. These are: a) the existence of relatively undeveloped domestic democratic institutions (an absence of checks on the current ruler); b) the presence of nationally held resource rights (centralised economies); and c) the conferment of liquidity by outside agents upon such rulers (unconditional conferment of liquidity). (Sarr et. al. 2011)

As indicated above, the role of outside intervention within these countries is crucial to determining the incentives for looting. External intervention can have a determinative influence on autocrats, when it shapes the choice environment between staying and looting. In this paper we will focus on the potential role of the international lending institutions, but any form of intervention can help to frame the incentives of autocrats in this respect.[5] We demonstrate how excessive resource-based lending by external financial institutions can induce political instability and looting.[6] The instability is visible in the rate of governmental turnover that exists in such countries. The existence of looting is visible in the indebtedness that results. Such instability-linked indebtedness is the natural consequence of lending that is looted rather than invested. (Bulow, 2002).[7]

Our main results are as follows. We first demonstrate in a simple model how a dictator taking control of a nation's resources might decide between three distinctly different paths: (1) immediate looting of the country's resource wealth; (2) transitory investment in the country's capital base to build up additional liquidity for looting in the medium term; or (3) long term investment in the economy (and possibly in political repression) in an attempt to secure tenure and to consume from the economy. Second, we demonstrate that the choice of looting is endogenous to the problem; in particular, the level of liquidity made available from external agents is fundamental to the determination of the autocrat's choice between the three paths described above. Another important factor determining this choice is the level of indebtedness in the economy, indicating that previous choices of looting contribute to later ones.

We then examine the evidence. First we consider a panel dataset of departure times, and relate this to the nature of the resources, choices and interventions available to the rulers concerned. We find that the likelihood of departure is higher for states with resources and lending. Rulers in power with higher stocks of debt are more likely to depart, while those who have chosen higher levels of investment are more likely to stay. We argue that this is evidence of the dictators' choices described in our model.

We then return to the question of corruption: how much of the explanation for generally perceived corruption is rooted in this looting phenomenon? We explore this question empirically by examining in a treatment/effects model the extent to which looting-based instability is an explanation for higher rates of perceived corruption. We find that looting-based instability is a fundamental explanation for perceived corruption levels in resource-rich economies, more important than the social or cultural factors indicated by others and more significant than the internal competition explanations

[5]We have demonstrated in a separate paper that the external intervention may take forms other than lending and debt. The important feature of the intervention - for determining the dictators's decisionmaking environment - is that the dictator is provided with enhanced outside options. (Ravetti, Sarr and Swanson 2012) Other authors have focused on the role of private and public contracting, concessions and FDI. (Rose-Ackerman 2002, 2010).

[6]We also are not the first to highlight the roles of international lending and indebtedness in the curse. Manzano and Rigobon (2001) find that the resource curse vanishes when controlling for indebtedness. Their argument is that large credit offered on resource-based collateral in periods of commodity boom resulted in substantial debt overhang when commodity prices fell in the 1980's. We agree with their analysis, and develop ours to elaborate and expound upon the mechanisms by which resource-based lending goes bad. The most fundamental cause of this problem is moral hazard:This is because lenders see little reason to exercise restraint in lending to resource-rich states, since the resources (and liabilities) remain behind even when the regime changes (Bulow, 2002). This means that lenders have little reason to be concerned about the incentives their loans generate. According to Raffer and Singer (2001: 161), the policy of "*liberal lending by commercial banks opened a bonanza for corrupt regimes. After amassing huge debts and filling their pockets, military juntas (...) simply handed power and the debt problem over to civilians.*" We demonstrate in our model precisely how such unstructured lending generates the incentives for the combined events of debt and departure, instability and indebtedness.

[7]The existence of "excessive resource-based lending" is reinforced by the observation that 12 of the world's most mineral-dependent countries and six of the world most oil-dependent countries are currently classified as highly indebted poor countries (Weinthal and Luong, 2006).

provided by economists. For this reason we argue here that corruption is not primarily a cultural, sociological, or even historical phenomenon. Instead, corruption is endogenous to the problem of providing autocrats with the correct incentives for efficient use of their own resources. When the options of autocrats are limited to investment and development of their own economies, they will do so. When options are provided for liquidating and looting their economies, then corruption, non-investment, and indebtedness will be the result. Corruption can be a straightforward response to the availability of outside options.

The paper is organized as follows. In section 2, we present a stylized model of the looting of a resource-rich nation with an unchecked ruler who has access to foreign lending. In section 3, we provide an empirical estimation of our model, demonstrating how liquidity interacts with resource wealth to generate unscheduled departures by autocrats - which we interpret as looting. In section **??**, we examine the extent to which looting is a significant factor in explaining the general level of corruption across autocratic countries, and find that it is both significant and fundamental in determining corruption. In section 5, we conclude.

2 The Dictator Model: the dictator's choice between looting and investing

Here we develop a model based on Akerlof and Romer (1994) in which we investigate the effects of natural resource abundance and external agencies on the fundamental economic decisions made by all-powerful autocrats in resource-rich countries. We are interested in how such an autocrat will elect to achieve a payout on its position and, in particular, the impact of affording external options upon the dictator's choice between staying and looting. ***Staying*** involves the dictator's commitment to acquiring a return through holding power and investing in the economy. ***Looting*** involves electing a short term "hit and run" strategy of maximum loan, minimal investment, and immediate departure. Before we examine the model, we will first define the primary actors existing within the framework.

Autocratic Resource-Rich States. The states concerned hold their fixed natural resource stocks directly as sovereign assets; there are no intermediate entities (corporations, individuals) holding rights in these resources. Once in power, the leader of the state has the unchecked authority to mine the resources or to enter into contracts on behalf of the state in regard to the natural resource assets. These natural resources are sunk assets, but are assumed to be capable of providing a constant stream of revenues into the indefinite future. Consider such an autocratic resource-rich state, a small open economy producing output y_t according to the function $y_t = f(k_t) + \varphi(Z)$, where f and φ are two increasing, concave, and continuously differentiable functions of capital k_t and Z. $\varphi(Z)$ is the flow of resource rents deriving from the state's sunk resource wealth Z. We will assume here that the flow of rents from resources remains constant throughout the program, while the productivity of the economy may be enhanced by means of investment in capital. In this economy, investment in capital is given by $i_t = k_{t+1} - (1-\delta)k_t - \sigma_t$, where δ and σ_t represent the depreciation rate and the current amount of public funds diverted by the dictator. As a result, the capital stock k_t evolves according to the transition equation $k_{t+1} = (1-\delta)k_t + i_t + \sigma_t$. Because of the natural resource endowment, this country qualifies for loans l_t from international commercial banks at the beginning of each period so that it faces the following budget constraint: $c_t + i_t + rd_t = y_t + l_t$, where r is the interest rate paid on accumulated debt, d_t. The country's stock of debt evolves according to the following transition equation:

$$d_{t+1} = d_t + l_t$$

The interest on the debt must be paid each period for the banks to accept lending in the next period. So, the cost of servicing the debt rd_t is incurred each period that the state is not in default.

External Agents. External agents make liquidity available to the resource-rich states in recognition of the expected future flows of value from the resource base. These agents (assumed in this paper to be the commercial banking sector) recognize the authority of rulers of autocratic resource-rich states to enter into contracts on behalf of the states in regard to these resources, and any contracts entered into by a ruler continue as obligations of that state beyond the individual tenure of that ruler. The commercial banking sector offers liquidity to the current leader contingent upon the state not currently being in default. The amount of liquidity is constrained by an aggregate debt ceiling proportionate to the total resources available.

We are assuming here that international lenders are relying primarily on the anticipated flows from natural resource stocks as implicit collateral for their loans. Natural resources (more specifically the so-called "point source" resources such as oil and minerals) differ from other forms of capital such as physical infrastructure, hospitals, schools or factories in that they can be more readily liquefied by means of bank lending. We capture this notion by assuming that the liquidity parameter θ_z for the natural resource is larger than for other forms of capital, θ_k, i.e. $\theta_z > \theta_k \geq 0$.

Banks recognize that adverse selection can result from price-based lending and so limit lending levels instead (Stiglitz and Weiss, 1981). Credit rationing here is limited by both the immediate and aggregate flows from the resource base available for repayment (Bulow and Rogoff, 1989). This means that, so long as the state is not in default (i.e. prior debt is serviced), the lenders are willing to provide a maximum loan amount in any given period in proportion to the total amount of longer term resources available. The first point indicates that there is a certain proportion of resource-based capital and physical capital that is liquefiable in any given period, i.e. $\theta_z Z + \theta_k k_t$ ($l_t \leq \theta_z Z + \theta_k k_t$). The second point captures the idea of a credit ceiling (Eaton and Gersovitz, 1981). We assume that the aggregate debt level is limited to the amount serviceable by the present value of the stream of liquidity derivable from all capital stocks.

$$d_{t+1} \leq \frac{(1+r)}{r}\left(\theta_z Z + \theta_k k_t\right) \tag{1}$$

The Dictator. The ruler of the state concerned is a dictator in that he has unchecked power over the resource wealth and other assets of the state for the duration of his tenure. His problem is to determine how best to appropriate maximum utility from his period of tenure over these resources. These resources are sunk, in that there is only a fixed proportion of the resources realizable in any given period of his tenure. These flows may then be consumed immediately or invested in the productive capacity of the economy which makes them available for future consumption. The ruler can affect the length of his tenure by means of investments in societal betterment (shared consumption) but there remains uncertainty in each period concerning whether the regime will end at that time. With international lending, the ruler has the option of liquefying some additional proportion of the state's resource wealth in any given period, at the cost of an increase in the state's debt at the beginning of the next period.

The Dictator's Choice. These three assumptions are sufficient for establishing the structure of our autocrat's choice problem, which is built upon the premise that the ruler is pursuing his own agenda after assuming control of the state (Acemoglu et al., 2004). We assume that the self-interested dictator is faced with the problem of maximizing his own life-time utility largely by means of making the decision concerning his optimal length of tenure.

$$\begin{aligned} V(k_t, d_t, \varepsilon_t) \quad = \quad & \max_{\chi_t \in \{stay, exit\}} E_t \left[\sum_{j=0}^{\infty} \beta^j U(k_{t+j}, d_{t+j}, \varepsilon_{t+j}, \chi_{t+j}) \right] \\ & \text{s.t. } \chi_t \geq \chi_{t-1} \end{aligned} \tag{2}$$

where χ_t is the dictator's binary choice between staying ($\chi_t = 0$) and looting ($\chi_t = 1$); and ε_t is an unobservable state variable for the analyst.[8] Time is discrete and the dictator faces an infinite time horizon.

In each period, the incumbent dictator decides whether to stay in power or to loot the country and leave immediately. His choice resembles that of the manager of a firm who is strategically choosing the point in time of the liquidation

[8]The state variables k_t and d_t are observable unlike ε_t.

of a limited liability corporation (Mason and Swanson, 1996). The basic decision comes down to whether to abscond with maximum liquidity today, or whether to stay and invest in tenure and productivity in order acquire a return from holding control over the productive capacities of the enterprise in the future.

Here we model the problem recursively. If the dictator decides to stay, he captures part of the benefits from production, and then faces the decision regarding looting again in the next period. By staying, the dictator faces the possibility that he will be ousted, and lose everything along with his loss of control. The decision whether to stay one more period or to loot is a recursive discrete choice problem described by the following equation:

$$V(k_t, d_t, \varepsilon_t) = \max_{\chi_t \in \{stay, exit\}} \left[v^{\chi}(k_t, d_t) + \varepsilon_t(\chi_t)\right] \tag{3}$$

This equation relies on the assumption of additive separability (AS) of the utility function between observed and unobserved state variables. We will also assume that 1) ε_t follows an extreme value distribution; and 2) ε_{t+1} and ε_t are independent conditional on the observed state variables k_t and d_t. These assumptions follow Rust (1987 and 1994) and greatly simplify this complex problem.

The Decision to Retain Control. Given a decision to stay and maintain control, the dictator will choose current period consumption c_t, capital level k_{t+1}, debt level d_{t+1}, accumulated diverted funds w_{t+1} and repression level s_t to secure his rule. He enjoys an instantaneous utility $u(c_t)$ where $u > 0$, $u' > 0$ and $u'' < 0$, and expected stream of future utilities should he remain in power. He decides the level of funds placed abroad w_{t+1} as well as the investment level in productive capital each period by choosing k_{t+1} according to the following law of motions:

$$w_{t+1} = w_t + \sigma_t \tag{4}$$

$$k_{t+1} = f(k_t) + \varphi(Z) + (1-\delta)k_t - c_t - rd_t + l_t + \sigma_t - cost(s_t) \tag{5}$$

where s_t measures the repression level chosen by the dictator (e.g. expenditures on secret services, police and army) and $cost(s_t)$ are the associated costs.

Within each period t, the dictator experiences the realization of a discrete random variable $\xi_t = \{0, 1\}$, where $\xi_t = 1$ indicates that the dictator is toppled, and $\xi_t = 0$ indicates that the dictator remains in power. We assume that the realization of the shock depends both on the choice of next period's capital stock and repression level. This specification captures the idea that both investing in future consumption and military-spending are strategies for maintaining control over the economy. Let $\rho(k_{t+1}, s_t) = \rho(\xi_t = 1 \mid k_{t+1}, s_t)$ denote the probability of the dictator being deposed next period given he was in power this period; $\rho(k_{t+1}, s_t)$ is assumed to be strictly decreasing and strictly convex in both arguments—see Overland et al. (2005) for a similar idea. That is, increased k_{t+1} and s_t decrease the probability of being toppled at a decreasing rate. The idea here is that the dictator may invest in repression to secure his tenure and may also attempt to buy off peace by sharing some of the output with the population (k_{t+1}). This dilemma has also been analyzed by Azam (1995).

The recursive problem faced by the dictator does not depend on time *per se*, so that the programme is written as:

$$v^{stay}(k, d, w) = \max_{c, k', d', s, \sigma \in \Gamma(k, d, w)} \left(1 - \rho(k', s)\right) \left[u(c) + \beta E_{\varepsilon'} V(k', d', w')\right] \tag{6}$$

$$
\text{s.t. } \Gamma(k,d,w) = \begin{cases} k' = f(k) + \varphi(Z) + (1-\delta)k - c - (1+r)d + d' + w' - w - cost(s) \\ d' = d + l \\ w' = w + \sigma \\ c \geq 0;\ \sigma \geq 0;\ s \geq 0 \\ k \geq 0;\ d \geq 0;\ w \geq 0 \\ k(0) = k_0;\ d(0) = d_0;\ w(0) = w_0 \end{cases} \tag{7}
$$

where β is the discount factor, and k', d', w' and ε' represent next period's state variables.

The Decision to Exit. The dictator also has the choice to loot the economy's riches and exit. Conditional on looting, the dictator leaves with the maximum loan amount he can contract and the share of non-sunk capital $\theta_z Z + \theta_k k$ representing the current value of the liquefied natural and physical capital assets. It is assumed that the dictator absconds with this maximum amount of liquidity, without making any effort at retaining power, paying debts or investing in the economy. On departure, he invests the looted sum to live off a constant flow of consumption c^{exit}. The value of looting is then given by:

$$
v^{exit}(k,d,w) = \frac{u(c^{exit})}{1-\beta} \quad \text{where } c^{exit} = \frac{rW_0}{1+r} = \frac{r}{1+r}(w + \theta_z Z + \theta_k k) \tag{8}
$$

Figure 1 illustrates the dictator's decision tree.

Results. Obviously the dictator compares the payoffs from the two distinct options and chooses the strategy with the highest payoff. Hence, the optimal solution solves:

$$
\chi^*(k,d,w,\varepsilon) = argmax\left[v^{stay}(k,d,w) + \varepsilon(0),\ v^{exit}(k,d,w) + \varepsilon(1)\right] \tag{9}
$$

where the value of staying $v^{stay}(k,d,w)$ and the value of exiting $v^{exit}(k,d,w)$ are defined above. This amounts to an optimal stopping problem, where the decision to exit is an absorbing state.

As mentioned, if the decision is to depart, the optimal choice for the dictator is to set the level of loan at its maximum, invest nothing in the retention of tenure, and to depart immediately in pursuit of a lifetime of consumption (from looted funds). Given the decision to stay, however, the dictator's optimal choice for the next period's capital k', consumption c^{stay}, next period wealth placed abroad w', next period's debt d' and investment in security is given by the following first order conditions:

$$
\begin{aligned}
\left(1-\rho(k',s)\right)u'(c^{stay}) &= \beta\left(1-\rho(k',s)\right)\Big[\left(1-\rho(k'',s')\right)\left(f'(k') + (1-\delta)\right)u'(c'^{stay})Pr(\chi=0|k',d') \\
&+ \frac{r(\theta_k+\alpha)}{1+r}\frac{u'(c'^{exit})}{1-\beta}Pr(\chi=1|k',d')\Big] - \frac{\partial\rho}{\partial k'}\left(u(c^{stay}) + \beta EV(k',d')\right)
\end{aligned} \tag{10}
$$

$$
u'(c^{stay}) = \beta\left[\left(1-\rho(k'',s')\right)u'(c'^{stay})Pr(\chi=0|k',d',w') - \frac{r}{1+r}\frac{u'(c'^{exit})}{1-\beta}Pr(\chi=1|k',d',w')\right] \tag{11}
$$

$$
u'(c^{stay}) = \beta\left(1-\rho(k'',s')\right)(1+r)u'(c'^{stay})Pr(\chi=0|k',d') \tag{12}
$$

$$
\left(1-\rho(k',s)\right)cost'(s)\,u'(c^{stay}) = -\frac{\partial\rho}{\partial s}\left(u(c^{stay}) + \beta EV(k',d')\right) \tag{13}
$$

Equation (10) says that the dictator faces a trade-off when increasing capital stock: decreased consumption today versus an increased probability of remaining in power next period together with increased consumption tomorrow if power is retained or increased liquidity from capital in case of exit. Equation (11) suggests that the dictator faces a trade-off when increasing wealth stolen and placed in a Swiss bank account: he faces a decreased consumption today in return for an increase in the value in the event of departure tomorrow. The next condition (12) conveys the idea that the dictator chooses d' in order to balance increased consumption today against decreased consumption tomorrow due to debt servicing (if he stays the following period). Finally, equation (13) reflects the fact that by choosing s the dictator will trade-off the utility loss from expending resources on retaining power against the benefit from an enhanced security of tenure.

Lemma 1:

The value function $V(k,d,w)$ is increasing in k, Z, θ_z and θ_k, and is decreasing in d.

Proposition 1: *Define $\Delta V(k,d,w) \equiv v^{stay}(k,d,w) - v^{exit}(k,d,w)$ to be the net gain from staying relative to departing in any given period. For any given triplet (k,d,w), the dictator's optimal choice is to stay if $\Delta V(k,d,w) > 0$ and to exit if $\Delta V(k,d,w) < 0$.*

1) The gain from staying ΔV is decreasing in w, d, θ_z and θ_k.

2) The effect of θ_z on the gain from staying ΔV increases with Z, i.e. $\frac{d^2 \Delta V}{d\theta_z dZ} < 0$, if $-\frac{u''\left(c^{exit}\right)}{u'\left(c^{exit}\right)} < \frac{1+r}{r\theta_z Z}$.

3) If $-\frac{\varphi''(Z)}{\varphi'(Z)} - \varphi'(Z)\frac{u''(c^{stay}) + \beta u''(c'^{stay})D}{u'(c^{stay}) + \beta u'(c'^{stay})D} > -\frac{r\theta_z}{1+r}\frac{u''\left(c^{exit}\right)}{u'\left(c^{exit}\right)}$, then the gain from staying ΔV is non-monotonic with respect to Z

4) If $-\frac{f''(k)}{f'(k)+(1-\delta)} - \left(f'(k)+(1-\delta)\right)\frac{u''(c^{stay})}{u'(c^{stay})} > -\frac{r\theta_k}{1+r}\frac{u''(c^{exit})}{u'(c^{exitt})}$ then the gain from staying ΔV is non-monotonic with respect to k

These results are derived formally in Appendix A.1. The intuition for most of the findings is straightforward. Affording higher liquidity to the dictator (increasing parameters θ_z and θ_k) increases the opportunity cost of retaining power. The level of indebtedness reduces the relative returns to staying, since payment (by the dictator) is not required after exiting and looting. Increased security of tenure (reduced hazards) increases the relative returns to staying.

The non-monotonicity of ΔV with respect to k and Z results from the condition that v^{stay} is more concave than v^{exit} with respect to k and Z. Finally, we establish that the impact of liquidity supplied by the banks on the likelihood of looting increases with resource wealth when the dictator is not too risk-averse.

As indicated in Proposition 1, the sign of ΔV , that is whether v^{stay} is above or below v^{exit}, depends on many of the parameters in the model (debt, liquidity, security). We wish to focus here on how the level of resource-based liquidity afforded to the dictator (θ_z) affects the autocrat's incentives to loot or to stay and invest in the economy. We commence by defining the critical values of collateral-based liquidity (θ_z) in terms of their impacts upon the dictator's incentives.

Definition:

1) For a given θ_k, define $\overline{\theta}_z : v^{exit}(\overline{\theta}_z) = \frac{u\left(\frac{r(\overline{\theta}_z Z+\theta_k k)}{1+r}\right)}{1-\beta}$, represented by the curve tangent to v^{stay} at k^* in Figure 2 such that $(1-\rho(k',s))\left(f'(k^*)+(1-\delta)\right)u'(c^{stay}) = \frac{r\theta_k}{1+r}\frac{u'(c^{exit})}{1-\beta}$ and $v^{exit}(k^*,d) = v^{stay}(k^*,d)$.

2) For a given θ_k, define $\underline{\theta}_z : v^{exit}(\underline{\theta}_z) = \frac{u\left(\frac{r(\underline{\theta}_z Z+\theta_k k)}{1+r}\right)}{1-\beta}$, represented by the curve parallel to $v^{exit}(\overline{\theta}_z)$ in Figure 2 such that $v^{exit}(k=0,d;\underline{\theta}_z) = v^{stay}(k=0,d)$, with $\underline{\theta}_z < \overline{\theta}_z$.

Note that $v^{exit}(\overline{\theta}_z)$ is the curve passing the point at which the marginal product of capital and the marginal liquidity of capital are equal for a given θ_k. Also, $v^{exit}(\underline{\theta}_z)$ is parallel to $v^{exit}(\overline{\theta}_z)$ and passes through the minimum of v^{stay} at $k=0$. In effect, the v^{exit} iso-cline shifts upwards with increasing θ_z and the critical values define where it lies in relation to the v^{stay} curve. This definition allows us to state our main result.

Proposition 2: Value of looting as a function of liquidity

1) If $\theta_z > \overline{\theta}_z$, then the dictator always loots irrespective of the level of k.

2) If $\underline{\theta}_z < \theta_z < \overline{\theta}_z$, there are two capital levels $\tilde{k}_1$ and $\tilde{k}_2$ (with $\tilde{k}_1 < \tilde{k}_2$) such that the dictator stays for any $k \in (\tilde{k}_1, \tilde{k}_2)$ and loots otherwise.

3) If $\theta_z < \underline{\theta}_z$, then there is a capital level $\tilde{k}_3$ such that $v^{stay}(\tilde{k}_3,d,w) = v^{exit}(\tilde{k}_3,d,w)$. The dictator loots for any capital level above $\tilde{k}_3$ and stays otherwise.

Proof: see Appendix A.2.

In Figure 2 we illustrate the results stated in Proposition 2. For a given set of parameters (debt level, funds already siphoned and capital-based liquidity), the level of resource-based liquidity will determine the incentives of the dictator to stay and invest, or to loot the economy.[9] Specifically, the level of resource-based liquidity afforded must be such that the dictator finds itself in the region where the v^{stay} curve lies above the v^{exit} curve in order to have any incentives to stay and invest in the economy; otherwise, the optimal choice is to take any proffered liquidity and "to loot" the economy. Our main result is that increased liquidity will unambiguously increase the prospects for political instability and looting in a given state. That is, increases in the value of the parameter for resource-based liquidity (θ_z) raises the value of looting (shifts the v^{exit} curve upwards).[10]

If the two curves potentially intersect, then the two values $\overline{\theta}_z$ and $\underline{\theta}_z$ separate the space into three regions: 1) Region I, for values of θ_z located above $\overline{\theta}_z$ where looting is always optimal; 2) Region II for values of θ_z between $\overline{\theta}_z$ and $\underline{\theta}_z$ where staying and investing is optimal within a specified (intermediate) range of capital levels; and 3) Region III for values of θ_z below $\underline{\theta}_z$ where looting is optimal only for the highest values of k.

Lemma 2. *There is a unique w^* such that (i) for $w < w^*$, the value function $V(k,d,w)$ is decreasing in w; and (ii) for $w > w^*$, the value function $V(k,d,w)$ is increasing in w.*

The siphoning variable, w, enables the dictator to accumulate capital (when choosing to stay) outside of the country by means of accumulating stocks of wealth w in some store of value (e.g. gold bars). The advantage to the dictator to doing so is in terms of relative liquidity. We assume that the entire stock of wealth that is accumulated outside of the country is liquid in the event of "looting", but only that amount θ_k of k is liquefiable. The dictator receives a better return to capital when investing in the country - the return to w is r (assumed to be smaller than the return to investment in the country) while it is in the process of being accumulated - but at the cost of losing immediate access in the event of departure.

[9] Of course, the other parameters also play a role. Reductions in the values for the parameters for debt (d) and security of tenure (ρ) increases the value of staying (shifts the v^{stay} curve upwards). Sarr et al. (2011) investigate such effects.

[10] It is of course possible that, for particular parameter values, the two curves do not intersect anywhere in (v,k) space. This would be the case if security levels were so extreme as to render financial contracting unimportant. In this instance we term the issue of financial contracting non-critical, and we leave this case aside. Examples of such states might be the extremely secure states of the Arabic Peninsula.

Now the dictator has a portfolio choice problem, balancing its assets across a) the national economy (k) with a rate of return of approximately $f'(k)$ but with risk ρ; b) the store of value (w) with a rate of return r but with no risk (since unplanned departure enables access to this part of the portfolio).[11] Looting accompanied with the dictator's departure occurs when there no longer is a relative return from the economy that compensates for this risk.

In this decision making framework, the impact of increasing the amount of siphoning (w) within the autocratic economy is to advance in time the date of optimal departure when looting will occur. In Figure **??**, the impact of increasing w is to *both* shift up the v^{exit} function and also to shift down the v^{stay} function - resulting in a lower level of capital (k) at which state the choice of looting becomes optimal. This means that the dictator who elects to stay (and bear the risk of removal) in order to secure a return from the economy may balance these two objectives better (in line with its own risk preferences) simply by siphoning off some amount of the economy's wealth into this store.

3 Empirical Analysis: the dictator's choice

We have demonstrated in our model above that dictators in resource-rich countries may be seen as making a choice between two very different strategies. They may elect: a) to liquefy and loot; or b) to stay and invest and share consumption. There also siphoning options that enable the dictator to elect something between these these two strategies, while ultimately looting the economy in the medium run. In the first part of this analysis we wish to examine the evidence on whether this is a reasonable description of a real choice exercised by rulers of resource-rich countries.

3.1 Model Predictions

We will test the following factors explaining the choice of autocrats in resource-rich countries:

Prediction 1: Lending to resource rich dictators tends to enhance the prospects for looting, and hence increases the likelihood of departure.

Prediction 2: Second, increased debt levels imply lower net benefits from staying, and therefore an enhanced likelihood of departure.

Prediction 3: Third, the choice of departure is non-monotonic in the level of resources. It may fall, then rise, with natural resources. The likelihood of electing immediate departure should be less profitable at low values of these variables.[12]

Prediction 4: Dictators who elect to stay will demonstrate higher levels of investment in the domestic economy, and higher levels of repression

In the remainder of this section, we examine the evidence regarding the prevalence of the phenomenon of the dictator's choice.

3.2 Empirical strategy and Data

Since we have data regarding the year of leaders' departure, survival models provide a perfect framework for modeling departure probabilities. More specifically, we will estimate the probability that the dictator departs in time t conditional on being in power in time $t-1$.

[11] The assumption of three different rates of return on assets is necessary to provide for three distinct choices (investing in economy, investing outside of the economy, or looting the economy).

[12] Diminishing marginal utility implies large gains from staying one more period to consume in the future. Similarly, the present discounted value of departing from power depends positively on resources. This also incentivizes staying slightly longer particularly at low values. Beyond some threshold of natural resources wealth, looting and departing should become more likely.

Let X be a vector of relevant observed explanatory variables and β be a vector of coefficients. Let the random variable T be the dictator's length in power with a cumulative distribution function, $F(t|X_{it},\beta) = Prob(T \leq t|X_{it},\beta)$, and probability density function, $f(t|X_{it},\beta)$. Duration models allow us to estimate the hazard rate $\theta(t|X_{it},\beta)$ defined as the probability that the dictator i departs in time t conditional on being in power in time $t-1$, that is:

$$\theta(t|X_{it},\beta) = \frac{f(t|X_{it},\beta)}{1-F(t|X_{it},\beta)}$$

However, there is no single specification for the hazard rate. In our main estimation, we will examine two functional models frequently used in the literature: the Gompertz model (parametric) and the Cox model (semi-parametric). The Gompertz model is a particular case of the proportional hazard models family which is characterized by the separability assumption:

$$\theta(t|X_{it},\beta) = \lambda(t)\exp(\beta X_{it})$$

where the baseline hazard function $\lambda(t)$ is the probability of failure assumed common to all leaders and reflects the pattern of duration dependence. For instance, if there is positive duration dependence, it means that the probability of being ousted increases the longer the dictator is in power. The dictator's specific scaling factor $\exp(\beta X_{it})$ depends on the vector of covariates X and varies with the survival time. Thus, two different dictators have probabilities of irregular turnover that are proportional for all t. The estimation of a parametric survival model requires the functional specification of the baseline hazard distribution $\lambda(t)$. In particular, the Gompertz model assumes that $\lambda(t) = \exp(\gamma t)$ where the shape parameter γ indicates the pattern of duration dependence. If $\gamma > 0$, then the hazard is monotonically increasing; if $\gamma = 0$, it is constant; and if $\gamma < 0$, the hazard declines monotonically.

Given the nature of our data (panel data) we capture omitted explanatory variables by including unobserved heterogeneity. We will estimate the *frailty* model

$$\theta(t|X_{it},v,\beta) = \lambda(t)\exp(\beta X_{it})v$$

where v is an unobserved individual-specic effect following a Gamma distribution and assumed independent of X with $\mathbb{E}(v) = 1$ and variance σ^2.[13] Given we can rarely observe the wealth siphoned by dictators among other unobservable characteristics, it is important to include frailty or unobserved heterogeneity in the model.

The main difficulty in estimating the model developed in the previous section is that looting decisions as modelled in this paper are virtually unobservable to the analyst. Thus, Following Sarr et al. (2011), we assume that the political instability induced through looting-type behaviour is manifested in terms of enhanced levels of unscheduled departures. Therefore we use political instability as a proxy for looting. The probability of looting is based on a binary variable, irregular regime change, constructed using the Archigos database (a database of political leaders developed by Gleditsch and Chiozza, 2009). The binary variable takes on the value 0 or 1. When it is equal to 1, it proxies for a scenario when the net benefit of staying $\Delta V(k,d)$ is negative and departure is optimal. Such event takes place when 1) a ruler or regime has been deposed or forced from power in a non-constitutional manner, and 2) the ruler is safe and has either remained in the country or lives in a foreign country. The important characteristics about leaders' fates once they have lost power (to the best of our knowledge) is only found in Archigos database and are yet to be updated beyond 2004 even in the latest version published in August 2009. [14]

[13] This is the most commonly used specification in the literature.

[14] GET SIMILAR INFORMATION. In our baseline sample (results are reported in Table XX) there are 10 country-year observations out of 394 when Loot equals 1.

The key determinants of the likelihood of looting-led power change are resource rents and foreign lending. The resource rents come from the World Bank Environment Department. The interaction between resources and lending is particularly important. If a positive coefficient is found here, and the marginal impact of lending turns out to be positive at a given level of resource abundance, this would substantiate our main prediction that lending in the presence of resources may induce instability. The square of the resource rents is included to test the non-monotonic effect of resources. Lending and debt level by private creditors come from the World Bank Global Development Finance (GDF, 2012).[15]

To test our hypothesis that investment and repression change the time horizons of the government by reducing the probability of being deposed in any period we introduce per capita investment, per capita consumption, military spending as well as an indicator of the frequency of torture developed by Cingranelli and Richards (2005). In addition, in vector $\mathbf{X_1}$, we include an indicator of the lack of colonial past as a proxy for independence from Western influence and external intervention as well as regional dummies for Sub-Saharan Africa, Middle East/North Africa and Latin America.

3.3 Estimation Results: the dictator's choice

This section reports our estimation results and analyses of the determinants of rulers' likelihood of departure using duration models. We use a sample of 55 countries that covers the period 1996-2004. The chosen period is constrained by the availability of data with regard to the proxy of looting and corruption indices.

Our baseline specifications are reported in Table 2. Note that in both specifications, we only control for regional fixed effects rather than country fixed due to the limited size of our sample.

Our main prediction is that greater lending afforded by financial institutions to resource rich rulers leads to instability as it provides them with the incentive to siphon the country's wealth and departs when the situation becomes too risky. In addition, we would like to test our prediction regarding the effect of liquidity and debt on looting as well as our hypotheses regarding rulers' strategies to remain in power.

To test our first prediction, that more loans to resource rich rulers increases the conditional likelihood of departure, we introduce an interaction term between liquidity (lending) and resources. The model predicts that under some condition, $\frac{d^2\Delta V}{d\theta_z dZ} < 0$, i.e. the marginal impact of lending at higher levels of resource wealth leads to a greater likelihood of departure. In other words, our model predicts that the sum of the effect of lending through resource wealth must be positive. In Panel B columns (2)-(3), the instability equations show that the interaction term of resources and lending is highly significant and associated with a higher likelihood of turnover. This result indicates that greater lending to resource rich countries is associated with higher political instability. This finding is consistent with the prediction of the theoretical model that dictators of resource rich countries with greater access to external capital may choose to loot rather than invest, as it provides them with the incentive to siphon the country's wealth and departs when the situation becomes too risky. This in turn leads to increased instability. Besides, the fact that the coefficient of resource rents (main effect) is significantly negative suggests that resources *per se* are not to blame for political instability.

In addition, we would like to test our prediction regarding the effect of liquidity and debt on looting as well as our hypotheses regarding rulers' strategies to remain in power. We find that the direct effect of private lending is negative and statistically significant. However, the positive sign of the interaction effect may offset the direct effect effect, suggesting that resource wealth combined with lending to dictators may constitute a toxic mix.[16] This is because

[15] The main limitation of this dataset is that the major Gulf countries are not available because they do not report such borrowing.

[16] The marginal effect of lending is computed as $\frac{\partial Pr(Loot=1|Loan_{it}, NRStock_{it})}{\partial Loan_{it}} = (-0.232 + 0.045 \times NR_{it})\,\phi\,(\mathbf{W}_{it}\beta)$. (These figures come from Panel B column (3)). Beyond a certain threshold of resource rents equal to 5.13% (76th percentile, well below the mean for countries like Nigeria 33% for the period under consideration), the interaction effect totally offsets the direct effect of lending. However, the marginal effect becomes statistically significant only for relatively high values of natural resource rents.

the interaction effect through natural resources. Hence this finding confirm our theoretical result that in resource rich countries, the net value of staying is decreasing in liquidity, i.e. $\frac{d\Delta V}{d\theta_z} < 0$.

Second, our results suggest that as predicted by our model debt levels lead to more instability and looting. The coefficients are positive and statistically significant at the 1% level. Third, the data are also consistent with the subsidiary prediction regarding the non-monotonicity of natural resources with respect to incentive to stay by including the square resources. Our empirical results indicate that resources *per se* do not have an adverse direct effect on the ruler's departure since the coefficient on resource rents has a negative and statistically significant coefficient both in columns (2) and (3). Its square has a positive, statistically significant coefficient at the 10% in column (3) and only at 12% in column (2). Thus, the non-monotonicity of natural resources as predicted in the model (here U-shape relationship with looting) is substantiated. The overall marginal effect of natural resources, which depends on the level of lending and resources suggests that at sufficiently high resources and lending looting is more likely.[17]

Finally, two strategies are assumed typical instruments for dictators to retain power. The dictator can undertake productive investments in an effort to buy peace, thus averting possible discontent, namely by investing in the productive capacity of the country.[18] An alternative, albeit illegitimate, instrument in the hand of the dictator is the use of repression. To capture these strategies. We control for per capita investment, per capita consumption, per capita GDP growth as well as repressive devices such as the extent of military spendings as a share of GDP and the frequency of the practice of torture. As hypothesized, we find that investment reduces the likelihood of losing power. A somewhat surprising and counter-intuitive result is that greater per capita consumption by the population raises the odds of losing power. The findings regarding investment in "repression" are interesting. Perhaps unsurprisingly we find that military spendings are positively related with regime change and are statistically significant. This is probably due to the fact that spendings on secret police or on some security forces such as the presidential guards (Iraq, Libya, etc.) are more likely to explain rulers' hold on power. Such data is not available. However, frequent practice of torture by a repressive regime seems to act as security for the dictator, and reduces the rate of departure by dictators.

4 Corruption and the Curse

We have examined a micro-economic model of dictator's choice, in which the ruler of a resource-rich country decides whether the optimal choice is to loot his own economy, or if it is better to stay and invest in it. We have found that there is significant evidence to support the view that autocrats are faced with such an election, and that external agents affording outside options have a significant impact on how this choice is made. It is also apparent from the model and the evidence that those who elect to loot their economies are more likely to leave behind an economy encumbered by political instability, high debt, and low investment. (Sarr et. al. 2011)

In this section we wish to make the link between this micro-economic model and the general perception of corruption across an economy. This link occurs because, when dictators elect a strategy of short or medium term looting, all of the conditions will be present for what has been stylised as a *corrupt economy*. Dictators will accept personal payments in return for claims on national resources. Funds will be siphoned out of the treasury and into personal bank accounts. Investments will not occur, while external claims on resources multiply. Dictators will depart in the middle of the night, leaving behind an economy encumbered by debt and unendowed with investment. In this way,

[17]The marginal effect of resources on looting has three parts which are given by the coefficients on resources, the interaction of resources and lending and the square term. Its sign is given by $\beta_1 + 2\beta_2 NR_{it} + \beta_4 NR_{it} = -0.360 + 2 \times 0.006 NR_{it} + 0.045 Loan_{it}$. (These figures come from Panel B column (3)). The marginal effect of resources on looting is positive at any positive loan levels as long as resource rents is greater than 30% of GDP which is the case for Nigeria.

[18]In the aftermath of the Arab Spring in 2011, oil rich Saudi Arabia successfully adopted such strategy to prevent a revolution as in Tunisia and Egypt. In February 2011, King Abdallah announced that an amount of 36 billion dollars will be invested to the benefit of the population. The main objective was to improve the country's education and health system, and build infrastructure. In March 2011, another financial package amounting to 94 billion dollars was announced that aimed at raising salaries, education allowances, building housing, etc.

looting behaviour by autocrats may be linked up generally with levels of perceived corruption and poor performance in resource rich economies.

We believe that this economic explanation for the link between resources and corruption is much more fundamental than the social, cultural and historical factors explored by others. (Serra 2006; Treisman 2000) Also, we show that this is a highly significant economic explanation of corruption. In the context in which we are working, the external workings of agents and the dictator's choice of looting is more important than internal factors such as political competition or patronage in the explanation of general levels of corruption in resource-rich countries. We find that the fundamental nature of corruption in resource-rich countries is that of external agents enabling autocrats to translate power into personal wealth - so-called *grand corruption*.

4.1 Empirical Analysis: Looting as an explanation of corruption

We now explore the extent to which looting is a determinant factor in creating a corrupt economy. Our main contention is that economic factors trump cultural, sociological, or historical factors in explaining corruption (or more precisely corruption perception) once we controlling for looting-driven political instability in resource rich countries. Secondarily we intend to demonstrate that looting acts as a more significant explanatory factor than the others that are often used in the economics of corruption.

Our empirical model will rely on the joint estimation of two equations. One treatment equation, i.e. the looting equation and one outcome equation that exploits the looting behaviour to explain the factors determining the perception of the level of corruption in economies.

$$\begin{aligned} Loot_{it} &= \begin{cases} 1 & \text{if } Loot^*_{it} > 0 \\ 0 & \text{otherwise} \end{cases} \qquad (14) \\ Loot^*_{it} &= \beta_0 + \beta_1 NR_{it} + \beta_2 NR^2_{it} + \beta_3 Loan_{it} + \beta_4 NR_{it} * Loan_{it} + \beta_5 Debt_{it} \\ &+ \beta_6 Investment_{it} + \beta_7 Consumption_{it} + \beta_8 Repression_{it} + \beta_9 \mathbf{X_1}_{it} + \eta_{it} \end{aligned}$$

$$Corruption_{it} = \alpha_0 + \alpha_1 Loot_{it} + \alpha_2 NR_{it} + \alpha_3 \mathbf{X_2}_{it} + u_{it} \qquad (15)$$

We estimate equations (15) and (14) jointly by Full Information Maximum Likelihood (FIML) using a treatment regression approach. This allows for correlation between the error terms which are assumed to be normally distributed. The treatment (turnover regression) and outcome (corruption equation) are estimated jointly by maximizing the bivariate normal likelihood function. This is a fully efficient estimation method which takes account of the possibility that omitted forces drive both corruption and turnover by incorporating a correlation between the error terms in the treatment and outcome equations into the model. Identification in this framework may come from the non-linear functional form and in principle does not require an exclusion restriction assumption. However, identification by functional form may be particularly weak (Arellano, 2006). To improve the identification of the model, we impose some exclusion restrictions, for instance the repression variables (military spending or frequency of torture) affect the probability of turnover but are excluded from the corruption equation.

The turnover equation includes the same variables analysed early in the duration model. Following the empirical literature on corruption (Treisman 2000; Ades and di Tella 1999), the corruption equation incorporates cultural, sociological, and historical explaining variables such as religion, ethnic diversity, legal origin, colonial origin, the federal nature of the state, together with economic factors (lagged income per capita, trade openness and natural resources). The standard corruption equation is augmented with leadership turnover as a measure of instability.

The non-governmental organization Transparency International was the first organization to systematically construct such indicator from 1995. They define corruption as *"the abuse of public office for private gain"*. Their Corruption Perception Index (CPI) is based on perceptions and opinions held by experts (business people and country risk analysts) because of the inherent difficulty in obtaining objective and reliable measurements of corruption (Razafindrakoto and Roubaud 2010). The measure of CPI ranges from 0 (highly corrupt) to 10 (least corrupt). It has been published yearly since 1995 but has seen its measure change over time. For this reason, we will use an alternative measure, i.e. the World Bank's Control of Corruption Index (CCI) developed by Kaufmann, Kraay and Mastruzzi (2008). This index measures *"the exercise of public power for private gain, including both petty and grand corruption and state capture"* and takes values on a scale from -2.5 (high corruption) to +2.5 (low corruption). Like the CPI, it combines various sources and relies predominantly on the opinions of experts and business people. To make the analysis more intuitive and straightforward, *(i)* we normalise the scale of the World Bank's corruption index between 0 (least corrupt) and 5 (highly corrupt); and *(ii)* the scale of the Transparency Internation index between 0 (least corrupt) to 10 (highly corrupt).

Table 3 and Table 4 present the relationshionship between political instability and corruption using full information maximum likelihood estimation. Panel A shows the corruption equation (15) and Panel B presents the results from turnover equation (14). Panel B displays qualitatively the same results as the duration model. The results on the corruption equation are presented in Panel A of Table 3 and Table 4. Our analysis will mostly focus on Table 3 which uses the World Bank's Control of Corruption Index (CCI). However, most results are qualitatively similar when we use Transparency International's Corruption Perception Index (CPI).

We first replicate in column (1) the standard model of the determinants of corruption following Treisman (2000) who relied mainly on Transparency International data.[19] We find that in addition to economic factors, many of the cultural, sociological, and historical determinants referred to in the literature matter, especially for the CPI measure in Table 4 and to a lesser extent in Table 3.[20] Once we augment the standard model of the determinants corruption with our measure of looting together with resource rents, none of the social (proportion of Protestants), historical (formerly British colonies) and institutional (Common Law) determinants remain statistically significant. On the other hand, we find that the economic determinants for perceived corruption are all that matters. Everything else being equal, richer nations in terms of GDP per capita tend to have lower corruption scores while wealthier nations in terms of natural resources tend to be perceived as more corrupt. Finally looting is strongly and significantly associated with higher level of perceived corruption.[21]

Also, our results indicate that looting is a more fundamental explanation than more internally focused economic explanations. Those explanation focus on internal competition between interest groups and the importance of rent-seeking and patronage. These economic explanations find that factors intensifying internal competition (ethnic fractionalisation and unitised states) provide important explanatory power in the perception of corruption. Again, our analysis indicates that these factors are rendered insignificant by the inclusion of looting within the analysis. Although we believe that these other economic explanations make sense, their impacts are over-ridden by those of looting.

Overall, these findings support the view that natural resource wealth when combined with the supply of easy credit

[19] Note that we tried to use the same data as Treisman when possible to be able to replicate his results as closely as possible. That explains why we use his measure of resource wealth (mineral exports) in Column (1)

[20] Note that we may at times obtain some different signs. Thus, unlike and Treisman (2000), we find a negative relationship between the proportion of protestants in a country and corruption. This might be due to the fact that our sample does not include the Northern European countries which are overwhelmingly protestant and enjoy the lowest levels of corruption indicators. The same applies to the Anglo-saxon countries to a lesser extent.

[21] Finally, a Wald test rejects the null hypothesis that the error term of the instability equation is uncorrelated with the error term of the corruption equation. For example, in our baseline specifications (Table 3), we obtain $\chi^2(1) = 6.96$ (p-value=0.0083) for in column (2) and $\chi^2(1) = 6.15$ (p-value=0.0132) in column (3). This implies that the joint estimation of the treatment and outcome equations is required to generate unbiased estimates of the other parameters. We also note that the correlation between the errors is estimated to be positive. Unobserved factors positively affecting turnover are also associated with higher perceived corruption. The correlation between the error terms is still significant with the CPI although at the 7% and 8% levels only.

has the potential for driving looting and instability. This looting-based instability, together with resource-richness, is then the most fundmental factor in explaining the level of corruption observed.

4.2 Discussion - resources, looting and corruption

We see from our analysis that looting is a highly significant explanatory factor in the perceived level of corruption in resource-rich countries. This provides a potential line of explanation for the linkages between resources, corruption and the curse. Resources provide the underlying attractor, leading external agents to present outside options to the autocrat in exchange for claims on the state's resources. Given outside options, the dictator then has an increased likelihood of electing to convert those resources into personal riches, via immediate looting. And looting leaves the resource-endowed society with external claims on the national resources, and a lack of leadership and investment. Under this line of reasoning, there is a clear line of causation leading from the actions of external agencies, to economic looting and corruption as a fundamental explanation for the resource curse.

This indicates that Rose-Ackerman's phenomenon of *grand corruption* may be a fundamental cause of the curse, as an explanation for poor performance in resource-rich countries. Many of these states possess political structures that concentrate a lot of power in a small number of central figures, and the combination of such centralisation with significant resources, means that much of the impact of corruption is felt through the actions of a small number of individuals. Pay-offs to leaders of states in order to secure preferred access to resources lies near the foundation of the problem.

5 Conclusion: Corruption and the Curse

This paper has attempted to set out a mechanism through which corruption and the resource curse operate. Our main contribution is to show how external agents impact upon the choices of dictators in resource-rich countries. In our model, a dictator makes a choice between staying and looting, and the question we ask is: Why would any dictator stay if an external option exists? We find that there are indeed few reasons for an autocrat to stay around and invest, if there are decent options available for receiving immediate payments for natural resources. External actors attracted by resource-richness hence make looting likely through pay-offs to leaders in return for claims on resources. One problem with such a scenario is that it is dynamically attractive. Once a choice to loot is implemented by a single autocrat, the incentives to loot are enhanced for every succeeding administration. This is a consequence of the autocrat's ability to commit all of the state's resources - during the length of its tenure - and the fact that this commitment will outlive the autocrat's tenure. This means that succeeding administrations start from an initial condition that is more indebted, and hence more prone to looting than previous ones. Looting is a dynamically attractive phenomenon.

We also have shown that looting is a fundamental explanation for the level of perceived corruption in resource-rich countries. Other explanations of corruption either become insignificant (such as cultural and historical factors) or less significant (such as political competition and patronage) in the context in which we are working. What we are analysing here is the essence of the sort of grand corruption described by Rose-Ackerman (1999, 2002), and a fundamental explanation for the reason that resource-rich countries are subject to the curse (Sarr et. al. 2011). It appears to be near the core of the institutional problem that links resources and the resource curse.

What is the source of grand corruption? Although we do not include any modelling of the motivations of external agents within our paper, it is apparent that moral hazard is only one of many concerns in this context. External agents at the very least can remain oblivious to the effects of affording liquidity to autocrats, since their assuror is the state's resources not the autocrat. Even more troublesome is the fact that endogenous corruption may be viewed as a positive benefit to external agents looking to transfer a state's wealth to their own balance sheets. Enhanced levels of corruption may enhance the potential for future revenue streams from resources and, in any event, are unlikely to redound to the detriment of the outsider. Payments to autocrats may be seen as the means for transferring the long-term revenues from resources from the state concerned to the external operators' balance sheets - by means of placing ever-increasing debt obligations on the state's. In this way, it is possible to see grand corruption as the essential link between resources, institutions and economic performance. This is a situation where corruption may be seen as a vehicle by which resources are shifted (implicitly) from a state's balance sheets onto those of external agents. The dictator's choice model argues that this is because corruption is an important vehicle for transferring the wealth of resource-rich countries to others, at the price of minor transfers to temporary autocrats.

What can be done about it? Clearly one implication is that corruption of this kind should never be dismissed as "grease on the wheels" of the countries' systems; there is nothing but deadweight losses flowing from grand corruption. Many of the other, most obvious policy suggestions have been made by others previously, regarding the disallowance of bribery and pay-offs by multi-nationals and arms manufacturers. (Rose-Ackerman 2002; Kolstad and Soreide 2009). Less obvious is our previous point that any form of unstructured liquidity offered to autocrats has the same effect as a pay-off to a dictator. (Sarr et. al. 2011) It is important for any funds supplied to a dictatorial regime to be closely monitored and tied to transparent domestic investments; otherwise, they function in just the same way as a straightforward bribe.

In short, centralised un-checked control of a resource-based economy represents an accident waiting to happen. Outsiders must treat such regimes very carefully. Any options provided to such autocrats are likely to generate the worst possible outcomes for the societies concerned. And these worst outcomes are self-perpetuating once these claims are in place. The resource curse is the most likely outcome of these initial conditions, unless outsiders are very careful to maintain strict incentives for autocrats to invest in their own societies.

Figure 3: Change value of staying and departing as function of w

../../../AppData/Local/Temp/GraphVLootStay7alpha_Dec2011.eps

Figure 1: Dictator's decision tree

../../../AppData/Local/Temp/DictatorDecisionTree_14Oct08.eps

Figure 2: Looting and staying regions as function of θ_z

../../../AppData/Local/Temp/GraphRegionsLootStay_March09.eps

Table 1: Definitions of Variables and Source

Variables	Definition	Data Source
Resource Rent (% GDP)	Quantity $*$ (Commodity price $-$ Unit extraction cost)$/GDP$	World Bank, Environment Dept
Resource Stock (% GDP)	Ratio of the stock of resource over GDP	World Bank, Environment Dept
Private Lending (% GDP)	Ratio of lending from private creditors over GDP	Global Development Finance 2012
Private Debt (% GNI)	Ratio of the debt from private creditors over GNI	Global Development Finance 2012
Log Investment	Log of investment per capita	World Development Indicators 2012
Log Consumption	Log of consumption per capita	Global Development Finance 2012
Lag per capita GDP growth	Lag of GDP growth per capita (PPP, constant price 2005)	Penn World Tables 7.0
Trade (% GDP)	Sum of import and export over GDP	Penn World Tables 7.0
Military Spending (% GDP)	Ratio of military spending over GDP	Calculation from Correlates of War 2010
Torture Frequency	Torture Frequency	Cingranelli and Richards (2005)
Ethnic Fractionalization	Ethnic Fractionalization	Alesina et al 2003
Corruption (TI Index)	Perception of corruption index	Transparency International
Corruption (WB Index)	Perception of corruption index	Kaufman et al. (2008), World Bank

Table 2: Determinants of Dictator's Strategy (Likelihood of Departure)

	Weibull Model (1)		Gompertz Model (2)		Semi-parametric Cox Model (3)	
	Coef.	Std Error	Coef.	Std Error	Coef.	Std Error
main						
Resource Rent (% GDP)	-0.518*	(0.304)	-0.436**	(0.207)	-0.373***	(0.129)
Resource Rent^2 (% GDP)	0.00746	(0.00692)	0.00660*	(0.00396)	0.00638**	(0.00266)
Private Lending (% GDP)	-0.581	(0.434)	-0.641	(0.466)	-0.452	(0.296)
Resource Stock×Lending	0.0852*	(0.0504)	0.0832*	(0.0463)	0.0422*	(0.0250)
Private Debt (% GNI)	0.174**	(0.0808)	0.127**	(0.0501)	0.129***	(0.0365)
Log Investment/GDP	-17.70**	(8.669)	-15.07***	(5.650)	-9.889***	(2.190)
Log Consumption/GDP	15.71*	(9.118)	15.05**	(7.265)	6.998***	(1.965)
GDP Growth	0.219	(0.189)	0.167	(0.136)	0.382*	(0.199)
Military Spending (% GDP)	0.398*	(0.204)	0.265**	(0.133)	0.415***	(0.120)
Torture Frequency	-2.260*	(1.324)	-1.674	(1.239)	-1.267*	(0.751)
Never Colonized	9.222**	(4.064)	7.999**	(3.348)	6.749**	(3.012)
Constant	-34.90	(29.27)	-41.09	(29.20)		
Shape parameter ln_p	0.826**	(0.405)				
Shape parameter gamma			0.166*	(0.0896)		
N	475		475		475	
Number of Countries	55		55		55	
Log Pseudo-Likelihood	-14.30		-14.98		-12.86	

Robust Standard errors in parentheses are clustered at the country level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

We control for region dummies. The time horizon extends to the period 1996 –2004.

Table 3: Determinants of Corruption and Looting: World Bank Control of Corruption Index (CCI)

	OLS (1)		Treatment Effects (2)		Treatment Effects (3)	
	Coef.	Std Error	Coef.	Std Error	Coef.	Std Error
Corruption Equation (CCI Index)						
Loot			0.723***	(0.270)	0.739***	(0.285)
Resource Rent (% GDP)			0.0257***	(0.00574)	0.0257***	(0.00574)
Mineral Export (% Export)	0.00497	(0.00305)+				
Lag log GDP per capita	0.481***	(0.0926)	-0.540***	(0.145)	-0.541***	(0.145)
Trade (% GDP)	0.00226	(0.00151)	0.000153	(0.00194)	0.000165	(0.00197)
English Common Law	0.136	(0.175)	0.0108	(0.182)	0.0110	(0.182)
Former British Colony	0.0699	(0.177)	0.0465	(0.156)	0.0464	(0.156)
Never Colonized	-0.0492	(0.185)	0.290	(0.187)	0.291	(0.187)
Federal States	-0.410**	(0.183)	0.103	(0.181)	0.104	(0.181)
Protestant (%)	-0.00695*	(0.00397)	0.00640	(0.00569)	0.00642	(0.00570)
Ethnic Fractionalization	-0.518*	(0.265)	0.373	(0.318)	0.370	(0.318)
Constant	-4.144***	(0.656)	6.799***	(1.001)	6.803***	(1.002)
Instability Equation						
Resource Rent (% GDP)			-0.228***	(0.0874)	-0.360**	(0.159)
Resource Rent^2 (% GDP)			0.00310	(0.00199)	0.00613*	(0.00371)
Private Lending (% GDP)			-0.190*	(0.102)	-0.232**	(0.110)
Resource Stock×Lending			0.0327***	(0.00933)	0.0453***	(0.0120)
Private Debt (% GNI)			0.0506***	(0.0136)	0.0791***	(0.0165)
Log Investment/GDP			-6.974***	(1.279)	-8.468***	(1.655)
Log Consumption/GDP			6.268***	(1.452)	7.124***	(1.668)
GDP Growth			-0.112***	(0.0309)	-0.0468**	(0.0205)
Military Spending (% GDP)			0.352**	(0.163)	0.303*	(0.177)
Torture Frequency					-0.921***	(0.335)
Never Colonized			3.999***	(1.077)	4.319***	(1.026)
Constant			-15.75**	(6.146)	-13.12**	(6.089)
Correlation ω			-0.809***	(0.307)	-0.883**	(0.356)
Variance σ			-0.820***	(0.104)	-0.820***	(0.105)
N	457		316		316	
Number of Countries	85		55		55	
R-squared	0.5638					
Log Pseudo-Likelihood			-199.6		-199.0	
Wald Test of Indep. Eq Chi2(1)			6.96		6.15	

Robust Standard errors in parentheses are clustered at the country level. $^{+}$ $p < 0.11$, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Specification (1) replicates some of the results found in the literature by using an OLS estimation. The two other models are estimated using Treatment Effects. We control for region dummies. The time horizon extends to the period 1996–2004.

Table 4: Determinants of Corruption and Looting: Transparency International Corruption Perceptions Index (CPI)

	OLS (1)		Treatment Effects (2)		Treatment Effects (3)	
	Coef.	Std Error	Coef.	Std Error	Coef.	Std Error
Corruption Equation (CPI Index)						
Loot			1.480**	(0.694)	1.498**	(0.703)
Resource Rent (% GDP)			0.0368***	(0.0117)	0.0368***	(0.0116)
Mineral Export (% Export)	0.0293***	(0.0104)				
Lag log GDP per capita	1.245***	(0.157)	-1.513***	(0.316)	-1.514***	(0.318)
Trade (% GDP)	0.00678***	(0.00226)	-0.0000978	(0.00453)	-0.000182	(0.00449)
English Common Law	0.838*	(0.484)	-0.0802	(0.567)	-0.0789	(0.564)
Former British Colony	-0.123	(0.434)	-0.308	(0.548)	-0.310	(0.544)
Never Colonized	-0.762*	(0.405)	0.931*	(0.528)	0.931*	(0.531)
Federal States	-0.533*	(0.281)	0.537	(0.475)	0.544	(0.476)
Protestant (%)	-0.0185*	(0.0101)	0.0182	(0.0197)	0.0183	(0.0198)
Ethnic Fractionalization	-1.907***	(0.518)	0.985	(0.715)	0.974	(0.714)
Constant	-6.780***	(1.185)	18.21***	(2.052)	18.23***	(2.067)
Looting Equation						
Resource Rent (% GDP)			-0.115	(0.0758)	-0.183	(0.125)
Resource Rent^2 (% GDP)			0.00191	(0.00226)	0.00385	(0.00369)
Private Lending (% GDP)			-0.139**	(0.0558)	-0.143***	(0.0516)
Resource Stock×Lending			0.0160***	(0.00560)	0.0204***	(0.00504)
Private Debt (% GNI)			0.0276	(0.0239)	0.0394	(0.0260)
Log Investment/GDP			-3.141***	(0.930)	-3.888**	(1.514)
Log Consumption/GDP			2.613**	(1.054)	3.128**	(1.352)
GDP Growth			-0.0297	(0.0537)	-0.00245	(0.0298)
Military Spending (% GDP)			-0.000956	(0.138)	-0.0624	(0.211)
Torture Frequency					-0.582	(0.366)
Never Colonized			2.116***	(0.696)	2.067**	(0.872)
Constant			-5.547	(5.229)	-4.479	(3.861)
Correlation ω			-1.003*	(0.551)	-1.062*	(0.589)
Variance σ			-0.146	(0.152)	-0.146	(0.152)
N	425		326		326	
Number of Countries	74		50		50	
R-squared	0.7335					
Log Pseudo-Likelihood			-429.3		-428.4	
Wald Test of Indep. Eq Chi2(1)			3.31		3.25	

Robust Standard errors in parentheses are clustered at the country level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Specification (1) replicates some of the results found in the literature by using an OLS estimation. The two other models are estimated using Treatment Effects. We control for region dummies. The time horizon extends to the period 1995 –2004.

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6 Appendix A.1: Proof of Proposition 1 - Comparative Statics

Comparative Statics $V(k,d,w)$

From the Envelope Theorem we can derive the marginal changes of v^{stay} and v^{exit} with respect to k, d and w:

$V(k,d,w)$ **is strictly increasing in** k **as:**

$$\frac{\partial v^{stay}(k,d,w)}{\partial k} = \left(1-\rho(k',s)\right)\left(f'(k)+(1-\delta)\right)u'(c^{stay}) > 0; \text{ and } \frac{\partial v^{exit}(k,d,w)}{\partial k} = \frac{r\theta_k}{1+r}\frac{u'(c^{loot})}{1-\beta} > 0$$

$V(k,d,w)$ **is decreasing in** d **as:**

$$\frac{\partial v^{stay}(k,d,w)}{\partial d} = -(1+r)\left(1-\rho(k',s)\right)u'(c^{stay}) < 0; \text{ and } \frac{\partial v^{exit}(k,d,w)}{\partial d} = 0$$

Monotonicity of $V(k,d,w)$ **with respect to** w**:**

$$\frac{\partial v^{stay}(k,d,w)}{\partial w} = -\left(1-\rho(k',s)\right)u'(c^{stay}) < 0; \text{ and } \frac{\partial v^{exit}(k,d,w)}{\partial w} = \frac{r}{1+r}\frac{u'(c^{loot})}{1-\beta} > 0.$$

Case 1: For some w_0, $v^{stay}(k,d,w_0) > v^{exit}(k,d,w_0)$

Since v^{stay} is decreasing in w while v^{exit} is increasing in w, then there must exist a single w^* such for $w = w^*$, $v^{stay}(k,d,w^*) = v^{exit}(k,d,w^*)$.

(i) For any $w < w^*$, $v^{stay}(k,d,w) > v^{exit}(k,d,w)$ and therefore $V(k,d,w) = v^{stay}(k,d,w)$ is decreasing in w

(ii) For any $w > w^*$, $v^{stay}(k,d,w) < v^{exit}(k,d,w)$ and therefore $V(k,d,w) = v^{exit}(k,d,w)$ is increasing in w

Case 2: For some w_0, $v^{stay}(k,d,w_0) < v^{exit}(k,d,w_0)$

Since v^{stay} is decreasing in w while v^{exit} is increasing in w, the two values will diverge as w increases. As a result for any w, $V(k,d,w) = v^{exit}(k,d,w)$ increases.

Monotonicity of $V(k,d,w)$ **with respect to** θ_z**,** θ_k **and** Z

$$\frac{dv^{exit}(k,d,w)}{d\theta_z} = \frac{rZ}{1+r}\frac{u'(c^{exit})}{1-\beta} > 0; \text{ and } \frac{dv^{stay}(k,d,w)}{d\theta_z} = \beta\left(1-\rho(k',s)\right)\frac{dEV}{d\theta_z}(k',d',w')$$

$$\frac{dv^{exit}(k,d,w)}{d\theta_k} = \frac{rk}{1+r}\frac{u'(c^{exit})}{1-\beta} > 0; \text{ and } \frac{dv^{stay}(k,d.w)}{d\theta_k} = \beta\left(1-\rho(k',s)\right)\frac{dEV}{d\theta_k}(k',d',w')$$

$$\frac{dv^{exit}(k,d,w)}{dZ} = \frac{r\theta_z}{1+r}\frac{u'\left(c^{exit}\right)}{1-\beta} > 0; \text{ and } \frac{dv^{stay}(k,d,w)}{dZ} = \left(1-\rho(k',s)\right)\left[\varphi'(Z)u'\left(c^{stay}\right)+\beta\frac{dEV(k',d',w')}{dZ}\right]$$

We now need to determine the sign of $\frac{dEV}{d\theta_z}$, $\frac{dEV}{d\theta_k}$ and $\frac{dEV}{dZ}$. We know that $EV(k',d',w')$ is the unique fixed point of a contraction mapping Λ (see Rust 1988 and 1994) such that when ε has an extreme value distribution, we have:

$EV = \Lambda(EV) = \log\left[\exp\left(v^{stay}(k',d',w')\right)+\exp\left(v^{exit}(k',d',w')\right)\right]$

So we have $H(EV;\theta_z,Z) \equiv EV - \Lambda(EV) = (I-\Lambda)(EV) = 0$. By the implicit function theorem:

$$\frac{dEV}{d\theta_z} = \left(I - \Lambda'(EV)\right)^{-1} \frac{d\Lambda(EV)}{d\theta_z}$$

Now by differentiating Λ with respect to EV, we obtain $\Lambda'(EV) = \beta\,(1-\rho(k'',s'))\,Pr\,(\chi = 0|k',d',w')$ so that:

$$(I-\Lambda)'\,(EV) = 1 - \beta\left(1-\rho(k'',s')\right)Pr\left(\chi = 0|k',d',w'\right)$$

In addition we can show that:

$$\frac{d\Lambda(EV)}{d\theta_z} = \frac{rZ}{1+r}\frac{u'\left(c'^{exit}\right)}{1-\beta}Pr\left(\chi = 1|k',d',w'\right)$$

Hence we obtain:

$$\frac{dEV}{d\theta_z} = \frac{Pr\,(\chi = 1|k',d',w')}{1-\beta\,(1-\rho(k'',s'))\,Pr\,(\chi = 0|k',d',w')}\frac{rZ}{1+r}\frac{u'\left(c'^{exit}\right)}{1-\beta} > 0$$

Similarly we determine:

$$\frac{dEV}{d\theta_k} = \frac{Pr\,(\chi = 1|k',d',w')}{1-\beta\,(1-\rho(k'',s'))\,Pr\,(\chi = 0|k',d',w')}\frac{rk}{1+r}\frac{u'\left(c'^{exit}\right)}{1-\beta} > 0$$

$$\frac{dEV}{dZ}(k',d',w') = \frac{\varphi'(Z)u'(c'^{stay})Pr\,(\chi = 0|k',d',w') + \frac{r\theta_z}{1+r}\frac{u'\left(c'^{exit}\right)}{1-\beta}Pr\,(\chi = 1|k',d',w')}{1-\beta\,(1-\rho(k'',s'))\,Pr\,(\chi = 0|k',d',w')} > 0$$

Given that $\frac{dEV}{d\theta_z}$, $\frac{dEV}{d\theta_k}$ and $\frac{dEV}{dZ}$ are all strictly positive, it follows that V is strictly increasing in θ_z, θ_k and Z.$\blacksquare$

Comparative statics: Monotonicity of $\Delta V(k,d,w)$

Comparative statics of $\Delta V(k,d,w)$ with respect to d, w, θ_z and θ_k

First let us analyze the partial effect of d on $\Delta V(k,d,w)$.

$\frac{\partial \Delta V(k,d,w)}{\partial d} = -\,(1+r)\left(1-\rho(k',s)\right)u'(c^{stay}) < 0$

It follows that ΔV is decreasing with respect to d.

Second, we analyst the partial effect of w on $\Delta V(k,d,w)$.

$\frac{\partial \Delta V(k,d,w)}{\partial w} = -\left(1-\rho(k',s)\right)u'(c^{stay}) - \frac{r}{1+r}\frac{u'(c^{exit})}{1-\beta} < 0$

Therefore ΔV is decreasing in w.

We are now interested in the effect of θ_z on $\Delta V(k,d,w)$.

$$\frac{d\Delta V(k,d,w)}{d\theta_z} = \beta\left(1-\rho(k',s)\right)\frac{dEV}{d\theta_z}(k',d',w') - \frac{rZ}{1+r}\frac{u'(c^{exit})}{1-\beta}$$

Replacing $\frac{dEV}{d\theta_z}$ by its expression and given c^{exit} is constant by assumption, $u'\left(c^{exit}\right) = u'\left(c'^{exit}\right)$, we obtain:

$$\frac{d\Delta V(k,d,w)}{d\theta_z} = \frac{rZ}{1+r}\frac{u'\left(c^{exit}\right)}{1-\beta}Q \tag{16}$$

where $Q \equiv \dfrac{\beta\left(1-\rho(k',s)\right)Pr\left(\chi=1|k',d',w'\right)+\beta\left(1-\rho(k'',s')\right)Pr\left(\chi=0|k',d',w'\right)-1}{1-\beta\left(1-\rho(k'',s')\right)Pr\left(\chi=0|k',d',w'\right)}$.

Now, it is clear that the numerator $\beta\left(1-\rho(k',s)\right)Pr\left(\chi=1|k',d',w'\right)+\beta\left(1-\rho(k'',s')\right)Pr\left(\chi=0|k',d',w'\right)<1$. It follows that the $\frac{d\Delta V(k,d,w)}{d\theta_z}<0$. That is the return to staying decreases as θ_z increases.

Similarly, we determine the monotonicity with respect to θ_k:

$$\frac{d\Delta V(k,d,w)}{d\theta_k} = \frac{rk}{1+r}\frac{u'\left(c^{exit}\right)}{1-\beta}Q<0 \tag{17}$$

That is the return to staying decreases as θ_k increases.

Non-monotonicity of $\Delta V(k,d,w)$ with respect to k and Z

Let us first consider the case of k:

$$\frac{d\Delta V(k,d,w)}{dk} = \left(1-\rho(k',s)\right)\left(f'(k)+(1-\delta)\right)u'(c^{stay}) - \frac{r\theta_k}{1+r}\frac{u'(c^{exit})}{1-\beta} \tag{18}$$

To determine the non-monotonicity of ΔV with respect to k, we will apply the idea of relative concavity[22] to $v^{stay}(k,d,w)$ and $v^{loot}(k,d,w)$. As $u(c^{stay})$ is a composite of two increasing and concave functions, there is a presumption that it is more concave in k than $u(c^{exit})$, which implies that $v^{stay}(k,d,w)$ would be more concave than $v^{exit}(k,d,w)$. We want to determine the condition under which this is true, i.e. $-\frac{\partial^2 v^{stay}/\partial k^2}{\partial v^{stay}/\partial k} > -\frac{\partial^2 v^{exit}/\partial k^2}{\partial v^{exit}/\partial k}$.

We can show that $v^{stay}(k,d,w)$ is more concave than $v^{exit}(k,d,w)$ with respect to k if the following condition is satisfied:

$$-\frac{f''(k)}{f'(k)+(1-\delta)} - \left(f'(k)+(1-\delta)\right)\frac{u''(c^{stay})}{u'(c^{stay})} \quad > \quad -\frac{r\theta_k}{1+r}\frac{u''(c^{exit})}{u'(c^{exit})} \tag{19}$$

Under this condition, v^{stay} exhibits faster diminishing returns to capital than v^{exit}. This implies that the gains from staying will increase for sufficiently low capital levels, for which the first term in equation (18) is larger that the second term. For large enough capital levels, the second becomes greater than the first term. This results in the non-monotonicity of ΔV with respect to k.

Let us now look at the non-monotonicity with respect to Z.

[22] Assume h and g are twice differentiable on (a,b), h is concave with respect to g (or h is more concave than g) if for h and g increasing we have: $-\frac{h''(x)}{h'(x)} > -\frac{g''(x)}{g'(x)}$ for any $x \in (a,b)$

$$\frac{d\Delta V(k,d,w)}{dZ} = \left(1-\rho(k',s)\right)\left[\varphi'(Z)u'\left(c^{stay}\right)+\beta\frac{dEV(k',d',w')}{dZ}\right]-\frac{r\theta_z}{1+r}\frac{u'(c^{exit})}{1-\beta}$$

$$\frac{d\Delta V(k,d)}{dZ} = \left(1-\rho(k',s)\right)\varphi'(Z)\left[u'(c^{stay})+\beta u'(c'^{stay})D\right]+\frac{r\theta_z}{1+r}\frac{u'\left(c^{exit}\right)}{1-\beta}Q \tag{20}$$

where $D \equiv \dfrac{Pr\left(\chi=0|k',d',w'\right)}{1-\beta\left(1-\rho(k'',s')\right)Pr\left(\chi=0|k',d',w'\right)}$, and $Q<0$ was defined above.

Applying the same method, we show that $v^{stay}(k,d,w)$ is more concave than $v^{loot}(k,d,w)$ with respect to Z if:

$$-\frac{\varphi''(Z)}{\varphi'(Z)}-\varphi'(Z)\frac{u''(c^{stay})+\beta u''(c'^{stay})D}{u'(c^{stay})+\beta u'(c'^{stay})D} > -\frac{r\theta_z}{1+r}\frac{u''\left(c^{exit}\right)}{u'\left(c^{exit}\right)} \tag{21}$$

Then under condition (21), ΔV is non-monotonic with respect to Z. v^{stay} exhibits faster diminishing returns to resources than v^{exit}. This implies that the gains from staying will increase for sufficiently low resource levels, for which the first term in equation (20) is larger that the second term. For large enough resource levels, the second becomes greater than the first term.

Effect of Z on $\dfrac{d\Delta V(k,d,w)}{d\theta_z}$

The cross-partial derivative of ΔV with respect to θ_z and Z is given by:

$$\frac{d^2\Delta V(k,d,w)}{dZ\partial\theta_z} = \left(u'\left(c^{exit}\right)+\frac{r\theta_z Z}{1+r}u''\left(c^{exit}\right)\right)\frac{rQ}{(1+r)(1-\beta)} \tag{22}$$

We know that the Q is negative so that $\dfrac{d^2\Delta V(k,d,w)}{d\theta_z\partial Z}<0$ if and only if $u'\left(c^{exit}\right)+\dfrac{r\theta_z Z}{1+r}u''\left(c^{exit}\right)>0$. That is:

$$-\frac{u''\left(c^{exit}\right)}{u'\left(c^{exitt}\right)} < \frac{1+r}{r\theta_z Z} \tag{23}$$

The LHS of the inequality is the Arrow-Pratt measure of risk aversion. If the dictator is not too risk averse then the negative effect of liquidity supplied by banks on the likelihood of looting increases with resource wealth Z. ■

7 Appendix A.2: Proof of Proposition 2

Case 1: $v^{exit}(k,d,w) > v^{exit}(\overline{\theta}_z)$ ***for a given*** d ***and*** θ_k

By definition of $v^{exit}(\overline{\theta}_z)$, $v^{exit}(k,d,w) > v^{exit}(\overline{\theta}_z)$ implies that for any value of capital k, $v^{stay}(k,d,w) < v^{exit}(k,d,w)$. Looting is always optimal independently of k.

../../../AppData/Local/Temp/GraphRegionI_March09.eps

Figure 4: Case 1: Dictator Always Loots

Case 2: $v^{exit}(\underline{\theta}_z) < v^{exit}(k,d,w) < v^{exit}(\overline{\theta}_z)$ ***for a given*** d ***and*** θ_k

Given that 1) $v^{exit}(\underline{\theta}_z) < v^{exit}(k,d,w) < v^{exit}(\overline{\theta}_z)$ for some d and θ_k; 2) both v^{exit} and v^{stay} are continuous in k and strictly increasing; and 3) the value of staying is more concave than the value of looting under condition (19), there exist two points of intersection between v^{stay} and v^{exit}. The value v^{stay} increases fast enough (for low k, v^{stay} increases faster than v^{exit}) to intersect v^{exit} from below at $\tilde{k}_1$. As k increases the combination of point 2 and 3 results in v^{stay} intersecting v^{exit} from above at $\tilde{k}_2$. Formally, there exist two capital levels $\tilde{k}_1$ and $\tilde{k}_2$ such that for $\tilde{k}_1 < \tilde{k}_2$:

1. $v^{stay}(\tilde{k}_1,d,w) = v^{exit}(\tilde{k}_1,d,w)$ and $\dfrac{\partial v^{stay}}{\partial k}(\tilde{k}_1,d,w) > \dfrac{\partial v^{exit}}{\partial k}(\tilde{k}_1,d,w)$
2. $v^{stay}(\tilde{k}_2,d,w) = v^{exit}(\tilde{k}_2,d,w)$ and $\dfrac{\partial v^{stay}}{\partial k}(\tilde{k}_2,d,w) < \dfrac{\partial v^{exit}}{\partial k}(\tilde{k}_2,d,w)$
3. $v^{stay}(k,d,w) < v^{exit}(k,d,w)$ for $k < \tilde{k}_1$ and $k > \tilde{k}_2$; and $v^{stay}(k,d,w) > v^{exit}(k,d,w)$ for $\tilde{k}_1 < k < \tilde{k}_2$

`../../../AppData/Local/Temp/GraphRegionII_March09.eps`

Figure 5: Case 2: Dictator Loots for Low and High k

Case 3: $v^{exit}(k,d,w) < v^{exit}(\underline{\theta}_z)$ ***for a given*** d ***and*** θ_k

Given that 1) $v^{exit}(k,d,w) < v^{exit}(\underline{\theta}_z)$ for some debt level d; 2) both v^{exit} and v^{stay} are continuous in k and strictly increasing; and 3) the value of staying is more concave than the value of looting under condition (19), it follows that there exists a capital level $\tilde{k}_3$ such that

$$v^{stay}(\tilde{k}_3,d,w) = v^{exit}(\tilde{k}_3,d,w) \text{ and } \frac{\partial v^{stay}}{\partial k}(\tilde{k}_3,d,w) < \frac{\partial v^{exit}}{\partial k}(\tilde{k}_3,d,w) \text{ for some } d \text{ and } w$$

The inequality is necessary because as v^{exit} is initially below v^{stay}, it has to grow faster than v^{stay} to catch up. For any $k < \tilde{k}_3$, $v^{stay}(k,dw) > v^{exit}(k,d,w)$. For any $k > \tilde{k}_3$, $v^{stay}(k,d,w) < v^{exit}(k,d,w)$.

To summarize, if $v^{exit}(k,d,w) < v^{exit}(\underline{\theta}_z)$ for some debt level d, and diverted funds w then there exists a capital level $\tilde{k}_3$ such that $v^{stay}(\tilde{k}_3,d,w) = v^{exit}(\tilde{k}_3,d,w)$ and $\left(1-\rho(k',s)\right)\left(f'(\tilde{k}_3)+(1-\delta)\right)u'(c^{stay}) < \dfrac{r\theta_k}{1+r}\dfrac{u'(c^{exit})}{1-\beta}$. The dictator loots for any capital level above $\tilde{k}_3$ and stays otherwise.

`../../../AppData/Local/Temp/GraphRegionIII_March09.eps`

Figure 6: Case 3: Dictator Loots only for High k

Comparative static of $\tilde{k}_i$ ($i = 1,2,3$) with respect to θ_z and θ_k

Using $\dfrac{dEV}{d\theta_k}$ and $\dfrac{dEV}{d\theta_z}$ determined in Appendix A.1 and the implicit function theorem, we obtain:

$$\frac{d\tilde{k}_i}{d\theta_k} = \frac{\dfrac{rk}{1+r}\dfrac{u'(c^{exit})}{1-\beta}Q}{(1-\rho(k',s))\,(f'(k)+(1-\delta))\,u'(c^{stay}) - \dfrac{r\theta_k}{1+r}\dfrac{u'(c^{exit})}{1-\beta}}$$

$$\frac{d\tilde{k}_i}{d\theta_z} = \frac{\dfrac{rZ}{1+r}\dfrac{u'(c^{exit})}{1-\beta}Q}{(1-\rho(k',s))\,(f'(k)+(1-\delta))\,u'(c^{stay}) - \dfrac{r\theta_k}{1+r}\dfrac{u'(c^{exit})}{1-\beta}}$$

We established in Appendix A.1 that Q is negative so that the signs of these ratios depend on the sign of the denominator. When the marginal liquidity of capital is larger than the marginal product of capital, then the denominator is negative and $\tilde{k}_i$ increases with both θ_k and θ_z. In particular, we infer that the denominator is negative at $\tilde{k}_2$ and $\tilde{k}_3$ (see Case 2 and Case 3) and positive at $\tilde{k}_1$ (see Case 2). Therefore, it follows that $\tilde{k}_1$ is decreasing in θ_k and θ_z while $\tilde{k}_2$ and $\tilde{k}_3$ are increasing with these parameters.■