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Media Freedom, Bureaucratic Incentives, and the Resource Curse[*]

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Abstract

How can a non-democratic regime provide proper incentives for a state bureaucracy? The dictator should gather information on the bureaucrats' performance. Such information can be collected either through a centralized source such as a secret service or a decentralized system such as free media. Free media aggregate information and thus constrain bureaucrats, but might also help citizens to coordinate on actions against the incumbent. Secret services do not leak information to the public but may also collude with the bureaucrats. We develop a simple dynamic model to argue that free media are less likely to emerge in resource-rich economies: the resource rents create incentives for dictators to cling to power. We then demonstrate that controlling for country fixed effects, media are less free in oil-rich countries; the effect is especially strong in less democratic countries. These results are robust to the choice of specification and and a variety of controls including the level of economic development and democracy, literacy, Internet penetration, country and population size, size of government, and inequality.

Keywords: media freedom, non-democratic politics, bureaucracy, resource curse.

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"We need full and truthful information. And the truth should not depend upon whom it has to serve. We can accept only the division into unofficial information (for the Comintern Executive only) and official information (for everybody)."

Vladimir Lenin (1921).

1 Introduction

In 1985, Mikhail Gorbachev, the new leader of the Soviet Union, faced a dilemma.[1] Without allowing certain amount of free speech, reforms of the highly inefficient bureaucracy and the command economy seemed all but impossible. At the same time, free flow of information would have undermined the very foundations of the Communist Party's rule. Gorbachev's dilemma was not unique: every autocratic regime has to provide incentives for low-level officials, and most of them fear free information as a threat to their political survival. Indeed, free media, the very same monitoring mechanism that helps in providing proper incentives to the bureaucracy, might also help citizens to overcome coordination problems in organizing a revolt.

The trade-off between restricting information flows to maintain political control and the need to use independent information sources to provide proper incentives for the bureaucrats is well illustrated by the slow response of Chinese state officials to the outbreak of Severe Acute Respiratory Syndrome (SARS). In the absence of free media, incentives for lower-tier bureaucrats to provide sufficient effort and transmit necessary information to higher levels proved inadequate (Saich, 2003). While the first information on SARS was received by local political authorities in November 2002, there was no real action until at least the end of March 2003. When on March 15, 2003 the World Health Organization issued a global warning on SARS, the Chinese Propaganda Department prohibited Chinese media to report it (*Washington Post,* May 13, 2003). Beijing's hospitals were trying to conceal the extent of the disease by hiding or transferring patients during visits of WHO officials (*Time,* April 18, 2003). [2] Four years later, the story repeats itself with AIDS: the top

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[1] The words "Gorbachev's dilemma" were first used by Eugene H. Methvin as a title for the article in the National Review (Dec. 4, 1987). The article starts "One swallow does not make a spring. And one prompt TASS report of rioting in Central Asia does not make a free Soviet press. But among Kremlin watchers it is certainly a noteworthy occurrence – as if, say, a California condor showed up at Capistrano."

[2] Saich (2003), in a week-by-week analysis of the story, attributes the slow reaction to bureaucratic inefficiency and disincentives for local politicians to gather and transmit information to higher levels. "Once action is called for, the vertical and segmented structure of China's bureaucracy hampers effective action. It is difficult to gather

Chinese party officials are more concerned with containing the foreign press (*Economist*, January 18, 2007).

As the recent "color revolutions" in Serbia, Georgia, Ukraine, and Kyrgyzstan have shown, even partly independent media are crucial in replacing non-democratic dictators (McFaul, 2005, Hill, 2005). On the other hand, the failure to provide the bureaucracy with adequate incentives may also cost the dictator his job. The lack of incentives undermines the state's capacity to handle major challenges such as war, large-scale natural disasters or macroeconomic crises. In these cases, even the censored media cannot cover up the incompetence of the dictator which might eventually bring the regime down. For example, the inability of coping with Chernobyl disaster has made obvious the need for change in the Soviet Union. As Methvin (1987) put it, "There surely must be days–maybe the morning after Chernobyl–when Gorbachev wishes he could buy a Kremlin equivalent of the Washington Post and find out what is going on in his socialist wonderland." The fall of Romania's Ceauşescu (Hardin, 1995, p.31) shows that in the absence of free media a dictator may lose any connection with reality; this in turn makes even a very centralized regime structurally vulnerable. On December 21, 1989, after days of local and seemingly limited unrest in the province of Timişoara, Ceauşescu called for a grandiose meeting at the central square of Bucharest, apparently to rally the crowds in support of his leadership. In a stunning development, the meeting degenerated into anarchy, and Ceauşescu and his wife had to flee the presidential palace, only to be executed by a firing squad two days later.

In this paper, we study the determinants of media freedom in a non-democratic or partially democratic state. To derive empirical predictions, we consider a simple model with a dictator who chooses a policy that affects both his own and his citizens' interests. A policy succeeds only if it is properly implemented, which requires hiring bureaucrats who may either work or shirk. In order to induce high effort, the dictator needs some verifiable information on the bureaucrat's performance (Holmstrom, 1979). We distinguish two cases: the case of a centralized information collection ("secret service") and a decentralized one ("mass media"). The secret service can collude with the bureaucrat and conceal evidence of the latter's failure; preventing such collusion involves additional costs. In contrast, the very decentralized nature of free media collect and distribute

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information across different sectors." ("The Real Fallout From China's Chernobyl", *Financial Times*, May 27, 2003.) Saich quotes a number of high-profile publications by Chinese media dismissing any information on the new disease as a mere gossip. The Chernobyl disaster, which occurred on April 26, 1986, was not acknowledged by Soviet officials until two days later, when the news had already spread by the Western media.

information on the policy outcome makes collusion impossible. However, media also makes the policy outcome known to the public, which may threaten the dictator's position in power. If the media report that the policy has failed, the public infers that the dictator has low ability; therefore the citizens would be better off replacing the dictator. What is more important, a negative media report makes the dictator's incompetence common knowledge, which is critical for a successful revolution. Indeed, revolutions involve a coordination problem; a citizen takes part in a revolt against the incumbent only if he knows that others will join a revolt (e.g., Tilly, 1978, Chwe, 2003, Acemoglu and Robinson, 2006, Persson and Tabellini, 2006).[3] We consider a dynamic game where citizens update their beliefs on the dictator's ability based on both private and public signals. In equilibrium, the dictator is replaced whenever there is a public report of the policy failure; citizens know that his misery is shared by others and everyone is sufficiently unhappy to rise against the incumbent.

Our theory implies that oil rich countries should have lower media freedom. Moreover, this relationship should be especially strong in less democratic countries, where other feedback channels do not function properly. We use both cross-country and panel data to test these predictions. We take media freedom indices from Freedom House and Reporters Sans Frontiers, democracy index from Polity IV, and oil reserves and oil production from BP. Controlling for countries' fixed effects, the level of economic development, democracy and other relevant variables, we find that the media are indeed less free in oil-rich countries. The effect of natural resources on media freedom is especially strong in less democratic countries. In mature democracies, there is no relationship between oil reserves and media freedom.

The results are statistically significant, economically important, and robust to a variety of controls including the level of development, literacy, Internet penetration, country and population size, size of government, and Gini index of inequality. Interestingly, the magnitude of the effect is the same whether we run panel or cross-section regressions and whether we choose logarithm of oil reserves or logarithm of oil production as an independent variable. According to our estimates, increasing oil reserves by 10% would reduce media freedom by 0.4 points. In other words, if Brazil's reserves were equal to the level of Venezuela's, Brazil's media freedom would have developed likewise.

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[3]Free media is not the only mechanism for aggregating information which is dangerous to rulers. Only a few autocrats allow free elections at the local level, decentralized NGO, or civil society. In this paper, we focus in particular on media, but the trade-off we analyze extends to other institutions.

While we focus on testing the prediction that natural resource abundance undermines media freedom in non-democratic societies, we also control for alternative explanations. First, there is a positive correlation (and a two-way causality) between media freedom and the level of democracy per se. Our empirical test yields that natural resources are a significant determinant of media freedom even controlling for the level of democracy, either present, or lagged. Second, media freedom may be negatively correlated with resource abundance as the latter provides dictators with means to compensate citizens for banning free media. Ross (2001) and Acemoglu, Robinson, and Verdier (2004) observe that the dictator might simply use resource rents to buy off political challengers. (Ross, 2001, demonstrates a significant correlation between natural resource abundance and the probability of having a dictatorial regime, and so does Tsui, 2005). In our framework, this argument implies that citizens value media freedom per se while dictators do not, e.g. for the standard reason that media may help in overcoming the coordination problem in revolts. Yet, dictators with no resources at hand are forced to allow free media as otherwise citizens would revolt. This "buy-off" argument treats resource rents as extra revenues available to the dictator. From this point of view, natural resources are equivalent to foreign aid or any other sources of income that he can use to pay off his citizens. We control for the *total* amount of resources that dictator can redistribute – GDP per capita, share of government in GDP, inequality – and find that our results are robust. Finally, we provide additional evidence that media freedom does improve the quality of bureaucracy – even controlling for country fixed effects and other variables.

Thus, our model demonstrates that in the presence of abundant resources, dictators are less willing to allow free media. Consistent with our theory, non-democratic countries such as Nigeria, Zambia, Sierra Leone, Angola, and Saudi Arabia have vast resources and poor growth performance, while the Asian tigers of South Korea, Taiwan, Hong Kong, and Singapore, while predominantly nondemocratic in 70s and 80s, have both high growth rates and scarce natural resources. These East Asian countries have managed to establish an effective meritocratic bureaucracy (Evans and Rauch, 1999, 2000; see also Gehlbach and Keefer, 2006, on the role of institutionalized parties in autocracies). Again, it is perhaps not coincidental that Gorbachev chose *glasnost* (openness) as the Soviet Union faced a substantial decline in the price of oil,[4] its major commodity export. On the contrary, with the oil price rising, Putin's Russia has experienced a significant decline in any

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[4]While the policy of *perestroika* was proclaimed in 1985, it was not until 1987 that *glasnost* became popularized and implemented on a large scale. In 1985–1986, the major stress was on *uskorenie* (modernization). The sharp oil price decline took place in 1986, which was also the year of the Chernobyl disaster.

media freedom ranking.

Among those dictators that chose not to liberalize the media, there is a clear pattern. They rely on security services; some even create multiple security services, specifically designed to spy on each other. The multiple security services are a somewhat intermediate solution, with the costs and benefits of both a single security service and competitive media. Making these security services compete, a dictator reduces the danger of collusion between them and bureaucrats, but also incurs a risk of information leakage to the public, not to mention substantial costs and delays. This was especially visible in "sultanistic regimes" (Chehabi and Linz, 1998, Egorov and Sonin, 2004) – examples include Idi Amin in Uganda, Francisco Machas Nguema in Equatorial Guinea, Claude Duvalier in Haiti, Fulgencio Batista in Cuba, Rafael Trujillo in the Dominican Republic, Reza Shah Pahlavi in Iran, Mobutu in Zaire, and Ferdinand Marcos in Philippines – which combined dictatorial oppression with dismal economic performance. The collection of case studies, Chehabi and Linz (1998) shows that in these regimes, the media were tightly controlled, and bureaucratic efficiency was singularly low; interestingly, such regimes were especially likely to occur in resource-rich countries.

The rest of the paper is organized as follows. Section 2 introduces the theoretical model; Section 3 contains the analysis. In Section 4, we present empirical support for our theory. Section 5 discusses related literature. Section 6 concludes.

2   Theory

Setup

There is an infinite horizon economy with a dictator D, a mass 1 of identical citizens, and also a mass of 1 of short-lived bureaucrats B. There economy includes two sectors: the resource sector and the "modern" sector. The resource sector produces a globally traded good, which yields a stream of revenues $Y_t^R = R$; the cost of production is normalized to zero. The other sector is the "modern economy"; its total output depends on the provision of a public good such as property rights and contract enforcement, infrastructure, education, etc. The amount of public good provided, A_t, depends both on the policy chosen by the dictator and the efforts exerted by the state bureaucracy as follows.

In period t, the dictator's policy space $\mathfrak{P}_t$ consists of right ($\pi \in \mathfrak{P}_t^R$) and wrong ($\pi \in \mathfrak{P}_t^W$)

policies. His ability to chose a right policy is imperfect: the probability of picking a right policy is $\nu \in \{\nu^L, \nu^H\}$, where v^L corresponds to the dictator with the low-ability type ("inept"), and ν^H to the high-ability type ("competent"). Hereinafter we normalize $\nu^H = 1$. Dictators are drawn from a distribution where μ of them are competent and $1 - \mu$ are inept.

Each bureaucrat j is responsible for a single task A^j and may exert either high or low effort $e^j \in \{e^H, e^L\}$ in fulfilling this task; the cost of high effort is $c > 0$, while the low effort is costless.

We assume a perfect complementarity between dictator's policy choice and bureaucrat's efforts. If the bureaucrat j exerts effort e^H and the policy choice is right $\pi \in \mathfrak{P}_t^R$, then $A_t^j = A^H$; if either effort is low $e^j = e^L$ or the policy is wrong $\pi \in \mathfrak{P}_t^W$, then $A_t^j = A^L < A^H$.

The total amount of the public good is $A_t = \int_J A_j^t dj$, and the output of the modern sector is normalized to $Y_M^t = A_t$. Thus, the total output of the economy equals

$$Y^t \equiv Y_R^t + Y_M^t = R + A_t.$$

The income of citizen i in period t is

$$y_t^i = \xi_t^i A_t,$$

where ξ_t^i is an idiosyncratic shock, ξ_t^i i.i.d. with $\mathbf{E}\xi_t^i = 1$ (assume that ξ_t^i is an atomless distribution with full support on $[0, \infty)$, c.d.f. F and p.d.f. f).

We assume that dictator taxes the modern sector at the rate τ; each citizen's after-tax income is therefore $(1 - \tau)\xi_i^{t'} A^{t'}$. The tax rate τ is exogenous; one could consider a model where the dictator sets the tax rate at the level that maximizes the tax revenue subject to the distortions of the modern sector's incentives to produce. As the resource sector produces pure rent, it is natural to assume that the dictator appropriates its revenues Y_R^t completely.

Both citizens' and the dictator's discount rate is β.

Bureaucratic Incentives

The dictator cannot provide proper incentives to bureaucrats directly as he observes only the total output but not the individual bureaucrats' efforts. To give the bureaucrats incentives to exert high effort, he may either use a centralized source of information (a "secret service") S, or free media M. We assume that the free media is unable to cooperate in concealing true evidence, while the secret service may be bribed by bureaucrats.[5]

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[5] For the brevity's sake we do not model production of information by mass media and media competition explicitly. One could consider a monopolistic competition model where information acquisition is cheap (recall that each media

The dictator's instantaneous utility is given by

$$U_t = (\tau A_t + R)\,\mathbf{I}\,\{\text{stays in power}\} - [\text{payments to } B \text{ and } S]$$

where τA_t comes from taxes from modern sector, all revenues from the resource sector accrue to the dictator, and $\mathbf{I}\{X\}$ is the indicator function which takes the value of 1 if and only if X is true; otherwise, $\mathbf{I}\{X\} = 0$. The dictator pays the bureaucrats and the secret service to maximize his expected life-time utility

$$\sum_{t'=t}^{\infty} \beta^{(t'-t)} \mathbf{E}_t U_{t'}.$$

We assume that the dictator can only condition his payments to the bureaucrat j on the report $s_t^j \in \{A^L, A^H\}$ that he gets about this bureaucrat's performance. This signal s_t^j is produced either by free media M or secret service S, depending on the regime the dictator chose. We capture the feature that S is centralized and M is not by assuming that M necessarily reports $s_t^j = A_t^j$; S does not have such restriction. The reason is that it is hard for the disorganized media outlets to coordinate on publishing or broadcasting false information.

Each bureaucrat maximizes his current period's utility. He has limited liability: the wage cannot be negative. The bureaucrat chooses the effort level, taking into account the dictator's ability v^d, $d = L, H$. If the dictator is inept, the bureaucrat does not know whether the policy he is asked to implement is right.

Media Freedom

In each period, the dictator chooses between free media and censorship (whenever he is indifferent between the two options, he prefers free media, e.g. as censorship has some implementation costs). Both free media and secret service observe the amount of public goods provided by each bureaucrat; the difference is in the way they report it. Free media publish the information they get. Under censorship, media are bound to publish good news, so citizens cannot distinguish between good news dictated by censorship and good news due to successful implementation of the right policy. If media are free, they publish information that allows the dictator to punish individual bureaucrats; the same information helps citizens update their beliefs about the dictator's competence. Conditional

uncovers a part of the puzzle only) but not free. Media outlets invest in information acquisition, because if they do not they will eventually be out of business, and in the presence of censorship they do not invest because they do not have any incentives to do so.

on the information, citizens may conclude that the policy failed due to the dictator's incompetence, and he thus should be replaced. We also assume that the dictator's ability to impose censorship is restricted by the other (imperfect) democratic institutions: even if media are censored, citizens are able to get a truthful public signal with some probability $\alpha > 0$.[6] Below it will become clear that α is also a probability that a failing ruler gets replaced even if there are no negative media reports; we will therefore interpret α as a proxy for democratic institutions.

In addition to the public signal delivered by media, either free or censored, individuals observe their personal welfare. While this allows each of them to update her own beliefs about the dictator's ability, she cannot be sure whether the other citizens get a similar update and do not allow them to make an unambiguous conclusion about the quality of the policy.

As an alternative to the free media, the dictator may monitor the bureaucrat with the help of a secret service. The benefit of the secret service is that it reports to the dictator, but not to the general public; there is no competitive pressure and no free-rider problem. However, the very same benefit creates a potential for collusion with bureaucrats. A bureaucrat may offer a bribe to the secret service for not reporting his personal failure. This would be impossible in the case of media where the competition and free-riding would not allow such contracting. The evidence of policy failure may be concealed by secret service but may not be forged,[7] so a bureaucrat only has incentives to bribe when he fails; the secret service can accept bribes from any number of bureaucrats.

Citizens

In period t, each individual i receives a private signal y_i^t about her personal income and a public signal $s_{pub}(t)$ published in the media, which is an average of reports (truthful or not) about each bureaucrat. In the case of free media (M), the citizens get the same signal as the dictator: $s_{pub}(t) =$

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[6]There is a range of levels of 'political freedom' in dictatorial regimes. E.g., in the Soviet Union of late 1980s, there was no free press, but citizens have not been prosecuted for transmitting information from person to person; in 1970s, a mere personal conversation might have resulted in a (predominantly, administrative, but sometimes criminal) prosecution. In 1930-1950s, a political opinion in a private conversation often resulted in a concentration camp term or execution.

[7]If S could forge the evidence of failure, it would blackmail even the hardworking bureaucrats who exerted $e = e^H$. This would result in S earning rents but not producing any useful information for the dictator; hence the dictator would never hire such monitors. For our results to hold we need forging evidence of failure to be at least costlier than concealing this evidence.

$\int_{j \in J} s_t^j = \int_{j \in J} A_t^j$, while in the case of censored media citizens get a "censored" signal $s_{pub}(t) = \int_{j \in J} A^H = A^H$. At the end of each period, every citizen decides whether to participate in a revolt against the dictator in order to replace him with a new one. A revolt succeeds if and only if the share of citizens who participate exceeds γ; taking part in an unsuccessful revolt costs each participant $r > 0$.

Thus, citizens face both collective action and free-rider problems. While we do not develop a full-scale theory of collective action (see a discussion in Acemoglu and Robinson, 2006, and Persson and Tabellini, 2006), we are making a few natural assumptions on citizens' behavior (see below).

Citizen i maximizes her expected welfare

$$\sum_{t'=t}^{\infty} \beta^{(t'-t)} \mathbf{E}_t \left((1-\tau) y_i^{t'} - r\mathbf{I} \left\{ i \text{ participates in unsuccessful revolt in period } t' \right\} \right).$$

Timing

The timing of events in the stage game is as follows.

1. The dictator hires bureaucrats, picks a policy π from the set $\mathfrak{P}_t$, chooses the degree of media freedom (free or censored), and makes contracts with both the bureaucrats (payments w_L and w_H, depending on $s_t^j \in \left\{ A^L, A^H \right\}$ for each bureaucrat j, the report of media or the secret service) and the secret service (payments z_L and z_H which depend on s_t^j if secret service is chosen).

2. Each bureaucrat chooses the effort level $e_t^j \in \left\{ e^L, e^H \right\}$.

3. The policy outcomes A_t^j are realized for each bureaucrat j, and each citizen i learns his/her individual payoff y_t^i.

4. Mass media publish the true outcome $s_t^j = A_t^j$ if it is free and censored news ("policy outcome is successful") if it is not. If the secret service is hired, the secret service learns the policy outcome A_t^j. It then bargains with bureaucrats over the information s_t^j that it will deliver to the dictator (bureaucrats make a take-it-or-leave-it offer to the secret service). The secret service reports s_t^j, whatever it chooses, to the dictator.

5. The dictator pays the bureaucrats and the secret service according to the contracts.

6. Citizens decide whether or not to revolt, depending on information available. If the revolt is successful the dictator is replaced with a new one. The new dictator is competent with probability μ and inept with probability $1 - \mu$.

Equilibrium concept and assumptions

The game is dynamic, and there are multiple individuals having private information. Since payoff-relevant variables may include all private signals that individuals got during the reign of the current dictator, the widely-used concept of the Markov Perfect Equilibrium (e.g., Acemoglu and Robinson, 2006, and Lagunoff, 2006) is not directly applicable. On the other hand, the set of all subgame perfect equilibria is too large, which necessitates a refinement. We impose the following intuitive technical assumptions.

First, we put on restrictions on the citizens' strategy space. We assume that citizen i revolts if and only if (i) she knows for sure that the share of those who want to replace the current ruler is sufficient for a successful revolt and (ii) she is among these dissatisfied people.[8] A citizen wants to replace the ruler whenever she estimates the probability of the current dictator being competent being below μ, so the incumbent is worse than a random draw.

Second, we impose an assumption on the distribution $F\left(\cdot\right),\gamma$ and ν^L. Denote

$$\overline{A} = \nu^L A^H + \left(1 - \nu^L\right) A^L. \tag{1}$$

[8]An alternative approach for modeling revolutions is Persson and Tabellini (2006) who incorporated 'global games' (Morris and Shin, 2001) to resolve the collective action problem in revolutions. While suggesting a rationale for an individual to participate in a potentially unsuccessful revolt, global games still do not allow individuals to condition their actions on their costs and benefits from revolt's success or failure. In our context, this means that individuals' incentive to revolt do not depend on their perception of ruler's quality and, consequently, on the policy he conducts. Persson and Tabellini avoid this problem by making an ad hoc assumption about the link between citizens' benefits from participating in a successful revolt (defense of democracy) and state variable ("democratic capital"). In this paper, however, we emphasize the importance of public information (as opposed to private signals) in collective action, not how agents may solve the collective action problem if their private signals are strong relative to the public one (and if the public signal is stronger, as is the case with free media, uniqueness of equilibrium, which is the most attractive feature of global games, disappears). We therefore opt to model revolutions differently.

We assume that γ is sufficiently large so that for any $n \geq 1$,

$$\int \cdots \int \frac{1}{(A^H)^n} f\left(\frac{x_1}{A^H}\right) \ldots f\left(\frac{x_n}{A^H}\right) dx_1 \ldots dx_n < \gamma \qquad (2)$$

$$\frac{\frac{1}{(A^H)^n} \int \cdots \int f\left(\frac{x_1}{A^H}\right) \ldots f\left(\frac{x_n}{A^H}\right) dx_1 \ldots dx_n}{\frac{1}{A^n} \int \cdots \int f\left(\frac{x_1}{A}\right) \ldots f\left(\frac{x_n}{A}\right) dx_1 \ldots dx_n} < 1$$

The intuition is as follows. Suppose a citizen expects that a competent dictator always provides public good A^H, whereas an inept dictator provides public good A. A citizen who has received a stream of incomes x_t at time moments $t = 1, ..., n$ during the rule of the current dictator and has no other signals believes that the incumbent is at least as good as a random draw if and only if the likelihood ratio satisfies

$$\frac{\frac{1}{(A^H)^n} \int \cdots \int f\left(\frac{x_1}{A^H}\right) \ldots f\left(\frac{x_n}{A^H}\right) dx_1 \ldots dx_n}{\frac{1}{A^n} \int \cdots \int f\left(\frac{x_1}{A}\right) \ldots f\left(\frac{x_n}{A}\right) dx_1 \ldots dx_n} \geq 1.$$

Thus, we simply require that if the dictator is competent and provides high incentives to the bureaucrat, then the share of dissatisfied citizens is sufficiently low so that there is no revolt. In particular, if ν^H/v^L, the difference in dictator's potential abilities, is sufficiently small or γ, the revolution threshold, is sufficiently large, the assumption holds for any distribution.

Finally, we impose the following Markovian (stationarity) condition: any dictator's strategy, which includes a choice of an incentive scheme and contracts with bureaucrat and/or secret service, depends only on dictator's type. This simplifies the analysis as we do not need to study some counter-intuitive off-equilibrium paths; in the equilibrium we obtain, the dictator's strategy is the best response given his complete information set.

We consider equilibria where competent dictators $(a = a^H)$ choose high-powered incentives for the bureaucrat without imposing censorship; this captures the presumption that competent rulers are an ideal benchmark that citizens compare the real rulers with. For such equilibria to exist, it is sufficient to require that the bureaucrat's cost of effort is lower than the benefit of successful implementation of the policy to the competent dictator $c < \tau\left(A^H - A^L\right)$. We will make a stronger assumption

$$c < \nu^L \tau\left(A^H - A^L\right). \qquad (3)$$

This assumption implies that high effort is optimal even if the dictator is inept. The assumption holds whenever bureaucrats' effort is not too costly (c is not too high) and/or the policy outcome does matter ($A^H - A^L$ is large).

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3 Analysis

The analysis proceeds as follows. First, we study the behavior of the media and the security service given incentive contracts offered by the dictator. Then we compute how much it costs the dictator to implement high-powered or low-powered incentives for the bureaucrats, ignoring for a moment potential effects on the probability of remaining in power. After that we proceed with equilibrium responses of the citizens to the different reports by the media. Finally, we find out how dictator's choice of media freedom depends on the parameters of the model.

Bureaucrat, Media, and Secret Service

Denote the payments that the dictator makes to bureaucrat j if $s_t^j = A^H$ and $s_t^j = A^L$ by w^H and w^L, respectively. Similarly, denote the payments to secret service S by z^H and z^L.

If the media is free, the dictator always gets truthful information about the performance of each bureaucrat, and therefore has no need for additional (costly!) monitoring by secret service. Each bureaucrat j, knowing the dictator's true type, compares the expected payoff if he exerts low effort (which equals w^L) with his output if he exerts high effort (which equals $\nu^d w^H - c$, where $d = L, H$ is the dictator's type). This bureaucrat exerts high effort if and only if

$$v^d w^H - w^L \geq c. \tag{4}$$

Hence, inducing low effort is costless for the dictator (it is sufficient to set $w^L = w^H = 0$), while to induce high effort, he has to pay $w^H \geq c/\nu^d$, because $w^L \geq 0$. Thus, choosing $w^L = 0$ and $w^H = c/\nu^d$ is the cheapest way to induce high effort in the presence of free media.

Now we proceed with the case of censored media. If the secret service learns that the policy is implemented successfully by bureaucrat j (so $A_t^j = A^H$), it cannot report a policy failure. If it learns about a failure by bureaucrat j, it compares the bribe b offered by the bureaucrat with the difference of its payoffs, $z^L - z^H$, in cases it reports a failure or a success. Therefore, the secret service reports a failure if and only if there is indeed a failure, and the bribe offer by the bureaucrat does not exceed its marginal payoff for reporting failure, i.e. $b \leq z^L - z^H$.

Each bureaucrat knows this, and thus, should the policy fail, he is willing to bribe the secret service by offering the bribe $b = z^L - z^H$ as long as it is profitable for him. If he bribes the secret service, he gets w^H from the dictator, and if he does not, he gets w^L. In other words, when bureaucrat's wage depends on the secret service's report, he offers a bribe if and only if

$z^L - z^H \leq w^H - w^L$; the size of the bribe then equals $w^H - w^L$. One direct implication is that if the dictator wants to implement truth-telling by the secret service in the absence of free media, he has to satisfy the collusion-proofness constraint:

$$z^L - z^H \geq w^H - w^L \tag{5}$$

which will hold as an equality in equilibrium (the dictator minimizes his costs). An alternative way to look at this constraint is to compare the joint surplus of the bureaucrat-secret service coalition in the case of truthfully reporting failure and colluding to report success: collusion-proofness requires $w^L + z^L \geq w^H + z^H$.

The above discussion is summarized in the following proposition.

Proposition 1 *The dictator of type $d = L, H$ can choose one of the three following alternatives:*

To induce a low effort level, the dictator offers $w^L = w^H = 0$ to the bureaucrat regardless of the dictator's own ability; he also does not allow free media and provides no incentives to the secret service $z^L = z^H = 0$. The dictator's expected payment to bureaucrats and secret service is 0.

To induce a high-powered incentive scheme via using free media, the dictator chooses $\left(w^L, w^H\right) = \left(0, c/\nu^d\right)$. The dictator does not pay anything to the secret service $z^L = z^H = 0$. The expected payment to the bureaucrat is $\left(1 - \nu^d\right) w^L + \nu^d w^H = c$.

To provide high-powered incentives without free media, the dictator offers the contract $\left(w^L, w^H\right) = \left(0, c/\nu^d\right)$) to each bureaucrat, and the contract $z^H = 0$, $z^L = c/\nu^d$ to the secret service. With such payment schedules, there is no collusion between bureaucrats and the secret service. Dictator's expected payment to the bureaucrats and secret service equals $\left(1 - \nu^d\right) \left(w^L + z^L\right) + \nu^d \left(w^H + z^H\right) = c/\nu^d$.

Indeed, if the constraint (5) is satisfied, or the dictator allows free media, the dictator will get a truthful signal s_t^j for sure. Bureaucrat's low efforts will lead to success with probability 0; in the case of high efforts, the probability is ν^d. He then chooses high efforts if and only if expected increase in payoff exceeds costs c, i.e. $\left(w^H - w^L\right) \geq c/\nu^d$. The cheapest way to satisfy these constraints is by setting $w^L = 0$, and $w^H = c/\nu^d$. Similarly, if the secret service is used, the ruler should set $z^H = 0$ and $z^L = w^H$.

The Proposition implies that the value of bureaucratic incentives is higher for the competent dictator. If the free media is allowed, the costs of providing incentives c are the same matter for dictators of both types. Yet, as the inept dictator's probability of success is lower $\nu^L < \nu^H$, the benefits of high-powered incentives are greater for the competent dictator. If the ruler does not allow free media, but still opts to have high-powered incentives, he must pay a wage $w^H = c/\nu^d$ to each bureaucrat who successfully implemented the policy and $z^L = w^H$ to the secret service if it fails. Overall, the ruler pays c/ν^d if he wants to implement high-powered incentives with secret service; this equals c (the same as in the case of free media) if the ruler is competent and $c/\nu^L > c$ if he is not.

Like in conventional models of collusion in a three-tier hierarchy (e.g. Tirole, 1992), there is no collusion in equilibrium. However, the risk of collusion incurs non-trivial costs: the need to provide collusion-proof incentives (5) distorts the dictator's payoffs. If there were no threat of collusion, the dictator would pay w^H in case of success, and nothing in case of failure (which occurs in equilibrium at least with probability $1 - \nu^L > 0$ for an inept dictator). The expected payments would be the same as in the case of media freedom. To ensure collusion-proofness, the dictator has to pay w^H whatever the outcome is: to the bureaucrat in the case of success or to the secret service in the case of failure; the additional expected cost is therefore $(1 - \nu^L) w^H$. Because of potential collusion, providing incentives via the secret service is costlier than via media freedom.

The Dictator and the Citizens

If a competent dictator always chooses high-powered incentive scheme for the bureaucrats with the help of free media, then his policy results in the optimal level of public good A^H, and the media always reports a truthful signal $s_t^j = A_t^j = A^H$ for all bureaucrats. On the other hand, if the dictator is inept, there is a non-trivial probability $(1 - \nu^L)$ that the policy π_t chosen at that period is a wrong one. In that case, there is a positive chance that the media will report the truth (that $s_t^j = A_t^j = A^L$); this probability, conditional on the policy failure, is equal to 1 if media is free and to $\alpha > 0$ if it is not. Therefore, a rational citizen who receives a signal $s_t^j = A^L$ is bound to believe (regardless of her private information) that the dictator is inept with certainty. Moreover, this information about the dictator's incompetence becomes common knowledge. As a result, all citizens will revolt and the ruler will be replaced.

Now consider a dictator who has had only positive media reports up for n periods since his

coming to power. In addition to private signals, each citizen has also received a stream of public signals $s_1^{pub}, \ldots, s_n^{pub}$, which have all been positive. Therefore, by Bayes' formula, each citizen i attributes a non-trivial probability to the event that the incumbent ruler is competent. If the incumbent is competent, then the share of citizens who believe that he is inept would be less than γ if they use only private signals. Public signals are all favorable to the dictator, and therefore the share of those who believe that the dictator is inept basing on all available information is even lower. Consequently, a citizen who has received a stream of positive public signals for all bureaucrats will never participate in a revolt. She cannot be sure that the share of citizens who think that the probability of the ruler being inept is above $1 - \mu$, the average, is sufficient for a revolt to succeed. This discussion is summarized in the following proposition.

Proposition 2 *Consider a dictator who has had only positive media reports until period t. Then in period t each citizen, given information available, assigns a strictly positive probability to the event that less than γ other citizens want the dictator replaced, and thus there is a positive chance that the revolt will not succeed.*

One may compare this result to the winner's curse phenomenon in the common value auctions. Here, each citizen gets a stream of private signals about the same variable (dictator's ability). When a citizen becomes just ready to revolt, she believes that most other citizens lag behind her in their confidence that the dictator is inept, because otherwise the revolt would have already occurred before (see Morris, 1995). As long as media reports policy success, citizens are unable to transfer negative information to each other, and at any given moment they are too afraid to initiate a revolt. However, if media reports policy failure, it immediately becomes common knowledge that the dictator is inept and enable the citizens to coordinate.

We have also established the following proposition.

Proposition 3 *The dictator stays in power as long as the citizens get $s_{pub} = A^H$. If citizens get $s_{pub} = A^L$, citizens revolt, and the dictator is replaced by a new one. No other public signal may be received by citizens in equilibrium.*

The intuition is straightforward. Upon a positive report citizens update their beliefs on the probabilities of the two outcomes: (i) the dictator may be able or inept, and media are free (ii) the dictator is inept but media are controlled. As in the case (ii) there is a non-trivial probability α of leakage of negative information, the positive report shifts the citizens' ex post beliefs in favor

of (i). Any single negative report, however, informs the citizens that the dictator is inept and is therefore inferior to an average pick from the dictators' pool next period; hence the current dictator is replaced.

Media and the Choice of Bureaucratic Incentives

We now check that a competent dictator indeed chooses the high-powered incentive scheme if the assumption (3) holds.

Proposition 4 *At any period of his tenure, a competent dictator is strictly better off allowing free media and choosing a high-powered incentive scheme. His expected life-time utility is $U = \frac{1}{1-\beta}\left(R + \tau A^H - c\right)$.*

Indeed, if a competent ruler chooses a high-powered incentive scheme, no revolt can take place. Both the secret service and free media are equally costly to the dictator (each period, in equilibrium, he has to pay c to the bureaucrats and nothing to the secret service, as the policy failure cannot happen). By providing no incentives (apart from a chance of revolt) the ruler loses $\tau\left(A^H - A^L\right)$ because of a chance of policy failure while gaining c by economizing on bureaucrat's wage. By assumption (3), providing no incentives is strictly dominated by providing high-powered incentives. It is straightforward to show that the equilibrium utility of an able ruler is given by Bellman equation

$$U_a = R + \tau A^H - c + \beta U_a,$$

implying $U_a = (1 - \beta)^{-1}\left(R + \tau A^H - c\right)$. This establishes that high incentives via free media is indeed the best strategy for the competent ruler.

The inept dictator faces a far more complex trade-off: he needs to choose high- or low-powered incentives, and the monitoring mechanism. The dictator never chooses free media together with low-powered incentive scheme as low-powered incentive scheme with censored media is strictly better, thus only three options remain: (i) high incentives and free media (denote this choice M); (ii) high incentives and censored media (we denote this choice S as the dictator relies on the secret service); (iii) low incentives (L).

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Then the dictator's expected utility at the beginning of a period when he is in power by U is as follows

$$U = \max\{U_M, U_S, U_L\}; \text{ where}$$

$$U_M = R + \tau\overline{A} - c + \beta\nu^L U;$$

$$U_S = R + \tau\overline{A} - c/\nu^L + \beta\left(\nu^L + \left(1 - \nu^L\right)(1 - \alpha)\right)U;$$

$$U_L = R + \tau A^L + \beta(1 - \alpha)U. \tag{6}$$

Denote solutions to equation $U_X(U) = U$ by U_X^*, where $X \in \{M, S, L\}$. Regime X is chosen whenever U_X^* is the greatest of the three: for example, if $U_M^* > U_S^*$ and $U_M^* > U_L^*$, then, since $U_S(U)$ and $U_L(U)$ have a slope less than 1, then $U_M(U_M^*) > U_S(U_M^*)$ and $U_M(U_M^*) > U_L(U_M^*)$, so $U = U_M^*$ is the solution to the problem; all other cases may be considered in the same way. Rearranging the terms, we obtain the solution:

$$U_M^* = \frac{R + \tau\overline{A} - c}{1 - \beta\nu^L}; \tag{7}$$

$$U_S^* = \frac{R + \tau\overline{A} - c/\nu^L}{1 - \beta\left(1 - \left(1 - \nu^L\right)\alpha\right)};$$

$$U_L^* = \frac{R + \tau A^L}{1 - \beta(1 - \alpha)}.$$

Simple comparisons of (7) result in the following Proposition.

Proposition 5 *Suppose that (3) holds. The inept ruler's choice depends on the level of democracy α and the resource abundance R as follows:*

If $0 < \alpha < 1 - \nu^L$, media freedom (M) is only chosen if R is low. If R is high, either low incentives or secret service is preferred.

If $1 - \nu^L \leq \alpha < 1$, the ruler always prefers to provide high incentives. If the resource abundance R is high, he chooses the secret service. If R is low, free media is chosen.

If $\alpha = 1$, then media freedom is preferred to any other regime for any level of R.

Empirical Predictions

The model generates a number of testable predictions about determinants of media freedom. The main prediction is that in a non-democratic country, resource abundance (high R) results in lower media freedom.
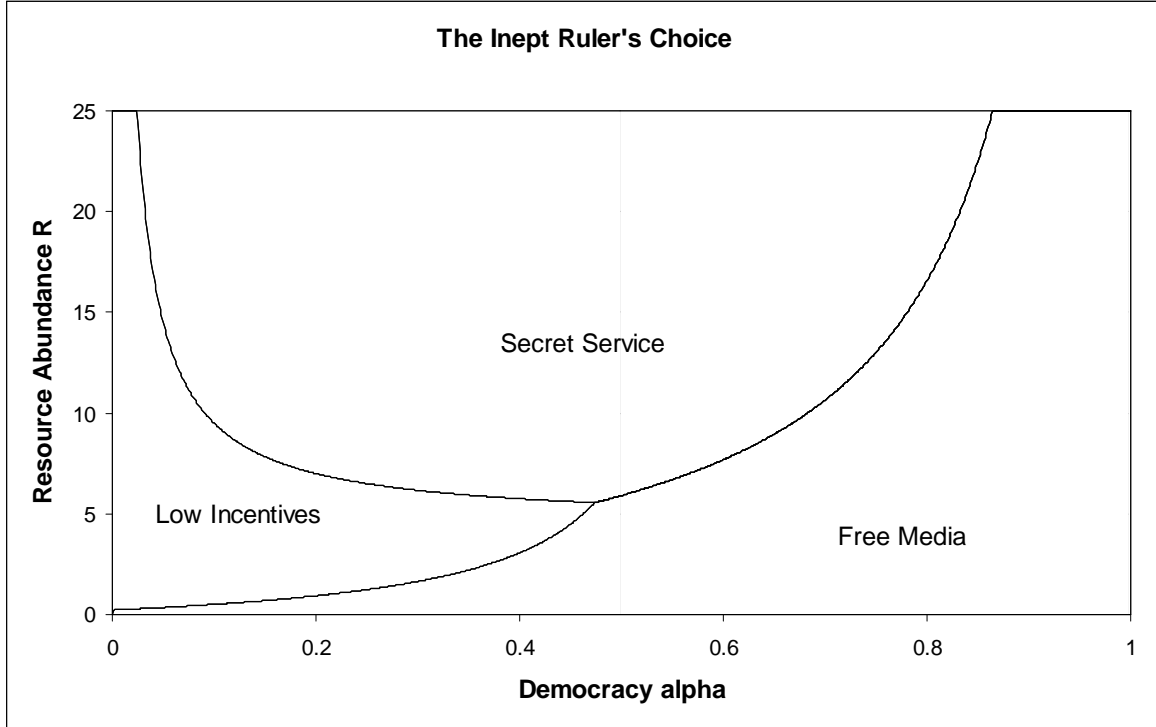
Figure 1: The inept ruler's choice of bureaucratic incentives as a function of R and α. The parameter values are as follows: $c = 2$, $A^H = 40$, $A^L = 0$, $\nu^L = 0.4$, $\beta = 0.9$, $\tau = 0.2$.

In a democracy, the dictator and his bureaucracy are bound to cope with free media. As shown above, if $\alpha = 1$, media freedom prevails in equilibrium under any level of resource richness R. If α is slightly below 1 (and $\alpha > 1 - \nu^L$) then media freedom is suppressed only if resource abundance is very high. Thus, we do not expect to find significant effects of natural resources on media freedom in democratic countries where monitoring of bureaucracy is carried out via separation of powers, opposition parties etc.

Figure 1 shows the choice of the regime (media freedom vs. secret service vs. low incentives as a function of resource abundance R and the proxy for democratic institutions α.

Proposition 5 implies that extra oil reserves have a negative effect on media freedom. However, oil may have a non-linear impact on the incentives provided to bureaucrats, and thus on economic performance. In non-democratic countries (low α), an increase in resource rents first suppresses the bureaucratic incentives as the equilibrium moves from media freedom to low incentives regime. Further increase in the resource rents raises the dictator's incentive to stay in power so that the

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dictator prefers to provide strong incentives to the bureaucracy albeit via a secret service rather than media freedom.

Robustness

While we introduced a number of simplifying assumptions to make the model tractable, our results are robust to the modelling choices. For example, suppose that smart dictators also make mistakes albeit with a lower probability $\nu^H \in (\nu^L, 1)$. The results still hold even though Bayesian updating will be somewhat more involved. In particular, citizens would allow dictators to remain in power after occasional policy failures. However, even smart dictators can be overthrown upon a series of mistakes due to bad luck.

We have assumed that the dictator does not punish the bureaucrat for the policy failure even when the dictator knows that the policy choice was right (e.g. because the dictator is able) and the failure is the bureaucrat's fault (this only happens out of equilibrium); he needs an outside verification of the negative outcome – either by the secret service or by the media. If we extend the model to the case of non-trivial probabilities of success in case of wrong policy choice or low effort, this would not be a problem – either success or failure may occur even if the bureaucrat works hard.

Yet another extension would be a departure from the assumption that bureaucrats work for only for one period. If there is a multi-period contracting environment, the dictator can offer the bureaucrat long-term incentives. In particular, the bureaucrat might be offered a deferred compensation – a tenure premium, pension, or even a stake in a property controlled by the dictator – that will only be paid if the dictator himself remains in office. This can result in an emergence of a crony capitalism where the incentives of the ruling elite are based on the legitimacy of their well-being which is in turn contingent on the regime's stability.

In our model, we have also neglected the cost of the ruler turnover. In many cases dismantling a dictatorship imposes substantial costs on the economy and the society. If these costs are substantial, out analysis would go through as long as the benefits of replacing an inept dictator are sufficiently high.

Each citizen updates her beliefs based on both public and private information. If the latter is consistently negative, the citizen knows that there is a high chance that the dictator is inept. However, he will never be certain that many others know it as well. Hence, a revolt would fail with

a non-trivial probability. Since there are individual losses but no individual gains from revolution, the revolt will be delayed until the negative information becomes public. This result follows from the absence of personal returns to taking part in a successful revolution. The result will change if the revolution leader receives private benefits if the revolution succeeds. Then, for some parameter constellations, revolution can happen even if the media only run positive news.

4   Evidence

In this section, we explore empirical evidence on the relationship between oil and media freedom using cross-sectional and panel data. To check the main testable prediction that the oil abundance has an adverse effect on media freedom in non-democracies, we use data on natural resources, level of democracy, media freedom and economic performance.

Data

We employ several sources of data. As a proxy for media freedom we use Press Freedom index available from Freedom House. Although certain information on media freedom is available for years as early as 1979, detailed data are unavailable until 1993, so we use only data for years 1993–2004. Press Freedom is constructed by Freedom House as an integer from 0 to 100, with 0 corresponding to ideally free media and 100 corresponding to no media freedom. However, to facilitate interpretation we use $(100-$ Freedom House Index$)$ as a measure of media freedom, so in this section, greater media freedom index corresponds to freer media. Note that Freedom House data captures both printed and broadcast media.

We used the *democ* variable from Polity IV dataset as a proxy for the degree of *Democracy*. The variable ranges from 0 to 10 where 10 corresponds to perfect democracy. In some cases, *democ* variable is assigned -66, -77, or -88 value; this corresponds to missing data or political turmoil in a given country and year. We exclude such data from our dataset.

A number of papers (e.g., Mehlum, Moene, and Torvik, 2006, Jensen and Wantchekon, 2004, and Ross, 2001) proxies the resource endowments by using the share of natural resources in GDP or exports. Unfortunately, these variables may be highly endogenous with respect to both growth (or growth opportunities) and institutions. In fact, since mining industry does not usually require much human capital – and if it does, it may be very well provided by foreign firms – the share of mining industry in GDP is actually a proxy for underdevelopment. For instance, the U.S. are

well-endowed with natural resources, including oil; yet, mining and drilling comprise for a small part of GDP as other industries are highly developed as well. Moreover, high resource exports may also be, for any given resources endowment, a proxy for the lack of growth opportunities: the lack of internal demand for fuels makes producers export them.

We proxy resource endowment by the proven oil reserves which are presumably exogenous. While investment in geological exploration affects this variable, these investments need not depend on the level of economic development. Even if investment in exploration depend on country's level of development, it is more plausible that well-developed countries have had more time and resources to invest. Thus, ceteris paribus, proven reserves should be higher in well-developed countries; hence, this effect would only bias our estimates towards null effect. (Our results are robust to use of oil production and share of oil production/exports in GDP instead of oil reserves in regressions.)

Using reserves rather than other measures of resource-richness is consistent with our model's logic. Indeed, the dictator's incentives to censor the media are driven by the future resource rents he expects to get while in office. It is therefore more important what oil rents will be appropriated in the future rather than the current production.

We focus on oil as it is by far the most important natural resource (Tsui, 2005), reliable data on oil reserves and production are easily available, and it is globally-traded (unlike, e.g., natural gas). Countries differ in terms of the oil quality and of the extraction costs but the data on the latter are less reliable; also these differences matter less in panel data regressions. We use data from Statistical Review of World Energy 2005, available on the BP's web-site (http://www.bp.com). This Statistical Review contains only data for countries which have positive oil reserves or produce a positive amount of oil; therefore, we assumed trivial oil reserves and production for other countries, unless explicitly stated that data are not available. We use reserves in billion barrels rather than in dollar terms; we control for the oil price as we include time dummies in our panel regressions. Notice that the proven reserves include the reserves that are economically relevant given the prevailing oil price; this also makes this variable a proxy for the expected value of future resource rents.

In order to measure the effect of media freedom on the quality of bureaucracy, we use the World Bank's data on government effectiveness and regulatory quality (the Governance and Anti-Corruption project of the World Bank Institute www.worldbank.org/wbi/governance).

Finally, we use data on GDP per capita (purchasing power parity), population, land area, and other relevant controls from the World Development Indicators.

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Main Results

The results are presented in the Table 1 in the Appendix. These results are consistent with the model's predictions, and are robust to the choice of specification, econometric methodology, and sample. In particular, the results hold both in cross-country OLS regressions and in panel regressions with country fixed effects.

Controlling for the level of development (proxied by GDP per capita in purchasing power parity) and the level of democracy, media freedom is negatively correlated with oil reserves (column (1)). This correlation is stronger in the less democratic countries. In column (2), we add an interaction term between democracy and oil reserves; not only the coefficient at the oil reserves remains negative and significant, but the coefficient at the interaction term is positive and significant. The less developed is the democracy, the stronger the negative effect of oil reserves on media freedom.

We also control for the country size both in terms of land area and population. The former may be related to the costs of monitoring the bureaucracy, the latter may reflect the importance of media as coordination device. The coefficient signs are consistent with our model. The larger the land area, the harder it is for the dictator to monitor his bureaucracy, hence a greater need for media freedom. The more populous the country the harder it is for people to coordinate without media; hence media is vital for overthrowing the dictator so the dictator prefers censorship. Including the country's population into the regression also helps assuring that we control for oil reserves per capita as well as the total oil reserves; similarly, we effectively control for the share of reserves to GDP as we include logarithms of the total reserves, GDP per capita and population.

In column (3), we control for size of government (log share of government expenditures in GDP), literacy, internet penetration and inequality (captured by the Gini coefficient). While the sample size is reduced, our results still hold. It is interesting that literacy has a negative effect on media freedom: the more literate is the population, the costlier is the free media for the dictator; the benefits of the media do not depend on the literacy rate. Once we control for Internet and literacy, the sign of the coefficient at the GDP per capita changes – indeed, it is the technological development and education rather than economic wellbeing per se that drives the choice of media freedom.

In column (4), we run the regression for the countries with non-trivial oil reserves and also obtain similar results.

In OLS regressions (1)-(4), the dependent variable (media freedom) is the 1993-2004 average
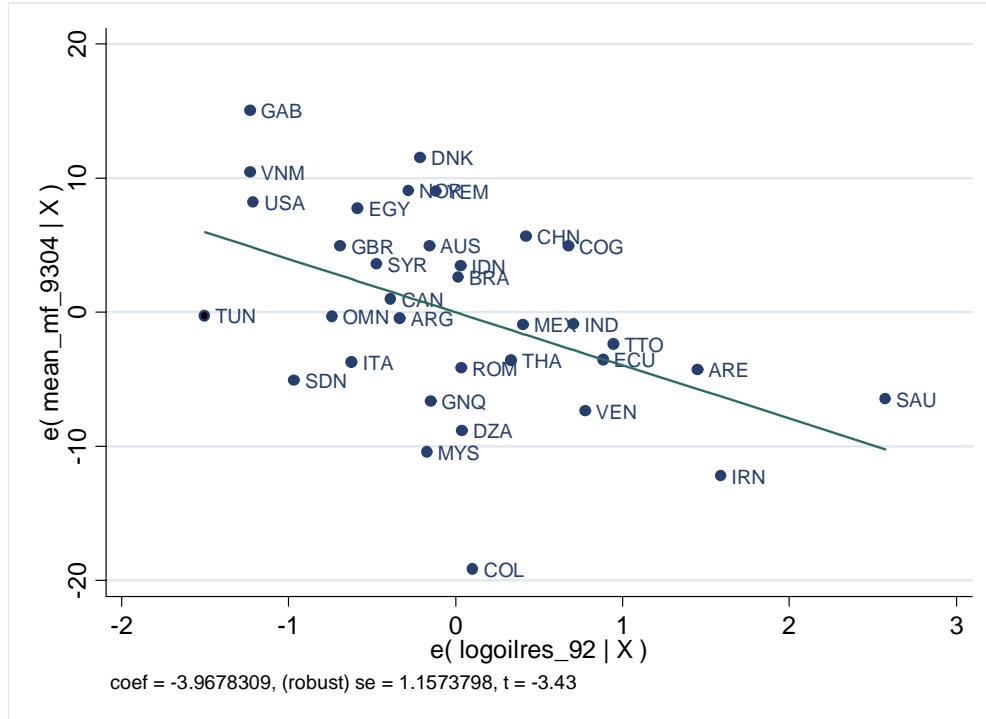
Figure 2: Adjusted partial residual plot for media freedom and oil reserves for countries with non-trivial oil reserves (specification 4 in Table 1).

and all the independent variables are dated 1992 except for democracy which is also 1993-2004 average. To resolve the reverse causality problem, we estimate specification (5) where we replace contemporaneous measures of democracy with its average level in 1980-1992. In column (6), we instrument democracy with the lagged democracy score and the results remain the same.

Our most important results come from using panel data for 1993-2004. First, we use country-level fixed effects (column (7)) with robust standard errors; we also include time dummies to control for changes in global oil price and other global variables. In column (8) we estimate a pooled regression controlling for clustering at the country level.

In all specifications, the coefficients at oil reserves and the interaction term between oil and democracy are significant and robust; they also have similar values across all specifications.

The effects are not only statistically but also economically significant. The coefficient -4 at the LogOilReserves implies that in a non-democratic country, a two-fold increase in oil reserves results in 4*ln(2)=2.8 change in media freedom score. Figure 2 presents the partial residual plot for media

freedom and oil reserve (adjusted for other independent variables) which shows that the difference in media freedom e.g. between United Arab Emirates and Mexico is explained by the respective difference in oil reserves. The coefficient 0.4 at the interaction term implies that the relationship between oil and media freedom weakens and eventually disappears as democracy score increases from 0 to 4/0.4=10 which is the level of democracy in OECD countries. This is fully consistent with our interpretation that media are crucial for bureaucratic incentives in the absence of separation of powers, opposition parties or other mechanisms present in democratic societies.

Robustness checks and additional evidence

Table 2 presents some robustness checks. Instead of including the interaction term, we run the OLS regression for democratic and non-democratic countries separately. Columns (1) and (2) in Table 2 present the results for the democracy threshold of $democ = 8$. The countries at this threshold are Brazil, Latvia, and Philippines. Other thresholds yield similar results. Oil reserves negatively affect media freedom in non-democratic countries only.

Regression (3) replaces oil reserves with oil production (OLS and FE specifications, respectively). In regression (5), we use the media freedom index from Reporters Sans Frontieres rather than the more conventional one from the Freedom House. In the regression (6) we control for 8 regional dummies. Column (7) presents the results of the regression with instrumental variables for the sample of non-democratic countries. In all the samples and specifications the results are consistent with our model's predictions.

The results are not driven by any single country or even region – we have tried to exclude all regions and individual countries one by one and the coefficients remain significant and had similar values. In panel regressions the results are also robust to excluding outlier observations.

Table 3 reports the results on the effect of media freedom on the quality of bureaucracy. We use two dependent variables: Government Effectiveness and Regulatory Quality. Column (1) and (2) report the OLS regressions for average values of these two indices for 1996-2004 whereas the independent variables refer to the year 1995. Regressions (3) and (4) are the panel regressions with country fixed effects. In all specifications, media freedom positively and significantly affects quality of bureaucracy controlling for the level of development and democracy, and controlling for natural resources. While in cross-section regressions there is a significant negative direct effect of natural resources on the quality of bureaucracy, this relationship becomes insignificant in the panel

regressions. This result suggests that media freedom is not just one of channels of the "resource curse" (the adverse effect of natural resources on the quality of institutions); it may be *the* major channel.

Yet another interesting research question is to study the effect of the interaction between resource abundance, media freedom and bureaucratic incentives on the long-run economic growth. Unfortunately, as there are no systematic media freedom data prior to 1993, this is not possible.

Alternative explanations

There can be several other explanations of the relationship between natural resource endowment be correlated and media freedom in non-democratic societies. For example, if a benevolent dictator wants to reform his bureaucracy and is willing to do so via paying high efficiency wages to bureaucrats. Resource rents allow to finance strong incentives without distortionary taxation; and the greater the rents and therefore the higher the efficiency wages the fewer independent journalists the dictator needs. The bureaucrats are punished very rarely but the punishment is large – the dictator takes away high efficiency wage. This explanation is not very likely. First, it is at odds with anecdotal evidence: in non-democratic countries dictators prefer cheaper tools of providing incentives – e.g. imprisonment. Second, it would imply that resource endowment would be correlated with lower corruption and better governance. This is not consistent with the evidence we present in Table 3: if there is a relationship between bureaucratic quality and it is an opposite one: ceteris paribus, resource-rich countries are less well-governed and more corrupt. In particular, if one excludes Media Freedom from specifications reported in Table 3, oil reserves would have either insignificant or negative effect on the quality of governance (we do not present results on corruption but they are similar).

A more realistic alternative explanation is a very simple one: non-democratic dictators do not like free media. However, citizens value media freedom per se hence the dictator has to pay for censorship. Similarly, if foreign partners or international organizations exert pressure for media freedom the dictator has be economically strong either to withstand this pressure or to buy off the partners tacit acceptance of censorship. In both cases, resource rents provide a source of revenue that helps silence the media. However, this argument assumes that resource rents come as an additional revenue source. The story does not explain why controlling for the aggregate income (GDP) and for the total government spending, the dictator with a greater share of oil in the GDP

and in government budget has easier time buying off citizens or foreigners. Why are citizens happier to exchange media freedom for a dollar if this is a petrodollar. The argument that oil rents are less distortionary than taxes and therefore easier to use for comforting the citizens is actually not consistent. If taxes are distortionary, the dictator should pay off the voters by lowering taxes rather than by giving out petrodollars (actually, many dictators do exactly this, granting voters with "no taxation" in exchange for "no representation"). Certainly, there is a potential role for inequality but we show that our results hold even when inequality is controlled for.

Yet another argument is that free media is a normal good, so it is more likely to occur in more affluent societies. Coincidentally, rich countries are also the ones that are oil poor. However, as we control for per capita GDP, this argument does not invalidate our results.

Finally, media freedom as well as democracy can be driven by a long history of development of political and economic institutions, e.g. due to colonial history, legal origin, religion, culture etc. We show that our results hold even when controlling for country-level effects; therefore all long-term and slowly changing factors are accounted for. It is also worth noting that cross-section and panel estimation produce similar magnitudes of the effect.

5   Related literature

We draw upon four major strands in the literature. First, our paper is related to the fast growing literature on the so-called "resource curse". The lower growth rates of resource-rich countries are well-documented (see, e.g., Sachs and Warner, 1996, 1997a,b, Auty, 2001, Gylfason, Herbertsson and Zoega, 1999, and Mehlum, Moene, and Torvik, 2006).

The early literature on the resource curse attributed the failure of growth-oriented strategies in resource rich-countries to the "Dutch disease" (see Sachs and Warner, 1996, and Krugman, 1987). Yet, there is now an emerging consensus that the major source of slow growth in resource-rich countries is institutions. First, resource abundance is not curse in countries with mature institutions; second, in the countries with poor institutions, the resource rents undermine institutional development which in turn slows down economic growth. The general mechanism was described by North (1981, 1991) and, most recently, by Acemoglu and Robinson (2006); the crucial role of institutions in generating the "resource curse" is analyzed in Lane and Tornell (1996), Ades and Di Tella (1999), Robinson, Torvik, and Verdier (2004), Mehlum, Moene, and Torvik (2006), Caselli (2006), and Boschini et al. (2006). This literature focuses mostly on the effect of resource

abundance on the political process; in particular Ross (2001) and Tsui (2005) show that resource richness hinders democratization. Ross (2001) notes that critical empirical contributions to the modernization debate by Przeworski and Limongi (1993) and Przeworski, Alvarez, Cheibub, and Limongi (2000) did not consider oil-rich Middle East states; in his own regressions, the Middle East dummy is significant and has a negative impact on democracy.

We try to go beyond these general insights to explain the microeconomic mechanisms that lead to economically inefficient policy choices. In this sense, our work is similar to Acemoglu, Robinson, and Verdier (2004) who consider an alternative micro-foundation for the resource curse: the divide-and-rule policies of kleptocratic dictators. They show that resource rents help the kleptocrats remain in power by buying off parts of the opposition.

Second, we use recent advances in political economics with its emphasis on dynamic models of strategic interaction (e.g., Acemoglu and Robinson, 2005, 2006, Acemoglu, 2003, 2006, Lagunoff, 2006, Bueno de Mesquita et al., 2003, Konrad and Skaperdas, 2005, Restrepo, 2002, and Gallego and Pitchik, 2004). The literature on optimal sequencing between economic and political liberalization is discussed in Persson and Tabellini (2006), who are also the first to consider a revolution as a global game.

Third, we employ insights from contract theory and the corporate governance literature that focuses on providing incentives to subordinates in a hierarchy (e.g., Williamson, 1967, Calvo and Wellisz, 1978, Holmstrom, 1979, Wilson, 1989, Prendergast, 1993, Qian, 1994, and Dewatripont, Jewitt, and Tirole, 1999). Kofman and Lawarree (1993) extend Tirole's model (1986, 1992) to compare internal and external auditors. Similar to free media in our model, external auditors are costlier but, at least in theory, never collude. Friebel and Raith (2004) model a three-tier hierarchy where there is a risk of value destruction as the middle-manager fears competition from his own subordinates and therefore is not willing to hire or promote the best talent.

Friebel and Guriev (2005) study the case of Enron and show that the earnings manipulation by the top management may result in the spread of distorted information throughout corporate hierarchy and undermine efficiency of incentive contracts. In the end of the day, Enron's top management lost the ability to monitor the performance even internally. A deputy CEO once complained: "With [Enron CFO Andrew] Fastow, you could never tell whether [individual] deals were clean because they were too complicated" (Maclean and Elkind, 2003, p. 152). The Enron case is also an illustration of the importance of risks of collusion with auditors: the auditors (the

Houston office of Arthur Andersen) did not want to lose a generous client that paid Arthur Andersen hundreds of millions of dollars in consulting fees. To avoid collusion, anti-trust authorities often offer leniency arrangements for cartel participants (Spagnolo, 2000). Similarly to our independent media, cartel participants cannot commit to keep the relevant information from the public.

The fourth strand is the fast-growing literature on the economics of media. Sen (1999), Besley and Burgess (2002), Besley and Prat (2006) emphasize the role of independent media in enhancing citizens' ability to choose right politicians and policies. Reinikka and Svensson (2005) and Kaufman (2006) show that media help to reduce corruption. Besley and Prat (2006) consider media capture in democracies. Mullainathan and Shleifer (2005) and Baron (2006) construct models explaining the observed media biases, while Petrova (2006) and Corneo (2006) explain the negative impact of economic inequality on media freedom. Svaleryd and Vlachos (2006) demonstrate that in a mature democracy increased political competition and extensive media coverage reduce political rents. Using cross-country data on media ownership in 97 developing and developed countries, Djankov et al. (2003) conclude that "worse" outcomes are correlated with state ownership of media; at the same time, state ownership of all forms of media is much higher in less democratic countries. Dyck and Zingales (2002) consider the situation where business reporting is endogenously biased; free competitive media is the only way to commit not to collude with the source of exclusive information.

6   Conclusions

We study the determinants of media freedom in non-democratic societies. In such societies, the dictator needs an independent source of information on the outcomes of his policies. Otherwise he cannot provide incentives to his bureaucracy which may result in poor economic performance and eventually cost him his job. The dictator may choose to allow at least partial media freedom or to build a secret service that would report on the bureaucracy directly to him. In the latter case, there is a risk of collusion between the monitor and the bureaucrat. The dictator can overcome collusion by providing high-powered incentives to the monitor but it is costly. On the other hand, independent and competitive media cannot commit not to provide this information to the citizens. Such leakage undermines the very basis of the non-democratic regime: the collective action problem in organizing a revolution. If citizens receive the same signal about the poor outcomes of the dictator's policies, e.g. with the help of mass media, they solve the coordination problem and overthrow the dictator. In resource rich countries, the value of remaining in office is relatively high while the need to provide

incentives to bureaucracy is relatively less important. Therefore our theory predicts a negative relationship between resource abundance and media freedom; this relationship is especially strong in less democratic countries.

Recently, two authoritarian regimes have seemingly defied this logic: Belarus and China. Both are (relatively) resource-poor and have tightly controlled media, while being apparently successful in terms of economic growth. Our model helps to read these cases. Belarus has been receiving substantial support from Russia, mostly in terms of heavily subsidized prices for oil and natural gas; BRATT (2006) estimates the direct benefits due to these subsidies on oil and gas prices alone at the level of 15% Belarussian GDP. Essentially, Alexander Lukashenko, the Belarussian President can afford censorship and heavy reliance on secret service; the support from Russia provides sufficient rents as if Belarus were a resource-rich country.[9]

In China, the ruling party is facing exactly the "Gorbachev's dilemma" that is the focus of our paper. On one hand, the tight control over the media stands in the way of attempts to improve bureaucratic performance as the SARS story vividly demonstrated. On the other, free media would have provided a challenge to the rule of the Chinese Communist Party. One way to deal with the information problem that has been followed by the Chinese leadership is to decentralize economic decision-making and even introduce elections at municipal and provincial level. In principle, such mechanisms might prevent nationwide information aggregation but for the very same reason they only partially mitigate the incentive costs of censorship.

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[9] We wrote the first draft of this paper before the 2006 presidential elections in Belarus. Very well in line with our argument, due to the complete absence of free media the opposition failed to gather sufficient number of protesters to overthrow the President. Also, the failed attempt demonstrated the tangible risks for revolution participants. Many protesters including both opposition presidential candidates were arrested and/or beaten up.

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Table 1. Regression estimates.

	1	2	3	4	5	6	7	8
	OLS, cross-country for Media Freedom, avg 93-04					IV	Panel	
				non-trivial oil reserves in 1992	with lagged democracy	Democracy instrumented by lagged democracy	FE	Pooled , clustering by country
Log oil reserves	-2.29	-3.79	-4.44	-3.15	-6.37	-1.66	-2.97	-3.36
	(0.83)***	(0.99)***	(1.47)***	(1.27)**	(1.19)***	(0.71)**	(1.34)**	(1.21)***
Log oil reserves x Democracy		0.4	0.4	0.46	0.43		0.57	0.31
		(0.13)***	(0.20)*	(0.19)**	(0.17)**		(0.17)***	(0.16)**
Democracy	4.58	4.35	3.92	4.27	3.03	5.17	1.2	3.86
	(0.29)***	(0.32)***	(0.38)***	(0.57)***	(0.44)***	(0.41)***	(0.21)***	(0.31)***
Log GDP per capita, PPP	3.72	3.88	-5.27	4.13	5.61	2.25	10.18	4.27
	(0.95)***	(0.97)***	(1.90)***	(1.83)**	(1.60)***	(1.18)*	(2.19)***	(0.99)***
Log land area	1.44	1.33	1.79	1.14	2.03			0.92
	(0.55)***	(0.54)**	(0.63)***	-0.93	(0.84)**			-0.62
Log population,	-2.01	-2.08	-0.84	-2.00	-1.68			-1.54
	(0.65)***	(0.64)***	-0.74	(0.93)**	(0.89)*			(0.68)**
Log (GovExp/GDP)			1.07				-2.58	4.1
			-1.92				(1.32)*	(1.91)**
Literacy rate			-0.18					
			(0.06)***					
Gini			0.02					
			-0.08					
Log Internet users			10.69					
			(1.57)***					
Observations	137	137	112	37	133	132	1591	1465
R-squared	0.81	0.82	0.86	0.92	0.65	0.79	0.14	0.75

Robust standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Notes: Regressions (1)-(5) are OLS. (1) is basic regression; in (2) we add the interaction term; in (3) we introduce other controls which, however, limit our sample. In (4) we run the same specification as (2) on the subsample of countries with non-trivial oil reserves. In (5) we use lagged democracy (averaged 1980-1992) instead of contemporaneous democracy. In (6) we instrument democracy (averaged 1993-2003) by lagged democracy (averaged 1980-1992), while. In panel regressions (7) and (8) fixed effects are included; in (8) we also control for clustering at the country level. In cross-sectional regressions (1)-(6), Log GDP per capita PPP, Log oil reserves, and Log population are for year 1992; Democracy (alone and in interaction term) is averaged for the period 1993-2003 in (1)-(5) and 1980-1992 in (6). Data for Internet users are for year 2003. In panel regressions (7) and (8) all variables are for current year, media freedom is for the next year. Dependent variable is (100 – media freedom, Freedom House), averaged for years 1993-2004 in columns (1)-(6).

Table 2. Robustness checks.

	1	2	3	4	5	6	7
	OLS	OLS	OLS	FE	OLS	OLS	IV
	non-democratic	democratic countries, democ>8	oil production	oil production	RSF	regional dummies	non-democratic countries only
Log GDP per capita, PPP	1.37	6.13	3.65	10.14	2.62	4.64	1.17
	-1.44	(1.36)***	(1.05)***	(2.33)***	(1.49)*	(1.00)***	-1.59
Log oil reserves	-2.19	1.24			-4.43	-2.95	-2.04
	(0.96)**	-1.19			(2.43)*	(1.11)***	(1.02)**
Log oil reserves X Democracy					0.32	0.27	
			(0.06)***		-0.26	(0.15)*	
Democracy	4.27	6.4	4.25	1.16	3.35	4.23	4.47
	(0.40)***	(2.34)***	(0.39)***	(0.22)***	(0.47)***	(0.42)***	(0.61)***
Log land area	1.45	0.9	1.29		2.14	1.08	1.43
	(0.76)*	-0.78	(0.59)**		(0.79)***	(0.57)*	(0.76)*
Log population	-2.2	-2.36	-1.7	-5.81	-5.13	-1.4	-2.26
	(0.89)**	(0.75)***	(0.74)**	-4.26	(1.14)***	-0.87	(0.87)**
Log oil production			-1.5	-2.07			
			(0.56)***	(0.78)***			
Log oil production x Democracy			0.14	0.18			
			(0.06)**	(0.06)***			
Log (GovExp/GDP)			1.41	-2.29			
			-1.94	(1.29)*			
Observations	92	45	137	1619	133	137	89
R-squared	0.64	0.58	0.82	0.13	0.6	0.84	0.63

Robust standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%

Notes: Regressions (1)-(4), (6) are OLS. (1) is for subsample of non-democratic countries (democracy averaged for years 1993-2003 is at most 8), (2) is for subsample of democratic countries (democracy greater that 8). In regression (3),(4) we replace oil reserves with oil production, and in (4) we use media freedom data from Reporters Sans Frontières instead of Freedom House. In (6) we control for regional dummies (8 regions total). In (7) we instrument democracy (averaged 1993-2003) by lagged democracy (averaged 1980-1992) for a subsample of non-democratic countries.
In OLS regressions, Log GDP per capita PPP, Log oil reserves, Log oil production, and Log population are for year 1992; Democracy (alone and in interaction term) is averaged for the period 1993-2003. Data for Internet users are for year 2003. Dependent variable is (100 – media freedom, Freedom House), averaged for years 1993-2004 in columns (1)-(3) and (5)-(7) and (100 – media freedom, Reporters Sans Frontières) for year 2004 in column (4).

Table 3. Effect of media freedom on the quality of governance

	1	2	3	4
	OLS		Fixed Effects	
	Government Effectiveness	Regulatory Quality	Government Effectiveness	Regulatory Quality
Media Freedom, divided by 100	1.41 (0.30)***	1.26 (0.32)***	0.38 (0.18)**	0.72 (0.23)***
Log GDP per capita, PPP	0.66 (0.06)***	0.50 (0.05)***	0.33 -0.23	0.74 (0.28)***
Log oil reserves	-0.13 (0.05)**	-0.11 (0.05)**	0.01 -0.08	-0.02 -0.08
Democracy	-0.04 (0.02)**	-0.01 -0.02	0.00 -0.01	-0.01 -0.01
Log land area	-0.01 -0.04	-0.03 -0.03		
Log population	0.11 (0.04)**	0.07 (0.04)*		
Observations	136	136	700	700
R-squared	0.77	0.74	0.04	0.09

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Notes: Regressions (1)-(2) are OLS, (3)-(4) fixed effects. In regressions (1)-(2) Log GDP per capita PPP, Log oil reserves, Log land area, and Log population are for year 1995; Government Effectiveness and Democratic Quality are averaged for the period 1996-2004. In regressions (3)-(4), the average number of observations per country is 4.8.