Media Freedom, Bureaucratic Incentives, and the Resource Curse*

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Abstract

How can a non-democratic ruler provide proper incentives for state bureaucracy? In the absense of competitive elections and separation of powers, the ruler has to gather information either from a centralized agency such as a secret service or a decentralized source such as media. The danger of using a secret service is that it can collude with bureaucrats; overcoming collusion is costly. Free media aggregate information and thus constrain bureaucrats, but might also help citizens to coordinate on actions against the incumbent. We endogenize the ruler's choice in a dynamic model to argue that free media are less likely to emerge in resource-rich economies where the ruler is less interested in providing incentives to his subordinates. We show that this prediction is consistent with both cross-section and panel data.

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 some amount of free speech (*glasnost*), reforms of the highly inefficient bureaucracy and the command economy more generally seemed all but impossible. At the same time, free flow of information would undermine the very foundation of the Communist Party's rule. Gorbachev's dilemma was not unique: every autocratic ruler has to provide incentives for his subordinates if he wants to remain in power, and most of them fear free information as a threat to their political survival. Even if an autocratic ruler has vast amounts of highly priced natural resources – as did Mobutu Sese-Seko of Zaire, Reza Shah Pahlavi of Iran, or the Soviet leadership throughout the two decades prior to the abrupt fall in oil prices in the mid-1980s – he still faces an endogenous constraint. The very same monitoring mechanism that provides proper incentives to his subordinates – parliamentary opposition, free media, or NGOs – might allow his subjects to overcome their coordination problems in organizing a revolt.

Gorbachev's dilemma is also relevant in modern China. 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.[2] While the first information on SARS was received

[1] The words "Gorbachev 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] A striking example of how a dictator can lose touch with reality in the absence of free media is the fall of the Romanian dictator Ceauşescu (Hardin, 1995, p.31). 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

by local political authorities in November 2002, there was no real action until at least the end of March 2003. When on March 15 the World Health Organization issued a global warning on SARS, the Chinese Propaganda Department prohibited Chinese media from reporting it (*Washington Post* on May 13, 2003) On April 18, 2003 *Time* reported that Beijing public hospitals were trying to conceal the extent of the disease by hiding or transferring patients during visits of WHO officials. 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.[3]

In our model, the ruler (either dictator or president, or even a collective body such as a parliament or a cabinet of ministers) chooses a policy which affects both his own and his citizens' interests. A policy succeeds only if it is properly implemented, which requires hiring a bureaucrat who may either work or shirk. In order to induce high effort, the ruler needs an agency to produce information on the bureaucrat's performance. We distinguish two cases: the case of a centralized agency ("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 may be very costly. In contrast, free media collect and distribute information on the bureaucrat's performance. (Of course, a media outlet might collude with the bureaucrat as well; the evidence of postcommunist Russia certainly shows that the media are corruptible. Still, decentralized and free media are much less likely to be engaged in all-encompassing collusion.) The downside of media freedom is that the policy outcome becomes common knowledge to the public, which may threaten the ruler's position in power. Indeed, if the media report that the bureaucrat exerted a high level of effort, the public infers that it is the ruler who has low ability. Moreover, a negative media report makes the low ability of the ruler common knowledge, which is critical for a successful revolution (Tilly, 1978, Chwe, 2003).[4]

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days later.

[3] "Once action is called for, the vertical and segmented structure of China's bureaucracy hampers effective action. It is difficult to gather 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, which operate under tight political control, claiming that any information on the new disease is merely rumor. The Chernobyl disaster, which occur on April 26, 1986, was not acknowledged by Soviet officials until two days later, when news already spread across Western media.

[4] 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.

As a result, for the more than half of the world population that lives in non-democratic regimes, information is in especially scarce supply. The fact that rulers' fear of media is justified might be illustrated by the recent experience of "brinkmanship democracies," which combine somewhat free elections with somewhat independent media."Color revolutions" in Serbia, Georgia, Ukraine, and Kyrgyzstan have taught (semi-)autocratic rulers around the world a lesson: even a partly independent media might be crucial in defeating an attempt to falsify elections (McFaul, 2005, Hill, 2005). McMillan and Zoido (2004) use evidence on bribes paid by the Peruvian government to the country's media to argue that the media were the major check on the government's power. It was TV journalists, rather than politicians or bureaucrats, to whom President Fujimori's security chief Montesinos paid the highest bribes. Eventually the only newspaper that remained independent revealed the extent of the government's corruption.

The trade-off between incentives for bureaucracy and the need to "divide and rule" by suppressing information flows is especially visible in developing countries with abundant natural resources. The fact that such countries perform, on average, less successfully than resource-poor countries is well-documented (see, e.g., Sachs and Warner, 1996, 1997a,b, Auty, 2001, Gylfason, Herbertsson and Zoega, 1999, and Mehlum, Moene, and Torvik, 2006).[5] The early literature on the "resource curse" tracked the failure of growth-oriented strategies in resource rich-countries to the "Dutch disease" (see Sachs and Warner, 1996 and Krugman, 1987 for the theory of the long-term consequences of the Dutch disease due to dynamic economies of scale). Yet, there is now an emerging consensus that the major source of slow growth in resource-rich countries is institutions. 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), and Mehlum, Moene, and Torvik (2006). Still, these general insights do not explain the mechanics of the decision-making process that leads to economically inefficient policy choices.

In Acemoglu, Robinson and Verdier (2004), the dictator uses resource rents to buy off political challengers. However, the model stops short of explaining why buying off the political opposition cannot be done simultaneously with carrying out a growth-enhancing policy. Our model demonstrates that in the presence of abundant resources, it becomes less important to provide proper

[5]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 Midlle East states; in his own regressions, A Middle East dummy is significant and has a negative impact on democracy.

incentives for bureaucrats, which in turn reduces the ruler's willingness to have 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 ultimately chose glasnost as the Soviet Union faced a substantial decline in the price of oil,[6] its major commodity export.

While not attempting to fully revise or replicate a vast empirical literature related to the debate on autocratic modernization, we do check for empirical support for our findings.[7] Country-level evidence on the relationship between resource richness and media freedom seems to be consistent with our model. Using Freedom House data on media freedom, Polity IV scores for democracy and autocracy, and BP data on oil reserves, we show that, controlling for level of economic development and democracy, the media are less free in oil-rich countries. This effect is present in cross-section, in two-stage least squares, and in panel regressions with country fixed effects. The effect is statistically significant, economically important, and robust to a variety of controls including literacy, Internet penetration, country and population size, Gini index of inequality, and regional dummies. We also show that – in line with our model – the effect of natural resources on media freedom is especially strong in less democratic countries. On the other hand, mature democracies do not suffer from an adverse effect of oil reserves.

Among those dictators that did not follow the democratization path, e.g. by lifting restrictions on free media, there is a clear pattern. They 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

[6] 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). To compare, the sharp oil price drop occurred in 1986, which was also the year of the Chernobyl disaster.

[7] Recent empirical contributions to the modernization debate include Epstein et al. (2004), Przeworski et al. (2000) (see also Przeworski and Limongi, 1993) and Wantchekon (2004).

was especially visible in "sultanistic regimes" (Chehabi and Linz, 1998) – 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. Chehabi and Linz (1998) specifically point out that such regimes were especially likely to occur in resource-rich countries; under these regimes, the media were tightly controlled, and bureaucratic efficiency was singularly low.

Investigating the interrelationship between media and bureaucratic incentives outside the democratic world, we draw upon three major strands in the economic literature. First, we use recent advances in political economics with its emphasis on dynamic models of strategic interaction (see Acemoglu and Robinson, 2006, Acemoglu, 2006, Lagunoff, 2006). Second, we employ insights from contract theory and the corporate governance literature; providing incentives to subordinates is, obviously, a major issue in this literature. Third, we relate our work to a rapidly growing literature on the economics of media. Section 5 discusses the most relevant works in more detail.

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

2 Setup

In the model, time is discrete and infinite, $t = 1, \ldots \infty$, and population of the country constitutes a unit continuum of individuals (citizens). There are rulers, which may be different in different periods, and bureaucrats, selected by the ruler each period. There also might be an agency, either media or a secret service, which monitors policy results. In each period, individuals observe personal welfare (a private signal) and media broadcasts (a public signal), and decide whether or not to revolt.

Dictators and Policy Choice

In each period, the ruler R chooses a policy. As the ruler is not competent in implementing the policy, he hires a bureaucrat B. To monitor the bureaucrat, he also hires a secret service S or allows free media M. The ruler may choose policies from policy space $\mathfrak{P}_t$ consisting of right ($\pi \in \mathfrak{P}_t^R$) and wrong ($\pi \in \mathfrak{P}_t^W$) policies; in each period, the share of right policies is $\Pr\left(\pi \in \mathfrak{P}_t^R \mid \pi \in \mathfrak{P}_t\right) = \lambda$.

The result of implementing a policy may either be a "success" or a "failure". In the case of success, the policy increases the welfare of share $\overline{\alpha} \in \left(\frac{1}{2}, 1\right)$ of individuals by a fixed amount $h > 0$ (we may interpret this as the expected discounted net present value of the increase) and does not change the welfare of the rest. In the case of failure, the policy increases the welfare for only $\underline{\alpha} < \overline{\alpha}$ of individuals (by the same amount h). Those who benefit from policy are drawn independently each period, i.e. individual's expected gains from policy success and failure are $\overline{\alpha}h$ and $\underline{\alpha}h$, respectively. In other words, each individual i gets a private signal $s_i(t) \in \{H, L\}$ about policy outcome; ceteris paribus, getting a high private signal increases the individual's perception that policy resulted in a success. We assume that a wrong policy necessarily fails; this assumption is a mere normalization and may be relaxed. The outcome of a right policy may be either success or failure, and the probability of success depends on the efforts of the bureaucrat.

Rulers differ in their ability to choose the right policy. Namely, each ruler gets information $\sigma(\pi)$ about every policy π from $\mathfrak{P}_t$ such that

$$\Pr\left(\sigma(\pi) \in \mathfrak{P}_t^R \mid \pi \in \mathfrak{P}_t^R\right) = \Pr\left(\sigma(\pi) \in \mathfrak{P}_t^W \mid \pi \in \mathfrak{P}_t^W\right) = a,$$

so the ability parameter a is the probability of getting the correct signal about a policy. We assume that ability may be high (*able* ruler) or low (*inept* ruler), or, formally,

$$a \in \left\{a^H = 1,\ a^L \in \left(\frac{1}{2}, 1\right)\right\}, \Pr\left(a = a^H\right) = \mu;$$

the ruler knows his own ability.[8] As the able ($a = a^H = 1$) ruler perfectly distinguishes between right and wrong policies, he may choose a right policy with probability 1. The inept ruler ($a = a^L$) may mistakenly perceive a right policy as a wrong one and vice versa, so his chance of choosing a right policy (i.e. the probability that the policy is right if ruler thinks it is right) is $\nu \equiv \frac{a^L\lambda}{a^L\lambda + (1-a^L)(1-\lambda)}$. Note that this probability increases both with λ (share of right policies) and a^L (ruler's ability). Condition $a^L > \frac{1}{2}$ implies that ruler's chance to choose a right policy is not greater if he picks one that he perceives to be wrong.

We assume that the ruler gets instantaneous utility

$$U_t = (u - l\mathbf{I}\{\text{policy fails}\})\,\mathbf{I}\{R \text{ stays in power}\} - [\text{payments to } B \text{ and } S]$$

[8] This departs from Holmstrom's (1999) model of career concerns where the ability is fixed over time but known neither to the player himself nor to the market. Given asymmetric information structure of this model, the ruler, the bureaucrat and the citizens would update their beliefs about ruler's ability differently. By allowing the ruler to know his type (and assuming that the bureaucrat knows it as well) we are left with only citizens updating, which greatly improves tractability.

which means that he gets $u > 0$ from being in power, but loses $l < u$ if the policy fails. The ruler is also responsible for payments to bureaucrat and (potentially) secret service (see later). Here $\mathbf{I}\{A\}$ is the indicator function which takes the value of 1 if and only if A is true; otherwise, $\mathbf{I}\{A\} = 0$.

The ruler maximizes his expected life-time utility

$$\sum_{\tau=t}^{\infty} \beta^{(\tau-t)} \mathbf{E}_t U_\tau,$$

where we assume that discount rate β incorporates the probability of the ruler's death.

Bureaucratic Incentives

Each period, the ruler hires a bureaucrat to implement the policy. The bureaucrat may exert either high or low effort $e \in \{e^H, e^L\}$. The cost of high effort is $c > 0$ while the low effort is costless. For simplicity's sake, we assume a perfect complementarity between the bureaucrat's effort and the ruler's competent policy choice. If the policy is wrong, any effort level results in a failure. If the policy is right, the bureaucrat makes a difference: the policy succeeds if and only if the bureaucrat chooses $e = e^H$. While here we consider an extreme case where both the right policy and high effort on the part of the bureaucrat are critical for policy to succeed, our results also hold under milder assumptions.

The bureaucrat maximizes his current period's utility. Thus, to induce high effort, the ruler has to provide incentives, i.e. a higher salary in the case of success. The bureaucrat has limited liability, so his wage cannot be negative. The bureaucrat chooses the effort level, being fully aware of the ruler's ability a. However, if the ruler is inept, the bureaucrat does not know whether the policy he is asked to implement is right. The ruler cannot observe the bureaucrat's effort. Policy outcome is not directly observable either, but the ruler may use a third party to monitor the latter. In this paper, we distinguish between two polar cases: fully decentralized monitoring, which corresponds to free mass media (M), and a single monitoring agency, e.g. a secret service (S).

Media Freedom

In each period, the ruler 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). Under censorship, media is 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. Individuals' private signals do not allow them to make an unambiguous conclusion about the quality of the policy. We assume, however, that censorship is imperfect, and there is a small probability $\eta > 0$ that mass media publish true information about poor policy outcome (e.g., there may be disasters such as Chernobyl which are all but impossible to conceal). If the media are free, they publish information that allows citizens to aggregate it and get correct perception on how many people benefited from policy in the current period. For the brevity's sake we do not model production of information by mass media and media competition explicitly.[9] Free media help the ruler monitor the bureaucrat but also increase the chances that the ruler loses his job. Indeed, upon aggregating information, citizens might conclude that the policy failed due to the ruler's incompetence, and he thus should be replaced.

As an alternative to the free media, the dictator may monitor the bureaucrat with the help of a secret service. If the ruler intends to use the secret service, he must pay it at least $\sigma > 0$ to cover the secret service's cost of gathering information (it's natural to think that mass media also bear this cost, but are reimbursed by advertisers). The benefit of the secret service is that it reports to the ruler but not to the general public; there is no competitive pressure. However, the very same benefit creates a potential for collusion with the bureaucrat. The bureaucrat may offer a bribe to the secret service for not reporting his failure. This would be impossible in the case of media where the competition and the free-rider problem would not allow such contracting. We assume that evidence of policy failure may be concealed by secret service but may not be forged,[10] so the bureaucrat only has incentives to bribe when he fails.

Citizens

At the end of each period, each individual i in the population learns two things: a private signal $s_i(t)$ (whether her payoff increased as a result of the policy or not) and a public signal $s_{pub}(t)$ (whatever is published in the media). At the end of each period, each citizens decides whether to participate in a revolt against the ruler in order to replace him with a new one (of a random type). A revolt succeeds once sufficiently many citizens (share $\gamma \in (1-\overline{\alpha}, 1)$) decide to participate in it

[9] One could consider a monopolistic competition model where information acquisition is cheap (recall that each media uncovers a part of the puzzle only) but not free, media outlets invest in it if they compete, because if they don't 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.

[10] This prevents abuse of the bureaucrat who exerted $e = e^H$ by the secret service.

and that participating in an unsuccessful revolt costs $r > 0$.

Potentially, citizens face collective action and free-rider problems; while we are not to develop a full-scale theory of collective action, we are going to impose a few (natural) assumptions on citizen's behavior that would restrict the set of equilibria.

Citizen i maximizes her expected welfare

$$\sum_{\tau=t}^{\infty}\beta^{(\tau-t)}\mathbf{E}_t\left(h\left(\overline{\alpha}-\left(\overline{\alpha}-\underline{\alpha}\right)\mathbf{I}\left\{\text{policy fails}\right\}\right)-r\mathbf{I}\left\{i \text{ participates in unsuccessful revolt}\right\}\right).$$

We assume that the decision whether to participate in a revolt at period t is made in two steps. First, the citizen uses all the available information (public and private in current and previous periods) to evaluate the conditional probability that the current ruler is able, and thus whether she would want him replaced with a random one. She first decides whether wants the ruler to be replaced. If she wants to replace the ruler the evaluates the costs and benefits of participating in a revolution, and makes the decision on whether or not to revolt.[11] We make the following assumption on the citizens' ability to overcome collective action problem: If it is *common knowledge* that at least γ citizens want to replace the ruler, the ruler is replaced. Those who want to replace the ruler, revolt and do not bear the cost r, so that the taking part in the revolt is a utility-maximizing strategy.[12]

Timing

The timing of events in the stage game is as follows. (See Figure 1.)

1. The ruler hires a bureaucrat, picks a policy, chooses the degree of media freedom (free or censored, and makes contracts with both the bureaucrat (payments w_F and w_S which depend

[11] The assumption on the sequence of decisions by the citizen rules out equilibria where, say, everyone revolts after fifth period of current ruler's tenure regardless of policy and signals.

[12] Persson et al. (2000) solve the collective action problem differently by assuming that voters are allowed to coordinate their voting strategies (which correspond to actions in this context) ex ante, in a way that provide best incentives for politicians. In their model, this coordination also serves as a commitment device to punish (or not punish) politicians. While our main results would not change if we followed this path, we think that the assumption that we make, i.e. that citizens' actions are optimal ex post rather than ex ante, is more reasonable. Actually, in Persson et al. (2000), voters are allowed to somehow decide on common strategy ex ante, but not ex post so that voters are not able to renegotiate. In our setup, the only question that a citizen should answer when making decision to revolt is whether she would want to see ruler deposed if she had publicly available information only and whether her desire to revolt is shared by the others.

on the report of media or the secret service) and the secret service (payments z_F and z_S which depend on the service's report).

2. The bureaucrat chooses the effort level.

3. The policy outcome is realized, and each citizen learns his/her individual payoff.

4. Mass media publishes the true outcome if it is free and censored news (policy success) if it is not. If the secret service is hired, the secret service learns policy outcome. It then bargains with the bureaucrat over the information that it will deliver to the ruler (bureaucrat makes a take-it-or-leave-it offer to the secret service). The secret service reports to the ruler.

5. The ruler pays the bureaucrat and the secret service according to the contracts.

6. Citizens decide whether or not to revolt, depending on information available.

Equilibrium concept and assumptions

The game is truly dynamic, and there are multiple individuals having asymmetric information (especially if media are not free). The concept that has been widely used in recent works of, e.g. Acemoglu and Robinson (2006) and Lagunoff (2006), the Markov Perfect Equilibrium, is not applicable here, because payoff-relevant variables may include all private signals that individuals got during the reign of the current ruler. On the other hand, the set of all subgame perfect equilibria is too large, which necessitates a refinement. We restrict analysis to equilibria which are stationary in the sense that a ruler's strategy, which includes a choice of an incentive scheme and contracts with bureaucrat and/or secret service, depends only on ruler's type. This simplifies the analysis as we do not need to analyze of certain counter-intuitive off-equilibrium paths; in our equilibrium, the ruler's strategy is still the best response given his complete information set.

We do not require stationarity of citizens' strategies, so that they can accumulate past private and public signals. We consider equilibria where able rulers ($a = a^H$) choose high-powered incentives for the bureaucrat; 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 ruler:

$$c < l. \tag{1}$$

As we see below, this assumption assures that the ruler's benefits of high effort choice l are higher than the cost of providing high powered incentives c. The assumption holds whenever bureaucrat's

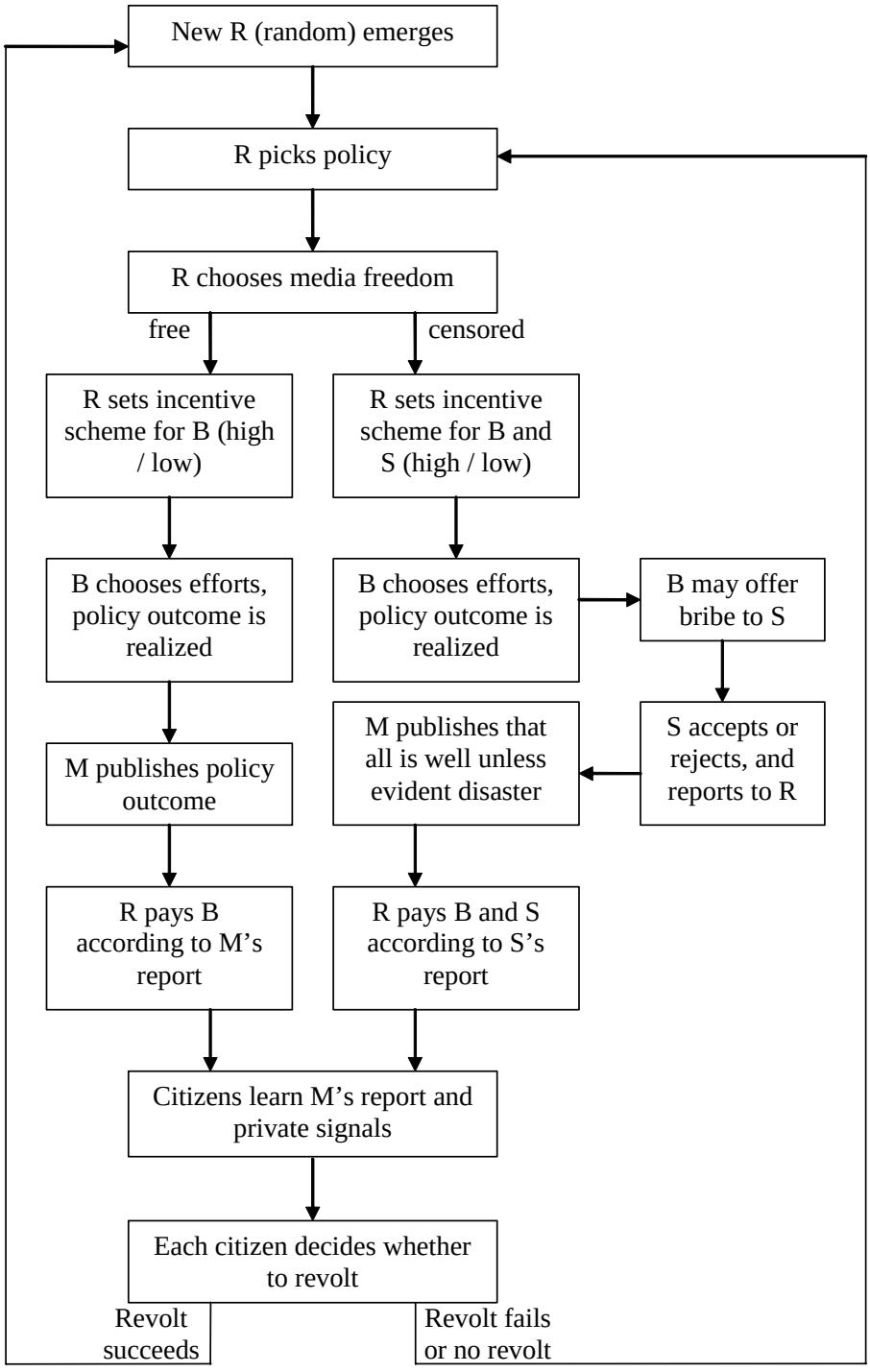

Figure 1: The stage game.

effort is not too costly (c is not too high) and/or the policy outcome does matter for the ruler's welfare (l is large).

We also assume that γ is sufficiently high so that if the policy is always successful, there will be no revolt. We need to make sure that share of those who received negative private signals in excess of the average negative private signals is not sufficient to initiate a revolt. Formally, for all integer $n \geq 1$

$$\sum_{(1-\overline{\alpha})n<j\leq n} \binom{n}{j} \overline{\alpha}^{n-j} (1-\overline{\alpha})^{j} < \gamma. \tag{2}$$

For any $\overline{\alpha}$ and $\gamma > \frac{1}{2}$, inequality (2) holds if n is sufficiently large, because by Central Limit Theorem,

$$\lim_{n\to\infty} \sum_{(1-\overline{\alpha})n<j\leq n} \binom{n}{j} \overline{\alpha}^{n-j} (1-\overline{\alpha})^{j} = \frac{1}{2} < \gamma.$$

For small n, this need not be true due to discreteness of binomial distribution of private signals.[13] It is also easy to show that (2) is always true if $\overline{\alpha} > \frac{1}{2}$ and $\gamma \geq \frac{3}{4}$.

3 Analysis

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

Bureaucrat, Media, and Secret Service

We begin by studying the equilibrium behavior of the secret service and the bureaucrat in the absence of free media. Clearly, if the secret service learns that the policy succeeds, it cannot report

[13] The left-hand side tends to 1/2 as $n \to \infty$for any $\overline{\alpha} \in (0,1)$; however, non-monotonically and non-uniformly (just pointwise). It depends on $\overline{\alpha}$ non-monotonically, too (it is decreasing, but has upward jumps due to discreteness). Basically, the problem is as follows: suppose $\overline{\alpha} = 0.52$ and $\underline{\alpha} = 0.51$. Then after two periods of policy success, almost 75% of people (those who got two negative signals and those who got one positive and one negative signal) increase their probability that the ruler is inept (two different signals are more likely under inept ruler). This is certainly an implication of discreteness.

a policy failure; by assumption a failure cannot be forged. If it learns about a failure, it compares the bribe b offered by the bureaucrat with the difference of its payoffs, $z_F - z_S$, 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. $b \leq z_F - z_S$.

The bureaucrat B knows this, and thus, should the policy fail, he is willing to bribe the secret service by offering the minimal bribe $b = z_F - z_S$ as long as it is profitable for him. If he bribes the secret service, he gets w_S from the ruler, and if he does not, he gets w_F. In other words, if bureaucrat's wage depends on the secret service's report, he offers a bribe if and only if $z_F - z_S \leq w_S - w_F$; the size of the bribe then equals $w_S - w_F$. One direct implication is that if the ruler wants to implement truth-telling by the secret service in the absence of free media, he should satisfy the collusion-proofness constraint:

$$z_F - z_S \geq w_S - w_F \tag{3}$$

which will hold as an equality in an equilibrium provided that the ruler minimizes his costs. An alternative way to understand 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 $w_F + z_F \geq w_S + z_S$.

The above intuition is summarized in the following proposition.

Proposition 1 *To induce a low-powered incentive scheme, the ruler offers $w_F = w_S = 0$ to the bureaucrat regardless of his own ability; he also does not allow free media and provides no incentives to the secret service $z_F = z_S = 0$. To induce a high-powered incentive scheme in the presence of free media, the ruler chooses $(w_F, w_S) = (0, c)$ if he is able and $(w_F, w_S) = (0, c/\nu)$ if he is inept. To provide high-powered incentives without free media, the ruler offers the same contract to the bureaucrat, while his equilibrium payment to the secret service is $z_S = 0$, $z_F = w_S$; with such payment schedules, there is no collusion between bureaucrat and secret service.*

All proofs are relegated to Appendix.

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 (3) distorts ruler's payoffs. If there were no threat of collusion, the ruler would pay w_S in case of success, and nothing in case of failure (which occurs in equilibrium at

least with probability ν for an inept ruler). To ensure collusion-proofness, the ruler has to pay w_S whatever the outcome is.

The Ruler and the Citizens

In an equilibrium where able rulers always choose high-powered incentive scheme for the bureaucrat, their policy is a success with probability 1: able ruler necessarily chooses the right policy, and bureaucrat exerts $e = e^H$. Consequently, media reports policy success regardless of whether it is free or censored. On the other hand, an inept ruler faces a non-zero chance of policy failure to be reported by the media: With probability $1 - \nu > 0$, he chooses a wrong policy which eventually fails, and the media reports this with probability 1 if it is free and $\eta > 0$ if it is not. Therefore, citizens observing public signal $s_{pub} = L$ in period t are bound to believe, regardless of their previous information, that the ruler is inept.

Since we consider equilibria where rulers of the same type always choose the same policy, citizen's expected utility depends on the ruler's type only. Policy of an able ruler never fails while that of an inept ruler has a non-zero chance of failure, so citizens strictly prefer able ruler to inept ones and want the ruler to be replaced if and only if they believe the current ruler to be able with probability less than μ. In particular, after getting a negative public report $s_{pub} = L$, each citizen not only believes that the ruler is inept for certain, but it is common knowledge that everyone wants the ruler replaced. Hence, after a negative media publication the ruler is indeed replaced, which makes free media dangerous for an inept ruler.

Given this result, the fact that the ruler stays in power implies that all previous media reports during his tenure have been positive. Suppose that so is current media report, so $s_{pub} = H$. A citizen, given public and private information, may or may not be willing to have the ruler replaced. However, as the following proposition shows, no citizen is sure that at least ξ of them want the ruler replaced.

Proposition 2 *Consider a ruler who 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 ruler replaced, and thus there is a positive chance that revolt will not succeed.*

One may compare this result to winner's curse phenomenon in auctions with common values. Here, each citizen gets a stream of private signals about the same variable (ruler's ability). When a citizen

becomes just ready to revolt, she believes that most other citizens lag behind her in their confidence that the ruler is inept, because otherwise the revolt would have already occurred before. 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 ruler is inept, and citizens become able to coordinate.

This establishes a proposition on the rulers' succession.

Proposition 3 *The ruler stays in power as long as the media report "success". If media report "failure", citizens revolt, and the ruler is replaced by a new one.*

The intuition is straightforward. Upon a positive report citizens update their beliefs on the probabilities of the two outcomes: (i) the ruler may be able and media are free (ii) the ruler is inept but media are controlled. As in the case (ii) there is a non-trivial probability η 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 ruler is inept and is therefore inferior to an average pick from the rulers' pool next period; hence the current ruler is replaced.

Media and the Choice of Bureaucratic Incentives

We now check that an able ruler indeed chooses the high-powered incentive scheme if assumption (1) holds.

Proposition 4 *At any period of his tenure, an able ruler is strictly better off allowing free media and choosing a high-powered incentive scheme. His expected life-time utility is* $U = \frac{1}{1-\beta}(u - c)$.

The inept ruler faces a far more complex trade-off: he needs to choose high- or low-powered incentives, and the monitoring mechanism. The ruler never chooses free media together with low-powered incentive scheme 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 ruler relies on the secret service); (iii) low incentives (L).

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

$$\begin{aligned} U &= \max\left(U_M, U_S, U_L\right); \text{ where} \\ U_M &= u - (1-\nu)\, l - c + \beta\nu U; \\ U_S &= u - (1-\nu)\, l - c/\nu - \sigma + \beta\left(1 - \eta\left(1-\nu\right)\right) U; \\ U_L &= u - l + \beta\left(1-\eta\right) U. \end{aligned} \tag{4}$$

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

$$\begin{aligned} \overline{U}_M &= \frac{u - (1-\nu)\, l - c}{1 - \beta\nu}; \\ \overline{U}_S &= \frac{u - (1-\nu)\, l - c/\nu - \sigma}{1 - \beta\left(1 - \eta\left(1-\nu\right)\right)}; \\ \overline{U}_L &= \frac{u - l}{1 - \beta\left(1-\eta\right)}. \end{aligned}$$

Proposition 5 *Free media is more likely to be chosen when the benefit of staying in office u is low, the value of a good policy l is high, or the cost of secret service σ is high. If free media is not chosen, secret service is more likely to be used to induce high effort if desire to stay in office is high, value of the good policy l is high, the cost of secret services σ is low, or the cost of bureaucrat's effort c is low.*

Let us also discuss the comparative statics with regard to utility of holding office u. Whenever u is very large, then the ruler will choose secret service. The reason is that he then pays attention only to his chances of staying at power, and these are maximized if S is chosen (free media M are definitely dominated, and, ceteris paribus, it makes sense to give high incentives to the bureaucrat so that some evident disaster that the media will report will be postponed for as long as possible).

Another dimension of interest is ν, which captures both inept ruler's ability a_L and the share of good policies λ, which may be a proxy for overall economic situation. The comparative statics here is more involved. Namely, as ν increases, it becomes more profitable (and cheaper, in case of secret service) to choose high incentives, so the chance that low incentive regime L will be chosen

diminish. There, however, remains a non-trivial trade-off between M and S: with higher ν, the ruler faces a lower chance of policy failure which makes him less afraid of choosing free media; on the other hand, higher ν decreases the difference between free media and secret service in terms of expected payments to B and S, which makes S more attractive. Overall, the statics is ambiguous, but one can prove that $\overline{U}_M$ is convex, while $\overline{U}_S$ is concave (if η is small) with respect to ν, so $\overline{U}_M - \overline{U}_S$ is a convex function which means that secret service dominates other options for some intermediate values of ν. Both very low and very high ν may make mass media superior to secret service (of course, depending on other parameters, one or both of these intervals may shrink); note, however, that for low ν both free media and secret service are dominated by low incentives regime.

Robustness

While we introduced a number of simplifying assumptions to make the model tractable, results seem to be robust to the modelling choices. For example, suppose that smart rulers also make mistakes albeit with a lower probability. The results still hold even though Bayesian updating will be somewhat more involved. In particular, citizens would allow rulers to remain in power after occasional policy failures; however even smart rulers can be overthrown upon a series of mistakes due to bad luck. Interestingly, in such a setting, there is a case for the smart ruler to choose free media over the secret service even if the secret service is costless ($\sigma = 0$). Indeed, if the smart ruler expects some chances of mistake, he will have to pay a bonus to the secret service to prevent collusion; this bonus is not needed if the monitoring is carried out by free media.

We have assumed that the ruler does not punish the bureaucrat for the policy failure even when the ruler knows that the policy choice was right (e.g. because the ruler is able) and the failure is B'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 R only for one period. If there is a multi-period contracting environment, the ruler 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 ruler – that will only be paid if the ruler himself remains in office. This can result in an emergence of 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 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 ruler $(1-\nu)(\overline{\alpha}-\underline{\alpha})h$ 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 ruler 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 revolting. 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 runs positive news.

Empirical Predictions

The model generates a number of testable predictions about determinants of media freedom. We argue that high u (or low l) may be associated with abundance of natural resources, since more resources imply that the adverse effect of a wrong policy may be mitigated by availability of petrodollars. Figure 2 presents the comparative statics with regard to high u (or low l).

In a democracy, the ruler and his bureaucracy are bound to cope with free media. Thus, we do not expect to find significant effect of natural resources on media freedom in democratic countries where monitoring of bureaucracy is carried out via separation of powers, opposition parties etc. The effect of media freedom on economic performance is ambiguous. The free media give rise to a higher turnover of inept leaders which should promote both a good policy and better bureaucratic incentives therefore resulting in economic growth. However, the cost of turnover may have an adverse affect on growth (e.g. via expropriation of property and macroeconomic instability).

Proposition 5 implies that extra oil reserves have unambiguous effect on media freedom: indeed, both higher desire desire to stay in power (high u) and low interest in policy success (low l) make less free media optimal for the ruler. However, oil may have ambiguous impact on the incentives provided to bureaucrats, and thus probably economic performance. Indeed, as we saw, if the ruler is

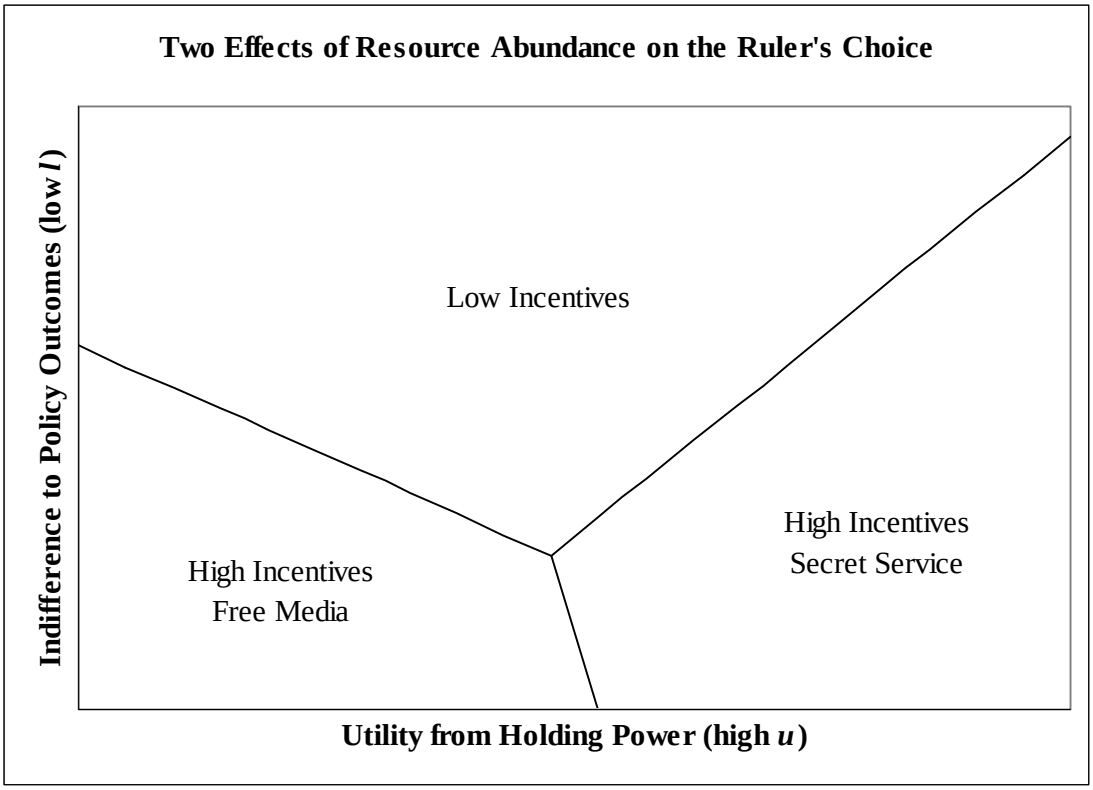

Figure 2: Comparative statics of the ruler's choice of incentives and monitoring mechanism with regard to the resources abundance: indifference to policy outcomes (low l, vertical axis) and high value of holding office (high u, horizontal axis).

not much interested in policy success, he will rank low incentives higher then the other two options. However, if the oil does not decrease his interest in outcome, but at the same time increases his desire to stay in power (l is constant but u is high), then, as Proposition 5 suggests, the ruler will choose secret service. The intuition is that he will then try to accomplish two goals, so that both policy outcome is more likely to be success and the chances of revolution are minimal, even despite the necessity of bearing higher costs. Therefore, our model predicts ambiguous effect of resource abundance on economic performance (although presence of oil and choosing of secret service instead of free media as a result may slow down the turnover of rulers and make it less likely that an able ruler will come to power soon).

4 Evidence

In this section, we illustrate the theory above with systematic evidence on the relationship betweeen oil and media freedom using cross-sectional and panel data. To check the main testable prediction (oil has adverse effect on media freedom in non-democracies), we need data on natural resources, level of democracy, media freedom and long-run economic performance. Unfortunately, systematic data on media freedom are not available prior to 1993, so we can check to what extent the effect of resource abundance on media freedom and bureaucratic incentives slows down long-run economic growth. We will therefore concentrate on the factors determining media freedom itself.

While we focus on testing our prediction that natural resource abundance undermines media freedom in non-democratic societies, we also control for alternative theories. First, there is a positive correlation (and a two-way casualty) between media freedom and the level of democracy per se. In our empirical analysis we show that natural resources are a significant determinant of media freedom even controlling for the level of democracy. Second, media freedom is a "normal good" and should therefore be positively associated with the level of development (affluent citizens demand better media) and negatively correlated with resource abundance. In this story, the resource-rich dictators simply have enough means to pay citizens for banning free media, while dictators with no resources at hand are forced to allow free media. We show that our results hold even if we control for the GDP per capita, for literacy, internet penetration, and for inequality. We also show that media freedom is negatively associated with literacy which is consistent with our model but is at odds with the "demand for media" theory.

Data

We use 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 on growth 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, but 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 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 instead of oil reserves in regressions.)

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 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.

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

Results

The results are presented in Tables 1 and 2 in the Appendix. These results are consistent with the model's predictions, and are robust to the choice of specification, econometric methodology, and sample. 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 ruler 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 ruler so the ruler 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 logarythms of the total reserves, GDP per capita and population.

In column (3), we control for 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 ruler. This is consistent with our model rather than with the alternative theory that the freedom of media emerges in response of public demand; this theory would imply a positive sign. One should also note that including internet and literacy changes the sign of the coefficient at the GDP per capita – 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. OLS regressions (1)-(4) are vulnerable to an endogeneity problem as democracy can depend on media freedom. In regressions (5), we replace contemporaneous measures of democracy with its average level in 1980-1992. In column (6), we instrument democracy with the lagged

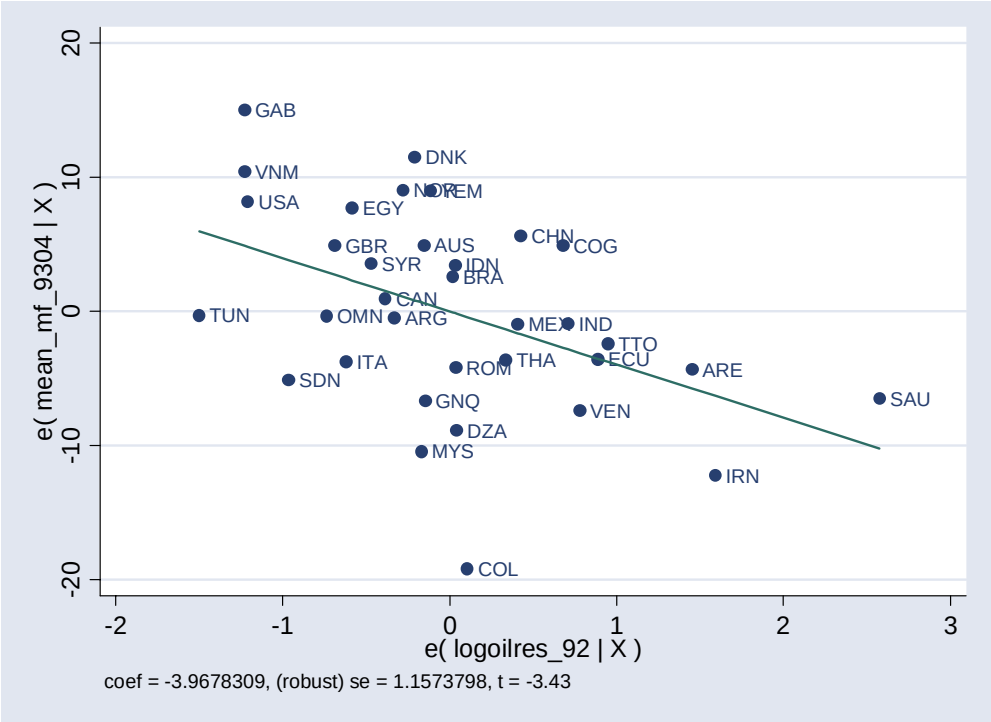

Figure 3: Adjusted partial residual plot for media freedom and oil reserves for countries with non-trivial oil reserves (specification 4 in Table 1).

democracy score and the results remain the same. In columns (7) and (8) we use panel data for 1993-2004. First, we use country-level fixed effects (column (7)); we also include time dummies to control for changes in global oil price and other global variables. In column (8) we estimate the random effects model 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 results are also robust to adding controls such as Gini, education, replacing oil reserves with oil production. The effect is 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.

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 3 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.

Table 2 presents further 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. In regression (4), we use the media freedom index from Reporters Sans Frontieres rather than the more conventional one from the Freedom House. Column (5) 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.

5 Related Literature

For our study, three major strands in modern economic literature are most relevant: (i) dynamic models of strategic interaction in political economics, (ii) contract theory and corporate governance, and (iii) economics of media.

Recent formal work on political dynamics of non-democratic regimes includes, among others, Acemoglu (2003, 2005), Acemoglu and Robinson (2006), Bueno de Mesquita et al. (2003), Konrad and Skaperdas (2005), Restrepo (2002), and Gallego and Pitchik (2004). Acemoglu (2003) demonstrates that the impossibility of political commitment precludes efficient political outcomes. Acemoglu and Robinson (2006) model political replacement process as, essentially, a two-player game between the rich and the poor, while Acemoglu (2005) investigates outcomes of oligarchic decision-making. Bueno de Mesquita et al. (2003) analyzes succession process within a framework of dynamic coalition formation, while Konrad and Skaperdas (2005), Acemoglu, Robinson, and Verdier (2004) and Padro-i-Miguel (2005) study divide-and-rule tactics of leaders in non-democratic

regimes. The literature on optimal sequencing between economic and political liberalization is discussed in Persson and Tabellini (2006).

The task of providing a bureaucrat with right incentives is similar to the principal's problem in contract theory literature. Since Holmstrom (1979), it has emphasized the crucial role of information in resolving the moral hazard problem. Tirole (1986, 1992) considers a model where a principal hires a supervisor to get information about agent's efforts; the problem is that the supervisor can collude with the agent. Kofman and Lawarree (1993) extend Tirole's model to compare internal and external auditors. Like free media in our model, external auditors are costlier but, at least in theory, never collude. Williamson (1967), Calvo and Wellisz (1978), and Qian (1994) study incentives in hierarchies and suggest that monitoring costs and risks of collusion are crucial for understanding the limits to efficiency of large organizations.

Prendergast (1993) builds a theory of "yes-men" which shows that whenever firms use subjective performance evaluation, there endogenously arises a tendency for the subordinates to conform to the boss's opinion therefore undermining efficiency. 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 difficulties of application of the basic agency theory to the analysis of incentives in government bureaucracy is discussed in Wilson (1989) and formally analyzed in Dewatripont, Jewitt, and Tirole (1999). Wilson (1989) emphasizes the importance of fuzziness of the mission and therefore preponderance of career concerns over formal contracts. We instead focus on the mechanism of

generating common knowledge information about the bureaucrat's performance which is crucial for the career concern model.

The economics-of-media literature is diverse and fast-growing. 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 Conclusion

We study the determinants of media freedom in non-democratic societies. In such societies, the ruler 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 ruler may choose to allow 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 ruler 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 ruler's policies, e.g. with the help of mass media, they solve the coordination problem and overthrow the ruler. As the need to provide incentives to bureaucracy is relatively less important in resource-rich countries, our theory predicts a negative relationship between resource abundance and media freedom; this relationship is especially strong in less democratic countries.

Two authoritarian regimes seem to defy 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.[14]

In China, the ruling party is facing exactly the "Gorbachev 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.

[14] 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.

Appendix: Proofs

Proof of Proposition 1.

If constraint (3) is satisfied, or the ruler allows free media, the ruler will learn policy outcome for sure. Bureaucrat's low efforts will lead to success with probability 0; in the case of high efforts, the probabilities are 1 and ν, respectively. He then chooses high efforts if and only if expected increase in payoff exceeds costs c, i.e. $(w_S - w_F) \geq c$ or $\nu(w_S - w_F) \geq c$. The cheapest way to satisfy these constraints is by setting $w_F = 0$, and w_S such that these expressions are satisfied as equalities. Similarly, if secret service is used, the ruler should set $z_S = \sigma$ and $h_F = \sigma + w_S$.

We now can obtain the (minimum) expected payments that the ruler expects to pay in each of these cases. Obviously, the ruler pays nothing if he chooses low-powered incentives. If he chooses high-powered incentives for the bureaucrat together with free media, he pays c with probability 1 if he is able. If he is inept, he pays c/ν with probability ν, which also gives c in expectation. If the ruler does not allow free media, but still opts to have high-powered incentives, he must pay bureaucrat's wage w_S to the bureaucrat if the policy was successful and $z_F = w_S$ to the secret service if it fails. Hence, an able ruler pays $c + \sigma$ while an inept one pays $c/\nu + \sigma$, which is strictly greater than in the case of free media.

Proof of Proposition 2.

After the first period, those who received $s_i = L$ want the ruler to be replaced, but they know that if $a = a^H$, the revolt will fail (assumption (2) implies for $n = 1$ that $1 - \overline{\alpha} < \gamma$), so they do not revolt. Assume that revolt is possible and consider the earliest time since beginning of tenure when citizens can revolt. (Since revolt in previous periods is impossible, citizens do not update on the fact that it did not occur, which simplifies arithmetic a lot.) Suppose that the number of periods passed is n, so each individual got n private and n public signals, public signals being all about success. For each individual, participation in an unsuccessful revolt costs r and participation in a successful one is costless. To participate, the individual must know for sure that revolt will succeed, and, in particular, he needs to know that there are enough fellow citizens who believe that the ruler is able with probability less than μ and want him replaced.

How an individual may know for sure that the share of citizens who believe the ruler is less able than average is sufficiently high (at least γ)? Indeed, it is possible for an individual to get a stream of n positive public signals and any combination of private signals even if the ruler is inept. Hence, an individual always assigns positive probability to ruler being able (she does not update

on the fact of absence of revolt in previous periods). To be positive that revolt, if occurs, succeeds, the individual must be certain that even if the ruler is able, there are sufficiently many citizens who believe that he is inept and want him replaced. Now consider the set of citizens who want to remove the ruler. If a citizen who received j negative signals (out of n) wants the ruler replaced then, obviously, a citizen who received more than j also does (Bayes' formula yields that getting a negative private signal instead of a positive one decreases the person's subjective probability that the ruler is able). Now assume that even if the ruler is able, there are indeed at least γ citizens who want the ruler replaced. We will show that this leads to a contradiction: namely, the "least certain" citizen, i.e. one who would not want the ruler to be replaced had he received one less negative signal, actually does not want to revolt.

To make matters simple, consider the set of citizens who would be willing to revolt if they had their private signals only. This set is even larger than those who are willing to revolt after taking both public and private signals into account, since public signals are positive and, by Bayes' formula, only improve the perception of ruler's abilities. If the ruler is able, the share of citizens who got j negative signals is equal to $\binom{n}{j}\overline{\alpha}^{n-j}\left(1-\overline{\alpha}\right)^{j}$. Assume that those who got at least k negative signals want to revolt, while those who got $k-1$ or less do not (evidently, those who got all positive signals believe that the ruler is able with probability greater than μ and thus want to keep him, so $k>0$; on the other hand, since we assumed that some citizens do want the ruler replaced, we have $k\leq n$). Thus, we have

$$\sum_{j=k}^{n}\binom{n}{j}\overline{\alpha}^{n-j}\left(1-\overline{\alpha}\right)^{j}\geq\gamma,$$

and, from assumption (2), that $k<\left(1-\overline{\alpha}\right)n$, i.e. the "least certain" citizen should have more negative private signals than expectation of those. If the ruler is inable, the probability of this citizen to get the number of signals he actually got is exactly $\binom{n}{k}\overline{\alpha}^{n-k}\left(1-\overline{\alpha}\right)^{k}$. If the ruler were inept, this number would be $\binom{n}{k}\underline{\alpha}^{n-k}\left(1-\underline{\alpha}\right)^{k}$. We now compare these two values.

The first value is greater than the latter if and only if $f\left(\overline{\alpha}\right)>f\left(\underline{\alpha}\right)$, where

$$f\left(x\right)\equiv\left(n-k\right)\ln x+k\ln\left(1-x\right).$$

We have

$$f'\left(x\right)=\frac{n-k}{x}-\frac{k}{1-x},$$

which is positive if and only if $1-x>\frac{k}{n}$. Since $\frac{k}{n}<1-\overline{\alpha}$, we find that $f'\left(x\right)>0$ on $(\underline{\alpha},\overline{\alpha})$, and hence $\binom{n}{k}\overline{\alpha}^{n-k}\left(1-\overline{\alpha}\right)^{k}>\binom{n}{k}\underline{\alpha}^{n-k}\left(1-\underline{\alpha}\right)^{k}$. This means that the citizen is more likely to get

exactly k negative signals if the ruler is able than if he is inept. Bayes' formula implies that such citizen should believe that the ruler is able with probability higher than μ based on his private signals; so, this happens if he takes positive public signals into account as well. This contradicts the fact that citizen who received k negative signals is willing to see the ruler replaced. Therefore, it is impossible for a citizen to be certain that more than γ other citizens want the ruler replaced, and hence he would prefer not to revolt. Hence, there is no minimum period in which citizens may revolt if all public signals during current ruler's tenure were positive. This contradiction completes the proof.

Proof of Proposition 4.

If an able ruler chooses a high-powered incentive scheme, there is never a revolt. Evidently, choosing secret service is strictly dominated by free media with high incentives, so we need to compare the latter with no incentives regimes. By providing no incentives (apart from a chance of revolt) the ruler loses l because of a chance of policy failure while gaining c by economizing on bureaucrat's wage. By assumption (1). It is straightforward to show that the equilibrium utility of an able ruler is given by Bellman equation

$$U_a = u - c + \beta U_a,$$

implying $U_a = (1-\beta)^{-1}(u-c)$.

Proof of Proposition 5.

We need to compare the derivatives with regard to u, l, σ, and c in each of these expressions. For example, with respect to l we have $\frac{\partial \overline{U}_M}{\partial l} = \frac{-(1-\nu)}{1-\beta\nu}, \frac{\partial \overline{U}_S}{\partial l} = \frac{-(1-\nu)}{1-\beta(1-\eta(1-\nu))}, \frac{\partial \overline{U}_L}{\partial l} = \frac{-1}{1-\beta(1-\eta)}$, so $\frac{\partial \overline{U}_M}{\partial l} > \frac{\partial \overline{U}_S}{\partial l} > \frac{\partial \overline{U}_L}{\partial l}$. This means that as if parameters are such that M was chosen, then an increase in l cannot change this, however, if M was not chosen, it may be chosen after the increase, so the set of other parameters where M is chosen is strictly larger for higher l. The same reasoning leads to the proof of the statement for other variables (to prove that M dominates L one needs to recall that $\eta < 1 - \nu$).

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Table 1. Regression estimates.

	1	2	3	4	5	6	7	8
	OLS					IV	Panel	
	Media Freedom, averaged 1993-2004						Media Freedom	
Log GDP per capita, PPP	3.79 (1.04)***	3.99 (1.06)***	0.65 -2.45	5.42 (1.78)***	5.61 (1.67)***	3.4 (1.22)***	5.38 (1.88)***	5.38 -3.59
Democracy	4.57 (0.30)***	4.32 (0.35)***	4.04 (0.61)***	4.1 (0.56)***	3.14 (0.48)***	4.95 (0.39)***	1.26 (0.28)***	1.26 (0.42)***
Log oil reserves	-2.67 (0.83)***	-4.2 (1.02)***	-7.56 (2.49)***	-3.97 (1.16)***	-6.14 (1.40)***	-1.83 (0.71)**	-3.53 (1.35)***	-3.53 (1.95)*
Log oil reserves * Democracy		0.39 (0.15)***	0.78 (0.36)**	0.46 (0.19)**	0.39 (0.19)**		0.41 (0.16)**	0.41 (0.25)*
Log population, 1992	-1.88 (0.68)***	-1.96 (0.67)***	-1.62 (1.13)	-2.04 (1.04)*	-2.07 (0.93)**			
Log land area	1.51 (0.57)***	1.37 (0.56)**	1.84 (0.86)**	1.46 (0.93)	2.41 (0.83)***			
Literacy rate, Databanks Int.			-0.32 (0.10)***					
Gini, WDI			-0.06 (0.12)					
Log Internet users, WDI			5.53 (1.56)***					
Observations	121	121	65	34	108	97	1380	1380
R-squared	0.81	0.82	0.81	0.93	0.69	0.82	0.10	0.10

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 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. 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						IV
	Media Freedom, Freedom House, except for (4) with Reporters Sans Frontières						
Log GDP per capita, PPP	1.14 (1.75)	6.12 (1.43)***	3.42 (1.03)***	1.91 (1.63)	1.54 (1.49)	4.92 (1.05)***	1.64 (2.06)
Democracy	4.22 (0.43)***	6.18 (2.35)**	4.38 (0.40)***	3.86 (0.53)***	4.38 (0.31)***	4.22 (0.44)***	4.11 (0.66)***
Log oil reserves	-2.48 (1.08)**	1.37 (1.26)		-6.08 (1.68)***	-2.66 (0.90)***	-3.21 (1.13)***	-2.27 (1.18)*
Log oil reserves * Democracy				0.64 (0.22)***		0.26 (0.15)*	
Log oil production			-1.53 (0.58)**				
Log oil production * Democracy			0.14 (0.07)**				
Observations	77	44	125	115	80	121	56
R-squared	0.63	0.58	0.82	0.65	0.77	0.84	0.64

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

Notes: Regressions (1)-(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) we put oil production instead of oil reserves, and in (4) we use media freedom data from Reporters Sans Frontières instead of Freedom House. In (5), OECD and former communist countries are excluded, and 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.
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).