A Theory of Informational Autocracy[*]

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Abstract

We develop an informational theory of autocracy. Dictators survive not by means of force or ideology but because they convince the public—rightly or wrongly—that they are competent. Citizens do not observe the leader's type but infer it from signals in their living standards, state propaganda, and messages sent by an informed elite via independent media. If citizens conclude that the leader is incompetent, they overthrow him. The dictator can invest in making convincing state propaganda, censoring independent media, co-opting the elite, or equipping police to repress attempted uprisings—but he must finance such spending at the expense of the public's consumption. We show that informational autocracies prevail over old-style, overtly violent dictatorships when the informed elite is sufficiently large but are replaced by democracies when elites are too numerous to be bribed or censored. The theory provides insight into various soft authoritarian regimes around the world and suggests a logic of modernization behind recent global political trends.

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1 Introduction

Contemporary autocracies differ from their predecessors. The classic 20th century dictators—whether totalitarians like Hitler or Stalin, military strongmen like Pinochet or Galtieri, or Third World despots like Idi Amin or Mobutu—used violence to intimidate potential opponents. To maximize the deterrent effect, they often advertised their brutality, holding show trials and public executions. Many combined fear with ideological brainwashing. Rejecting Western-style liberal democracy, they claimed to be building a new, superior order.

A few old school tyrants remain—in North Korea and Syria, for instance. Yet—as we document elsewhere (Guriev and Treisman 2019)—the balance has shifted in recent decades. A new form of autocracy has emerged that is better adapted to a world of open borders, international media, and knowledge-based economies. In the Peru of Alberto Fujimori, the Hungary of Viktor Orban, and the Russia of Vladimir Putin, illiberal leaders have managed to remove almost all constraints on their power while using relatively little repression and pretending to be democratic.

These new authoritarians are not completely non-violent. Amid civil wars and ethnic revolts, they use brutal force, and they sometimes target journalists to censor their revelations. But when they do repress, they try to conceal their involvement or camouflage its purpose—for instance, by prosecuting dissidents not for their politics but on fabricated charges of tax evasion or fraud. Where the old dictators sought to rouse the public with rhetoric of enemies and threats, many new ones mimic the language of democratic leaders. They boast of good economic performance and public service provision.

How do such non-ideological, softer autocrats manage to hold onto power without using the methods of their predecessors? We argue that their secret lies in the control of information. Instead of isolating their countries, imposing ideologies, or terrorizing citizens, such leaders achieve many of the same ends by manipulating public opinion. With the help of censored or co-opted media, they persuade citizens that they are competent and benevolent; their legitimacy rests on popularity rather than fear.

Of course, such leaders are not the first to manipulate information. Their totalitarian predecessors pioneered the use of propaganda. Yet today's soft dictators manipulate in a different way. Instead of trying to reprogram people's thinking with a comprehensive ideology, they aim only to improve evaluations of their leadership.

In this paper, we present a theory that explains how such "informational autocracies" function. We build on signaling models of accountability (see, e.g., Rogoff (1990), Coate and Morris (1995), Besley (2006)). As in democracies, the public seeks to replace "incompetent" leaders with "competent" ones, drawing inferences from policy performance. Our contribution is to add the tools of contemporary dictatorship to the accountability framework—leaders can send citizens costly

messages about their ability (propaganda), censor critical messages sent via independent media (censorship), or bribe the opposition elite to remain silent (co-optation).

Our model pits a leader—who may be either competent or incompetent—against an "informed elite," which observes the leader's type, and the general public, which does not. The public prefers a leader who is competent and may try to oust the incumbent—in a revolution or election—if it infers that he is not. The elite can send messages to the public via independent media; the leader transmits his own propaganda and can censor the elite's messages or co-opt it to stay silent. The public infers (in a rational, Bayesian way) the competence of the leader based on whatever signals it receives and on its own standard of living. The latter depends on the leader's economic performance, which varies stochastically but correlates with his ability. The leader can also deter challenges by spending on old-style mass repression, but at the cost of revealing irreversibly that he is incompetent.

Within this framework, three types of equilibrium emerge: "overt dictatorship," in which incompetent dictators repress the public; "democracy," in which signals are all accurate and uninformed citizens vote (or protest) retrospectively on the basis of economic performance; and "informational autocracy," in which incompetent dictators manipulate information to stay in power. The main determinant of regime type is the size of the informed elite. If the elite is large, bribing or silencing it costs so much that the population's living standard suffers noticeably, revealing the leader's incompetence. In such cases, informational autocracy cannot be sustained; democracy is the only possibility. By contrast, if the elite is too small, it costs so little to co-opt it that the public discounts its enthusiastic messages about the leader. Again, informational autocracy cannot work. Against a very small elite, repression is cost-effective, so overt dictatorship prevails. Thus, informational autocracies tend to occur in countries where the informed elite is intermediate in size, while democracies dominate where the elite is large and overt dictatorships are found where it is small.

At the same time, the equilibrium choices depend on the costs of censoring the independent media and of broadcasting convincing propaganda. These relate, in part, to the structure of the public and private press that a given leader inherits on coming to office. Where the independent media is large, censoring its messages or co-opting its owners is expensive. Where the state media is already dominant, the task of reaching the public with biased messages is easier.

Both these factors—the size of the informed elite and the costs of censorship and propaganda— relate to economic modernization in ways that can explain the observed shift from old-style repressive regimes toward informational autocracy—and ultimately democracy. Rapid increases in higher education in many developing countries have produced more sophisticated elites, who are better able to coordinate resistance and enlist international support against overtly violent leaders. Yet, the weakness of independent media in many of these countries gives the regime an advantage at first

in communicating with the public.[1] If modernization continues, the elite will eventually grow too large to be co-opted or censored, and private media, empowered by new information technology, will come to challenge the leader's dominance of messaging. Democracy then becomes the only option. Thus, our analysis provides a micro-foundation for versions of "modernization theory" which argue that economic development eventually leads to democracy. It also explains how countries can get stuck in the informational autocracy range for some time as a more educated public confronts a state that has monopolized mass communications.

While our model sharply apportions the parameter space to different equilibria, in reality the boundaries are fuzzy. Democratic politicians also seek to appear competent and their public relations operations sometimes resemble the propaganda of authoritarians. Some regimes—those of Cristina Kirchner or Silvio Berlusconi, for instance—have attributes of both informational autocracy and democracy. Informational autocracies may also degenerate into overt dictatorships, as may have occurred after Turkey's 2016 attempted coup, which prompted Erdogan to detain tens of thousands of suspected opponents.

The rest of the paper is structured as follows. The next section briefly discusses related literature. Section 3 develops the model. Section 4 presents illustrative evidence of its empirical relevance. Section 5 concludes.

2 Related literature

Our theory builds on a signaling model similar to those used previously to study accountability via elections in democracies (for reviews, see Besley (2006) and Gehlbach (2013, chapter 7)). The type of the leader (competent or incompetent) is asymmetric information. The public infers the leader's type from observed performance. However, whereas in standard models of democratic accountability the incumbent tries to improve performance in order to signal competence, in our model of informational autocracy the incumbent seeks to distort the public's observations by manipulating information.

Our model is also related to the literature on media capture in democracy pioneered by Besley and Prat (2006) (see Prat and Stromberg (2013) and Stromberg (2015) for recent surveys of theoretical and empirical work). Besley and Prat focus on the equilibrium co-optation of multiple media (explicitly modeling coordination among them); we abstract from intra-elite strategic interaction (treating elites as a single player) and focus on the trade-offs between various tools of authoritarian politics such as censorship, propaganda and repression.[2] Consistent with the empirical evidence in Stromberg (2015), we see media scrutiny as constraining politicians.

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[1]Another complementary factor not captured by our model is the end of the Cold War and the associated reduction in support for authoritarian anti-Soviet regimes (by the West) and pro-Soviet ones (by the USSR).

[2]A version of our model with multiple elite groups is considered in the working paper Guriev and Treisman (2015).

Previous research on the political economy of dictatorship has developed in a number of directions (see Gehlbach et al. 2016 for a recent survey). One strand examines the role of institutions in authoritarian states, interpreting them as mechanisms that enable the leader to credibly commit not to expropriate subjects (North and Weingast 1989, Gehlbach and Keefer 2011) and to share wealth with the poor (Boix 2003, Acemoglu and Robinson 2006) or power with the elite (Myerson 2008, Svolik 2012, Boix and Svolik 2013). A related set of papers considers why autocrats hold elections, with more—or less—genuine competition (Gandhi and Lust-Okar 2009). The goal may be to obtain information about local conditions (Cox 2009, Blaydes 2010), to signal strength (Simpser 2013, Gehlbach and Simpser 2015), or to deter challenges by opponents (Rozenas 2016, Egorov and Sonin 2014, Little 2014).

We abstract here almost completely from institutional detail. Indeed, our model does not distinguish between the ouster of leaders by revolution and by election. A more common approach is to classify regimes by their formal institutions—in particular, whether they select leaders through free and fair votes. Yet since almost all dictatorships today hold elections, the question is how free and fair they are. That depends less on the institutions themselves than on the setting in which they operate—most notably, the information environment. In our framework, what distinguishes regimes is whether the public's behavior is determined by state repression, information manipulation, or free information flows. When informational autocrats hold national elections, the goal is not to select new leaders but to enhance their reputation at home and abroad.

Other work explores how autocrats interact with their support group, and how the size of the inner circle affects policies and survival (Bueno de Mesquita et al. 2003, Egorov and Sonin 2011). Like us, Bueno de Mesquita et al. model the game between a leader, an elite, and a broader public. However, their "selectorate theory" mostly considers the allocation of resources in a world of perfect information, while ours concerns transmission of signals under asymmetric information. Unlike their winning coalition, which chooses the leader, our elite can only influence and help the public. And where their leaders bribe elites not to revolt, ours co-opt the elite to prevent it from sharing information.

Still another relevant strand of research considers when the public can coordinate on rebellion and how an authoritarian regime might prevent this. Fearon (2011) models how, in democracy, the threat of revolt disciplines leaders, and how regularly scheduled elections can serve as a device to coordinate that revolt. Of course, authoritarian rulers—even those that stage elections—seek to disable such mechanisms, often using information controls. For instance, autocrats may censor public communication and ban demonstrations (Kricheli et al. 2011); block private messages that encourage anti-regime action (King, Pan, and Roberts 2013); exaggerate their strength (Edmond 2013, Huang 2014); or use both censorship and propaganda to hinder coordination (Chen and Xu 2015). Other papers introduce tradeoffs. Egorov, Guriev, and Sonin (2009) and Lorentzen (2014)

model the dictator's choice in setting the level of censorship, where a free media, on the one hand, provides him with useful information, but, on the other hand, facilitates opposition mobilization.

All these papers consider ways leaders can impede coordination. By contrast, our dictator stays in power not by blocking attempted rebellions but by removing the desire to rebel. He manipulates information not to disrupt coordination but to increase his popularity. The closest paper to ours is Shadmehr and Bernhardt (2015), in which citizens must infer whether or not the news has been censored. However, that paper does not study the interaction with co-optation, propaganda, and economic shocks, which is central to our analysis.

Finally, various scholars have proposed different categorizations of non-democracies. A traditional distinction contrasts totalitarian with authoritarian regimes (Linz 1985). More recently, Geddes, Frantz, and Wright (2018) distinguish monarchies, one-party, military, and personalist dictatorships. Our classification, based on the method of exercising power, is orthogonal to such categorizations based on the identity of the ruling group. Although most informational autocrats are personalist dictators, some occur in one-party regimes (Malaysia, Singapore) or even monarchies (some of the Gulf states).

3 Theory

3.1 Setting

3.1.1 Players

There is a political leader and a continuum of citizens of unit mass. The leader has a type, denoted θ, which may take two values: competent ($\theta = 1$) or incompetent ($\theta = 0$). The ex ante probability that he is competent is $\bar{\theta}$; naturally, $\bar{\theta}$ is also the expected value of the leader's type.

The citizens are exogenously divided into informed (elite) and uninformed (general public). The main difference is that the elite—like the leader himself—directly observes θ, while the public does not. Much of the action of the game, therefore, concerns whether the elite communicates this information to the public. The elite (costlessly) sends a signal, $e = \{0, 1\}$, where $e = 1$ denotes "the leader is competent" and $e = 0$ denotes "the leader is incompetent." We assume that the elite can choose to hide evidence about the leader's incompetence (hence can send message $e = 1$ or $e = 0$ when the leader is incompetent) but cannot fabricate convincing negative messages when the leader is competent (i.e. can only send $e = 1$ when the leader is competent). This is simply to abstract from cases in which the elite might blackmail a competent leader.

The public is large and can, if it chooses, remove the leader by revolting or voting against him in an election. By contrast, the informed elite (of mass E) is small, so it cannot overthrow the leader by itself. Members of the elite are organized into a single group and make decisions together

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in the group's interest. For this reason, we model the elite as a unitary actor.[3] Similarly, as the general public is homogeneous, we also assume that it makes decisions as a single agent.

3.1.2 Economy

Total output (GDP), Y, may take two values, Y^L and Y^H, where $\Delta Y \equiv Y^H - Y^L > 0$. The probability, q_θ, of the high output, $Y = Y^H$, is higher if the leader is competent:

$$q_1 > q_0. \tag{1}$$

The leader uses Y to fund the citizens' consumption, C, information manipulation, M, and repression, R. His budget constraint is thus: $Y = C + M + R$. Public consumption may include both private goods and non-excludable, government-provided public goods. For simplicity, we assume it is distributed equally among citizens—so C is also per capita consumption, since the number of citizens is normalized to 1. Manipulation expenditure, $M = P + X + B$, includes spending on (i) propaganda, P, (ii) censorship, X, and (iii) co-optation/bribing of the elite to prevent it revealing the leader's type, B. Spending on the apparatus of repression, R, raises the leader's probability of survival in the event of a revolt. The public observes C and R, but not Y, X, P, or B (we assume that Y may include both official and unofficial revenue sources of the regime).[4]

3.1.3 Payoffs

All agents are risk-neutral but have limited liability (i.e. cannot pay large fines).

3.1.3.1 Leader's payoff

The leader maximizes the probability of his survival.[5] He does not benefit from higher GDP directly, just through increased resources to fund propaganda, co-optation, censorship, and/or repression.

3.1.3.2 Citizens' payoffs

Citizens maximize their current consumption plus the net present value of future consumption. For the public, consumption equals C. If the elite is co-opted, it gets $C + b$ per capita, where b is the

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[3]As noted, Guriev and Treisman (2015) includes a version of the model with strategic interaction between multiple elite groups.

[4]Thus, we assume that information about the citizen's own consumption and about mass repression is more immediately accessible than the kind of political news broadcast on national media. For consumption, this seems almost self-evident—each person knows what she consumes. For mass repression, the greater cost to a citizen of being wrong should motivate greater attention: if she protests against a "competent" leader, this may lead to the leader's replacement with a less competent alternative; but if she protests against a repressive leader, failure of the revolt may entail major personal costs. (For simplicity, we do not model such costs explicitly, but adding them would not change the qualitative results.)

[5]This is a one-period-model representation of maximization of the net present value of expected future payoffs in a setting where he receives an exogenous rent in each period that he remains in office.

bribe per member of the elite.

Future payoffs depend on the type of regime in place. We describe the citizens' net present value of having a leader of type θ in the future by a scalar parameter, $\beta > 1$. If the current leader stays, the net present value of future payoffs is $\beta\theta$. If the leader is removed, his replacement is drawn from the same distribution and so is competent with probability $\bar{\theta}$. Therefore the expected net present value of future payoffs under a new leader is $\beta\bar{\theta}$.[6]

3.1.4 Leader's toolkit

3.1.4.1 Mass repression

By "mass repression," we mean the threat or use of violence—physical attacks, killings, imprisonment, etc.—by agents of the state against members of the general public to deter or prevent them from actively supporting the political opposition. Its aim is to block popular revolt. We exclude from this violence against scapegoated ethnic, racial, or religious minorities (which may not deter opposition by majority members) and targeted attacks against members of the elite aimed at silencing them (which we classify as a version of censorship).

To focus on interesting cases, we assume that mass repression is sufficiently costly that competent leaders choose not to use it: in equilibrium, they achieve a higher probability of survival through other means. Thus, if the public observes non-trivial spending on repression against the general public, it understands the leader is incompetent.

We formalize mass repression very simply. If the public revolts, we assume the leader succeeds in suppressing the rebellion with probability $\eta(R, E)$ which increases in the amount of resources devoted to repression, R, and decreases in the size of the elite, E. Higher E renders revolts more effective in several ways. The elite may help mobilize and coordinate protesters, persuade regime insiders to defect, and organize international pressure on the leader to concede.

We assume there exists an $E^* > 0$ such that for all $E \geq E^*$ the revolt succeeds with certainty: $\eta(R, E^*) = 0$. The revolt also succeeds for sure if there is no spending on the repressive apparatus: $\eta(0, E) = 0$.

Since any spending on repression reveals the leader to be incompetent, there is no point spending anything on M or C. For such leaders, therefore, $R = Y$, and the ex ante probability of survival is:

$$\tau_\theta(E) \equiv q_\theta\eta(Y^H, E) + (1 - q_\theta)\eta(Y^L, E).$$

Clearly, $\tau_\theta(E)$ decreases in E and $\tau_1(E) > \tau_0(E)$ for all E.

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[6]For the sake of simplicity, we neglect the cost of regime change. In reality, this may be significant, but, as we show in Guriev and Treisman (2015), introducing a positive cost of regime change does not qualitatively change results.

3.1.4.2 Manipulation

Co-optation. If the leader chooses to co-opt the elite, he pays the elite b per capita, in return for which the elite sends the signal $e = 1$. The total cost of rewarding the elite is $B = bnE$, were $n = \{0, 1\}$ is the elite's choice whether to agree to be co-opted ($n = 1$) or reject the offer ($n = 0$). Both n and b are endogenously determined in equilibrium.

For the sake of simplicity, we assume that, if indifferent, the elite accepts the bribe.

Propaganda. The state media sends a message to the public about the leader's type. This message aims to persuade the audience that the leader is competent (i.e. the state of the nature is $\theta = 1$). However, the message may be either convincing, $p = 1$, or not, $p = 0$. The probability that the message is convincing, $p = 1$, depends on the true type of the leader and the propaganda expenditure, P, understood to include all costly efforts to render the message more believable. (These may include producing high quality fake news reports and constructing plausible conspiracy theories to explain why low consumption is not the leader's fault.)

Our key assumption here is that it costs more to render a false message convincing than it does to do the same for a true message; for simplicity, we normalize the cost of the latter to zero. Thus, if the leader is competent, the state media's message is convincing ($p = 1$) with probability 1 even at zero cost (therefore, the competent leader always chooses $P = 0$). If the leader is incompetent, making the state media's message believable is more expensive. The probability of the public getting a convincing message, $p = 1$, is

$$\Lambda(P) = \min\left\{\frac{P}{\widehat{P}}, 1\right\} \tag{2}$$

where $\widehat{P}$ is a parameter of the propaganda production function ($\widehat{P}$ represents the cost to an incompetent leader of generating fully convincing propaganda).

Censorship. The leader may try to censor the elite's message (i.e. replace a negative message with a positive one). He succeeds with probability

$$x = \min\left\{\frac{X}{\widehat{X}(1 - n)E}; 1\right\}$$

where X is the leader's spending on censorship and $\widehat{X}$ is a parameter that represents how much it would cost to censor the elite's message with certainty if, in a hypothetical case, the elite had unit mass and sent the message for sure. Or, put another way, for the leader to censor the message sent by a non-co-opted elite of size $(1 - n)E$ with probability x, he must spend $X = x\widehat{X}(1 - n)E$. The original message of the elite (positive or negative) goes through with probability $1 - x$.

The purpose of both censorship and propaganda is to convince the public that the leader is

competent. However, they differ in an important (and realistic) way. The incompetent leader's propaganda message is convincing with a probability that depends only on the amount the leader spends on it. But whether the public gets a message from the elite—and whether it has been censored—depends on the strategic interaction between leader and elite.

3.1.5 Regimes

We will consider three regimes: Democracy, D, Informational Autocracy, IA, and old-style Overt Dictatorship, OD. In Democracy, there is no use of manipulation or repression: $R = P = X = B = 0$. In Informational Autocracy, there is some non-trivial use of manipulation but no mass repression: $R = 0$ and $P + X + B > 0$. In Overt Dictatorship, the leader uses repression against the public, $R > 0$, but cannot manipulate its beliefs since his use of repression reveals his type.

When the leader chooses his strategy, he decides whether to opt for Overt Dictatorship ($R > 0$) or for one of the other two regimes ($R = 0$). If he uses repression $R > 0$, the public by definition observes it and understands that the regime choice is OD.

If he does not use repression, $R = 0$, the public cannot tell whether it is in a Democracy (D) or an Informational Autocracy (IA). Informational autocrats do their best to pool with democratic leaders in order to enhance their popular support. Indeed, that is the whole point of their strategy. They imitate democracy and conceal from the public their efforts to manipulate information through propaganda, censorship, and co-optation of the elite. Thus, citizens do not know with certainty what type of regime they are in and can only infer the probability that it is D or IA. The public updates its priors about the leader's type and his equilibrium regime choice based on the information it has. In Guriev and Treisman (2019), we show, with a variety of evidence, that this view is quite realistic. Most authoritarian regimes today do, in fact, pretend to be democratic, with elections, opposition parties, and other superficially democratic institutions, and the general public in such states is often unaware of the extent of media restrictions.

3.1.6 Information

The model contains six types of signals. All citizens (the elite and the public) directly observe repression against the public, R, and per capita consumption, C. The elite learns the type of the leader, θ, and GDP, Y, precisely. All receive the leader's propaganda signal, $p = \{0, 1\}$. Since the competent leader can send $p = 1$ at no cost, he always does so. So if the public observes $p = 0$, it knows for sure the leader is incompetent. Finally, the elite sends the public a signal on the leader's competence, $e = \{0, 1\}$.

The influence of such signals depends crucially on whether the public processes them. Public opinion research suggests ordinary people often pay little attention to political news (see, e.g., Zaller 1992). We assume that the public ignores the elite's and leader's messages with a certain

probability. Denoting the level of attentiveness $\sigma = \{0, 1\}$, we assume the public is *attentive* $(\sigma = 1)$ with an exogenous probability a; in this case, it makes its choices based on the elite's signal, e, the propaganda signal, p, its consumption, C, and the level of repression, R. With probability $1 - a$, the public is *inattentive* $(\sigma = 0)$ and does not process the signals from elite and propaganda. In this case, it bases its decisions on just the observed levels of consumption, C, and repression, R.[7] The realization of σ is independent of other random variables. Note that both attentive and inattentive publics are rational Bayesian agents making optimal choices given their information sets.[8]

The elite's negative signal, $e = 0$, evades censorship with probability $(1 - x)$, where x is the level of censorship. If the attentive public observes $e = 0$, it knows for sure the leader is incompetent. If, on the other hand, it observes $e = 1$, it must infer whether this is because the leader is competent $(\theta = 1)$, because the signal was censored (probability x), or because the elite was co-opted $(n = 1)$. Therefore, if the true state is $\theta = 0$, the probability of observing a positive signal, $e = 1$, is $1 - (1 - x)(1 - n)$.[9]

3.1.7 Timing

1. The leader and the elite observe the leader's type, $\theta \in \{0, 1\}$.

2. The leader chooses whether to set $R > 0$ and adopt Overt Dictatorship.

3. The economic shock, Y, is realized ($Y = Y^H$ with probability q_θ and $Y = Y^L$ with probability $1 - q_\theta$). Both the elite and the leader observe Y.

4. If the leader has not chosen Overt Dictatorship at time 2, he decides whether to adopt Democracy ($M = 0$) or Informational Autocracy. If the latter, he sets levels of spending on propaganda, P, censorship, X, and co-optation, B. The elite observes these allocations.

5. The elite decides whether (i) to support the regime, $n = 1$, send the signal $e = 1$, and receive the payment, or (ii) to refuse the payment, $n = 0$, and send a signal to the public revealing the leader's true type, $e = \theta$.

6. Contracts for the elite are implemented. If the elite sent a negative message, it is censored with probability x, so the signal gets through with probability $(1 - x)(1 - n)$. Payoffs are

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[7] The assumption that the public may be inattentive provides an incentive for incompetent rulers to choose Democracy at least for some parameter values. Indeed, if the public is inattentive, lucky incompetent leaders who enjoy good economic performance get to stay in office under Democracy. One could devise more sophisticated but less tractable models of democratic accountability. However, since this paper's focus is on Informational Autocracy, we opt for a simpler treatment of Democracy, based on the realistic assumption that the public is inattentive with a certain probability.

[8] One way to provide microfoundations for the inattentive public's ignorance of p and e is to assume that there is a stochastic cost of processing these signals proportional to $1 - \sigma$. If $\sigma = 1$, the public processes these signals at no cost; whenever $\sigma = 0$, this cost is sufficiently large to preclude processing the signals.

[9] The probability that the elite is not co-opted and so sends a negative signal when the leader is incompetent is $1 - n$; the probability that this negative signal is then not censored is $1 - x$; so the probability that a negative signal is sent and not censored is $(1 - x)(1 - n)$.

realized.

7. Citizens observe their consumption, C, and the level of repression, R. With probability a the public is "attentive" ($\sigma = 1$), in which case it also observes the propaganda signal, $p = \{0,1\}$, and the elite signal, $e = \{0,1\}$. The public updates its beliefs about θ and decides whether to try to replace the leader. If it does, it succeeds with probability $1 - \eta(R, E)$.

In the timing above we assume that the leader can commit to the contracts with the elites.[10] We also assume the leader chooses R before learning Y, while spending on propaganda, censorship and co-optation are chosen contingent on Y. This captures the idea that R is more of a long-term commitment than other tools, since setting $R > 0$ irreversibly reveals the leader's low competence.[11]

3.1.8 Assumptions

As mentioned above, we assume that repression is sufficiently inefficient that the competent leader never uses it, but efficient enough that the incompetent leader does use it when $E = 0$:

Assumption 1.
$$q_0 < \tau_0(0) \text{ and } \tau_1(0) < q_1.$$

This assumption implies that inequalities

$$q_0(1 - a) < \tau_0(0) \text{ and } \tau_1(0) < q_1(1 - a) + a \tag{3}$$

hold for all $a \in [0, 1]$. As we will show later, the left-hand-side inequality guarantees that the leader will choose OD when the size of the elite is sufficiently small; the right-hand-side one ensures that competent leaders never use repression.

To concentrate on more realistic cases, we also assume that $\widehat{P}$ is sufficiently large relative to ΔY that in equilibrium $P/\widehat{P} < 1$.[12]

Assumption 2.
$$\widehat{P} > \Delta Y/2.$$

3.2 Equilibria

All agents are rational and Bayesian: they maximize their expected payoffs given available information. The elite observes the leader's type, θ, consumption C, output Y, its own signal e, the

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[10]In a repeated game, the contracts between leader and elites could be sustained through grim trigger strategies.

[11]If R, P, X, and B are all chosen at the same time (after learning Y), the results are similar but the structure of equilibria is more complex as there are cases in which the leader chooses OD if $Y = Y^L$ but IA or D if $Y = Y^H$.

[12]Otherwise, the solution is a corner one: $P = \widehat{P}$; propaganda in equilibrium is always completely convincing, which seems unrealistic.

propaganda signal p, and the level of mass repression, R. If inattentive, the public observes only its own consumption, C and the level of mass repression, R. If attentive, it observes its own consumption, C, repression, R, and the signals p and e. If at least one of the latter two signals is low ($p = 0$ or $e = 0$), it knows for sure that the leader is incompetent and revolts. If both signals are high ($p = e = 1$), its inference about θ and decision whether to revolt depend on the consumption level, C.

Since current consumption is already set when the public chooses its action, it decides whether to revolt by comparing the net present value of future payoffs given the inferred quality of the incumbent to the net present value of payoffs given the expected quality of a potential replacement. Formally, the public solves $\max \left\{ \beta E(\theta|C, p, e); \beta\bar{\theta} \right\}$, using all available information. Here $E(\theta|C, p, e)$ is the public's belief about the current leader's type, θ, given the inference of the other players' equilibrium strategies and the observed values of C, p, and e. Recall that $\beta\bar{\theta}$ is the net present value of changing the leader.

The attentive public's strategy is defined by the endogenous threshold, C^*: it supports the regime if and only if it observes both $C \geq C^*$ and $p = e = 1$. In equilibrium, C^* is the lowest consumption level that satisfies

$$E(\theta|C = C^*, \sigma = 1, p = e = 1) \geq \bar{\theta}.$$

Similarly, the inattentive public has its own threshold, C^{**}: it supports the regime if and only if $C \geq C^{**}$. Here C^{**} is the lowest level of consumption that satisfies

$$E(\theta|C = C^{**}, \sigma = 0) \geq \bar{\theta}.$$

3.2.1 Democracy

Equilibrium under democracy works as follows. The incompetent leader chooses $R = M = 0$ and relies on his luck: indeed, with probability $(1 - a)$ the public is inattentive so his type is not discovered. As he spends nothing on repression and manipulation, $C = Y$. Also, as there is no propaganda, co-optation, or censorship, the state and elite signals announce the leader's incompetence with probability one.

If the public is attentive, it observes the media signals that accurately reveal the leader's type. It always keeps a competent leader and removes an incompetent one. If the public is inattentive, it

removes the leader if $C = Y^L$ but keeps him if $C = Y^H$. Indeed, condition (1) implies:[13]

$$E(\theta | C = Y^L, \sigma = 0) < \bar{\theta} < E(\theta | C = Y^H, \sigma = 0). \tag{4}$$

The probability of survival is therefore $q_1(1-a) + a$ for competent leaders and $q_0(1-a)$ for incompetent ones. Realistically, in this equilibrium the public includes both crude retrospective voters—who vote based on just economic performance—and sophisticated voters, who combine their observations of economic performance with all other information available.[14]

3.2.2 Informational Autocracy

In this equilibrium, incompetent leaders manipulate information but do not repress the public (although they may use repression against the elite as part of their censorship efforts). Five properties characterize the equilibrium. First, competent leaders use the same strategy as above: $C = Y$, $M = R = 0$. Second, "lucky" incompetent leaders, who observe $Y = Y^H$, spend exactly $M = \Delta Y$ on manipulation. Indeed, they want to set $Y = Y^H - \Delta Y = Y^L$ in order to pool with unlucky competent leaders.[15] Third, if the public is attentive, it supports leaders with $C = Y^H$ (they are competent with probability one). It also supports those with $C = Y^L$ if it observes positive elite and propaganda signals. Fourth, unlucky incompetent leaders (for whom $Y = Y^L$) survive with probability zero. Fifth, if the public is inattentive, it supports leaders with $C = Y^H$, but removes those with $C = Y^L$. Indeed, inattentive citizens understand that among leaders with $C = Y^L$ the share of competent ones is at most $\frac{\bar{\theta}(1-q_1)}{\bar{\theta}(1-q_1)+(1-\bar{\theta})}$, which is even smaller than under democracy, $\frac{\bar{\theta}(1-q_1)}{\bar{\theta}(1-q_1)+(1-\bar{\theta})(1-q_0)}$, which in turn is below $\bar{\theta}$.

The fourth and the fifth points might not seem obvious. To see why unlucky incompetent leaders are always removed, note first that the inattentive public removes all leaders under whom $C = Y^L$—which applies in this case. To avoid removal by the *attentive* public, an unlucky incompetent leader would have to spend enough on manipulation to secure positive propaganda and elite signals with

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[13]Using Bayes' equation, we rewrite (4) as: $\frac{\bar{\theta}(1-q_1)}{\bar{\theta}(1-q_1)+(1-\bar{\theta})(1-q_0)} < \bar{\theta} < \frac{\bar{\theta}q_1}{\bar{\theta}q_1+(1-\bar{\theta})q_0}$ Both inequalities always hold. Since the competent leader is more likely to deliver high output ($q_0 < q_1$), the realization of low output signals that the leader's quality is "below average." Therefore replacing him with an average outsider increases expected future payoffs: the left-hand-side inequality holds. Similarly, observing high output, the public upgrades its expectation of the leader's quality to "above average." Hence leader change brings lower expected future payoffs: the right-hand-side inequality holds.

[14]In the Democratic equilibrium, the inattentive public removes all competent but "unlucky" leaders (i.e. those with $Y = Y^L$), whereas the attentive public keeps them. In a sense, the inattentive public might seem more demanding than the attentive public. In fact, it is just less discriminating. When the leader is incompetent but lucky—and so "should" be removed—the inattentive public keeps him, whereas the attentive public fires him. In this case, the inattentive public is too lenient. In other words, the inattentive public makes both more type I errors (removing an unlucky good leader) and type II errors (keeping a lucky bad leader).

[15]Informational autocrats hide the fact that they use information manipulation. Manipulation expenditure, M, is therefore limited to the amount of resources the leader can divert without the public observing this. While the leader controls the whole output, Y, he can only secretly divert ΔY. Thus, spending on political manipulation is bounded by the typical variation in government resources caused by economic fluctuations.

a non-trivial probability. But to pay for such manipulation, he would have to lower C below Y^L, which would itself prompt removal. Thus, no unlucky incompetents survive. A subtlety arises regarding the fifth point in that unlucky incompetent leaders—since they are removed regardless— are indifferent between setting $M = 0$ (and $C = Y^L$) and $M > 0$ (and $C < Y^L$). If *enough* of the unlucky incompetent leaders set $C < Y^L$, then it might become optimal for the inattentive public to support leaders with $C = Y^L$, since most of these would now be competent. But this could not be an equilibrium as unlucky incompetent leaders would then have a strict incentive to set $C = Y^L$. Thus, in equilibrium a small share of unlucky incompetents could set $M > 0$, but all unlucky incompetent leaders—whether they set $M > 0$ or $M = 0$—are removed.

In this equilibrium, competent leaders survive with probability $q_1(1 - a) + a$, as in Democracy. Incompetent leaders survive with probability $q_0 a \pi$. Here π is the probability that $p = e = 1$ (i.e. that the leader ensures the elite's message is positive by censorship or co-optation and sends a convincing propaganda signal). This outcome is an equilibrium whenever $E(\theta | C = Y^L, \sigma = 1, p = e = 1) \geq \bar{\theta}$, or

$$\bar{\theta} \leq \frac{\bar{\theta}(1 - q_1)}{\bar{\theta}(1 - q_1) + (1 - \bar{\theta}) q_0 \pi}$$

which simplifies to

$$\pi \leq \frac{1 - q_1}{q_0}. \tag{5}$$

In Appendix B, we show how the incompetent leader allocates his resources between propaganda, co-optation and censorship. Briefly, if the relative cost of censorship is very low, the leader uses censorship and propaganda; if the relative cost of censorship is very high, the leader uses co-optation and propaganda. If the cost ratio is intermediate, the choice depends on the size of the elite: when it is small, the leader censors; when it is large, he co-opts. We also derive the probability of survival. The probability that lucky incompetent leaders survive when the public is attentive is:

$$\pi^*(E) = \max \left\{ \frac{\Delta Y}{a \beta \bar{\theta} E + \widehat{P}}; \widetilde{\pi}(E) \right\} \tag{6}$$

where

$$\widetilde{\pi}(E) = \begin{cases} \frac{\Delta Y - \widehat{X} E}{\widehat{P}} & \text{if } E < \frac{\Delta Y}{2\widehat{X}} \\ \frac{(\Delta Y)^2}{4\widehat{P}\widehat{X}E} & \text{if } E \geq \frac{\Delta Y}{2\widehat{X}} \end{cases}. \tag{7}$$

The intuition for these results is straightforward. Censorship and co-optation are substitutes, and propaganda is complementary to both. This simply reflects the fact that co-optation and censorship are alternative methods of preventing the elite from informing the public about the leader's type (if the elite is co-opted, there is no need for censorship; if the elite is censored, there is no need for co-optation).[16] Propaganda applies to the other signal—the one sent by the leader

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[16]The assumption of a homogeneous elite rules out equilibria with spending on both co-optation and censorship.

himself. If this signal is negative, then all resources spent on either co-optation or censorship are wasted.

3.2.3 Overt Dictatorship

By Assumption 1, a competent leader never uses repression. If an incompetent leader does repress, he sets $R = Y$, and his probability of survival is $\tau_0(E)$.

3.3 Regime choice

Consider now the choice of the incompetent leader, who compares OD (probability of survival $\tau_0(E)$), D (probability of survival $q_0(1-a)$) and IA (probability of survival $q_0 a \pi^*(E)$). Recall that both $\tau_0(E)$ and $\pi^*(E)$ are decreasing functions of E. Condition (5) implies the IA equilibrium exists and delivers a higher probability of survival than D if and only if

$$\frac{1-a}{a} \leq \pi^*(E) \leq \frac{1-q_1}{q_0}. \tag{8}$$

Under these conditions, the leader has a good chance of silencing the elite (by co-optation or censorship) and persuading the public with his propaganda. Let us denote as $\widetilde{E}$ the solution to $\pi^*(E) = \frac{1-q_1}{q_0}$.

Comparing survival probabilities under different regimes and taking into account the IA equilibrium existence condition (the left-hand-side inequality in (8)) we obtain the following

Proposition 1. *The choice of regime is as follows.*

(i) *If the elite is small, $E < \min\left\{E^*, \widetilde{E}\right\}$, then the incompetent leaders choose OD for higher a and lower E (such that $\tau_0(E) > q_0(1-a)$) and D for lower a and higher E.*

(ii) *If the elite is above a certain size, $E \geq \max\left\{E^*, \widetilde{E}\right\}$, then the incompetent leaders choose IA for higher a and lower E (such that $\pi^*(E) > \frac{1-a}{a}$) and D for lower a and higher E.*

(iii) *If $E^* < \widetilde{E}$ then the incompetent leaders choose D for all $E \in \left[E^*, \widetilde{E}\right]$.*

(iv) *The competent leaders always choose D.*

3.4 Empirical implications

Proposition 1 has implications for what types of regime are likely to occur in different parts of the parameter space. Note first that competent leaders always choose democracy, so we might expect

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However, if the elite contained multiple groups with different preferences, the leader might in equilibrium co-opt some and censor others.

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to observe some democracies at all levels of E, $\widehat{X}$, and $\widehat{P}$. However, this is not true of incompetent leaders.

Consider first the role of E, the size of the informed elite. At very low E, incompetent leaders prefer OD (Assumption 1). By contrast, for $E > E^*$, they prefer D or IA as mass repression no longer ensures survival. Therefore, as E rises, the regime should switch from OD to either IA or D. Continued growth of E in a regime of IA leads eventually to D. In short, at very low E, OD should predominate; at very high E, D will be most common.

IA should tend to occur at intermediate levels of E. If the elite is too small ($E < \widetilde{E}$), the dictator's manipulation is—paradoxically—*too* effective. The rational (and Bayesian) public understands that the leader will have silenced almost all potential critics, and so the lack of negative reports signifies little. By contrast, if E is too high, the cost of silencing all the critics becomes prohibitive: the leader then accepts democracy, taking his chances on good economic performance and public inattention to the media.

The theory also has empirical implications for comparative statics with regard to media control. Consider the parameter range in which overt dictatorships are not sustainable $E > E^*$. If an incompetent leader faces lower costs of propaganda and censorship (lower $\widehat{P}$ and lower $\widehat{X}$, respectively), the probability of convincing the public, $\pi^*(E)$, is higher for a given size of the elite, E. Therefore, in the two-dimensional space of elite size vs. media control, the IA equilibrium can occur in an area bounded by two monotonically increasing curves. Depending on the parameters, the equilibrium possibilities may look as in the left-hand side graph or the right-hand side graph in Figure 1.[17]
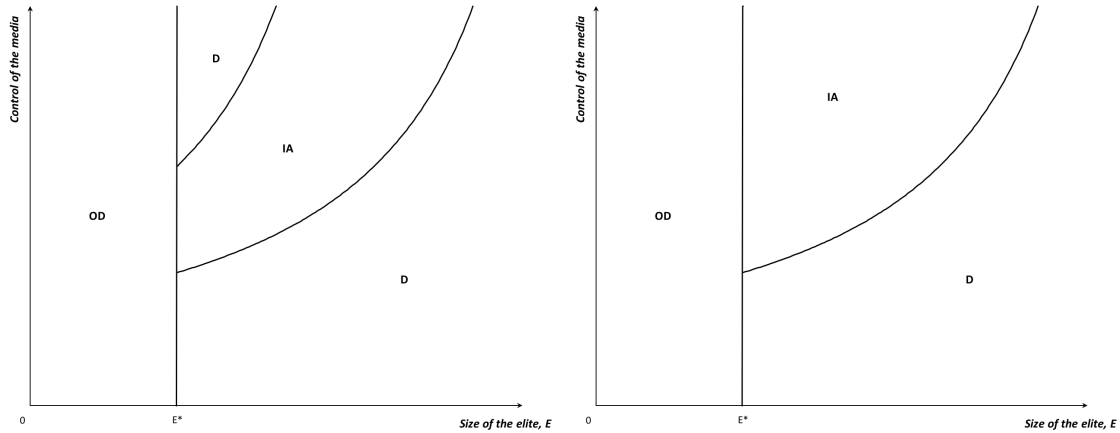
4 Empirical patterns

4.1 Elite size and regime choice

How well do these implications match the patterns of regime type observable in reality? To begin with, do regimes cluster on different ranges of E as predicted? Of course, since other parameters also matter, we should not expect a perfect correspondence. But is there a general fit?

Finding valid proxies for E, the size of the "informed elite," is not straightforward. E represents the proportion of the population that can directly observe the quality of the government and can communicate to the public through an independent media. The subgroup is defined by a combination of accurate political information and communication skills and resources. In order to proxy this, we use statistics on education. As a first cut, we use the share of the adult population that has completed tertiary education. This is a reasonable indicator of political sophistication that

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[17]Figure 1 shows the regime choice as a function of size of the elite E and control of the media proxied by the inverse cost of propaganda, $1/\widehat{P}$, while holding other parameters constant. Proxying media control with the inverse cost of censorship, $1/\widehat{X}$, while holding constant $\widehat{P}$, would produce a similar pattern.

Figure 1: Size of the informed elite, control of the media and choice of regime by incompetent leaders.
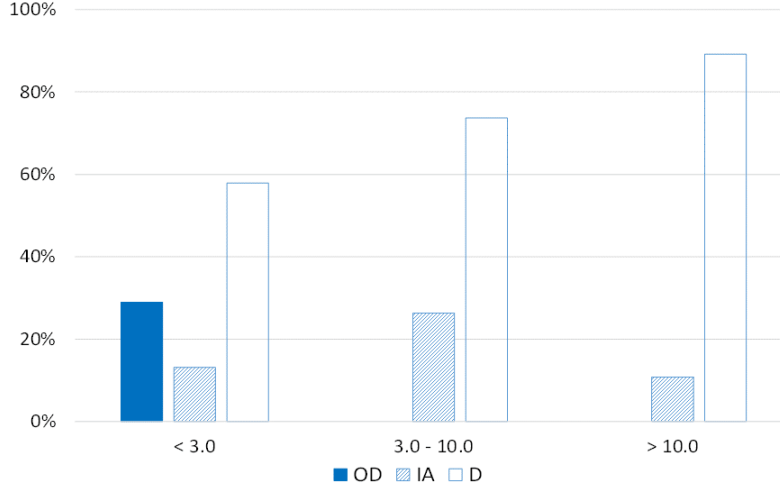

Notes: Horizontal axis: size of the informed elite, E. Vertical axis: degree of control of the media by the regime (proxy for inverse of cost of propaganda $1/\widehat{P}$). Classifications of the regimes: "OD" — overt dictatorships, "IA" — informational autocracies, "D" — democracies. Parameter values: $\Delta Y = 2$, $\bar{\theta} = 0.5$, $\beta = 10$, $\widehat{X} = 5$, $E^* = 0.3$, $a = 2/3$, $q_1 = 0.7$. In the first chart, $q_0 = 0.4$, in the second chart $q_0 = 0.3$. Note that we show here the predicted regime choice of incompetent leaders; competent leaders choose democracy for all parameter values.

is available for a large number of countries, although of course it is far from perfect. We use data from Barro and Lee (2018).

To classify countries into our three regime categories, we start by distinguishing democracies from non-democracies using Polity IV data, adopting the standard cutoff for democracy of +6 on the 21-point Polity2 scale that runs from -10 (a perfect autocracy) to +10 (a perfect democracy). We then distinguish among non-democracies based on the extent to which they employ violent repression. To capture this, we use original data from the Authoritarian Control Techniques database (see Guriev and Treisman 2019). Specifically, we use the estimated number of political killings per year by the state under the leader in power in 2015. We call non-democracies where the state has committed 10 or more killings per year on average under the leader in power "overt dictatorships" and those that have committed fewer than 10 political killings per year "informational autocracies." (The results are robust to using a variety of different thresholds.[18]) We exclude non-democracies where the current leader (in 2015) had not been in power for at least five years (or where the state had not been authoritarian for the full five years) since it is difficult to estimate the regime's

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[18]See Guriev and Treisman 2019. Political killings—when they target journalists or activists—may at times aim at censorship rather than mass repression. We checked the details for the 11 cases of overt dictatorship included in the empirical demonstrations that follow. Of the roughly 670,000 estimated political killings under the 11 "overt dictators" still in office in 2015, we found 27 that could plausibly be "censorship killings" rather than mass repression. These included the killing of two men who were putting up an opposition poster and the torturing to death of an opposition party member in Uganda as well as the shooting of an opposition journalist and his son and the killing of 22 political activists in Cambodia. Excluding these would not change the classification of either country. The vast majority of killings recorded were of protesters at or after demonstrations and of civilians in areas thought loyal to the opposition.

Figure 2: Regime types by terciles of tertiary education.

potential for political violence reliably using such a limited time period.

Figure 2 shows the proportion of each regime type among countries divided into terciles on the basis of the proportion of the population with higher education. (Since in the short run education rates are endogenous—depending partly on the leader's own policies—we use the proportion with completed tertiary education at the time when the given leader first came to power.) Recall that all competent leaders choose democracy in our model, but incompetent ones choose it more often at high levels of E. In line with this, democracies are found at all education levels but become increasingly frequent as tertiary education rises. Again as expected, overt dictatorships occurred only among countries with low levels of tertiary education. And informational autocracies, though found at all levels, were most frequent in the intermediate tercile. Figure 3 plots the non-parametric relationships between tertiary education and the likelihood of the three regime types, for all available countries. This confirms the patterns in Figure 2, with a clear non-monotonic relationship between E and the incidence of informational autocracies.

One imperfection of the simple tertiary education completion rate as a proxy for the size of the informed elite is that it does not take into account the large differences in quality of education

Figure 3: Non-parametric relationship between size of the informed elite and regime type.

Sources: Barro and Lee (2018), Polity IV, Guriev and Treisman (2019).
Notes: The graphs report the non-parametric relationships between the size of the informed elite and the regime type. Size of informed elite proxied by percent of population over 14 with completed tertiary education in year when current leader came to power. Regime types: Democracies: Polity2 $\geq$ 6; overt dictatorships: Polity2 $<$ 6 and $\geq$ 10 state political killings a year under leader in power in 2015; informational autocracies: Polity2 $<$ 6 and $<$ 10 state political killings a year under leader in power in 2015.

across countries. While more citizens of Peru apparently complete higher education than those of France, we doubt that the former has a larger "informed elite" than the latter. Moreover, some authoritarian governments use the education system to disseminate propaganda, which might actually reduce the frequency of politically independent thought.

We therefore tried adjusting the tertiary completion data for quality in two alternative ways. First, we used a measure of schooling quality constructed within the World Bank's Human Capital Project (HCP, see Patrinos and Angrist, 2018, Filmer et al. 2018)—specifically, the harmonized test scores across major international student achievement testing programs. Following the HCP approach, we multiplied the proportion of adults with tertiary education by the TIMSS-normalized measure of quality.

The HCP's test-score-based measure is not ideal. Some of the tests refer to primary and secondary school students; however, it is the quality of *higher* education that matters most for forging an informed elite. To better capture this, we constructed a second measure based on international university rankings. We used the Times Higher Education World University Rankings, which evaluate the research environment and reputation of each of 800 universities around the world, for 2014. To construct a crossnational index of quality, we assigned points to each country for each university that featured in the global top 800 in 2014. We allocated points based on where in the list the given university placed: 601-800: 1 point; 401-600: 2 points; 301-400: 3 points; 201-300: 4 points; 101-200: 5 points; 51-100: 6 points; 1-50: 7 points. Summing the points across all universities in the list yielded a total for each country, which we then normalized by dividing by the country's population in millions. We added one to each country's score, including those that had no universities in the top 800. This, then, constituted our index—which ranged from 1 in the various countries without any universities in the top 800 to 10.2 in Luxembourg (which had a top 200 university for a population of well under one million). We adjusted countries' tertiary education rates for quality by taking the logarithm of one plus the product of the quality index and the proportion of the population with completed tertiary education. The results—presented in Figures A1 and A2 in Appendix A—are very similar to those in Figure 3.[19]

4.2   Media control and regime choice

Our theory also suggests that leaders will choose their political strategy in part based on the costs of disseminating propaganda, $\widehat{P}$, and of censoring the private media, $\widehat{X}$. Again, proxying these is not simple. But both will depend in part on the structure of the media that the given leader confronts

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[19]Both measures of education quality disproportionately depend on science and math scores, which do not capture skills and resources for political analysis and communication. To address this, we constructed a third measure using citation counts for research in arts and humanities, economics, econometrics, finance, and social sciences as an indicator of national quality in educational fields that develop capacity for analyzing government performance. Again, results are similar (available from authors on request).

upon coming to power. Of course, in the medium term leaders can—and do—restructure the media to fit their strategy. But their initial choice should vary with the costs that they perceive upon *entering* office. Those that inherit a state-dominated media, attuned to the tasks of propaganda, will be tempted to use it. By contrast, those who come to power in a country with a vigorous independent press may face significant costs in taming it and building up a propaganda machine.

We proxy the costs of both censorship and propaganda with a single measure—the proportion of the top 5 national television channels that were state-owned at the time that the given leader first took office. The more dominant is the state media, the lower should be the costs of producing convincing propaganda. Similarly, the larger the independent media, the costlier it is to establish comprehensive censorship. We focus on television because in most countries, as of 2015, it was by far the most significant medium for political communication to the population at large.

We collected data from a variety of sources on the ownership of the top 5 television stations in the year in which the 2015 leader first came to office (see Table A1 in the Appendix for details). As before, we classify regimes based on Polity IV and our own data on political killings. Although it might seem that media control and tertiary education would be highly correlated, in fact they do seem to constitute separate dimensions. Indeed, the correlation between the percentage of the adult population with completed tertiary education and the private share of the top five television stations is only 0.21.

Figure 4 shows the empirical pattern of regimes, plotted in these two dimensions—size of the informed elite and (low) cost of media control.[20] The correspondence with Figure 1—although not perfect—is high. As expected, democracies can be found in all parts of the parameter space, consistent with the fact that competent leaders always choose democracy. But the proportion is higher where the informed elite is larger, which means incompetent leaders also make this choice. Also as predicted, the vast majority of informational autocracies cluster at intermediate levels of tertiary education and high levels of state control of the media (as of the current leader's entry date). And, again as expected, the overt dictatorships are all at low levels of tertiary education, and at varied degrees of media control.
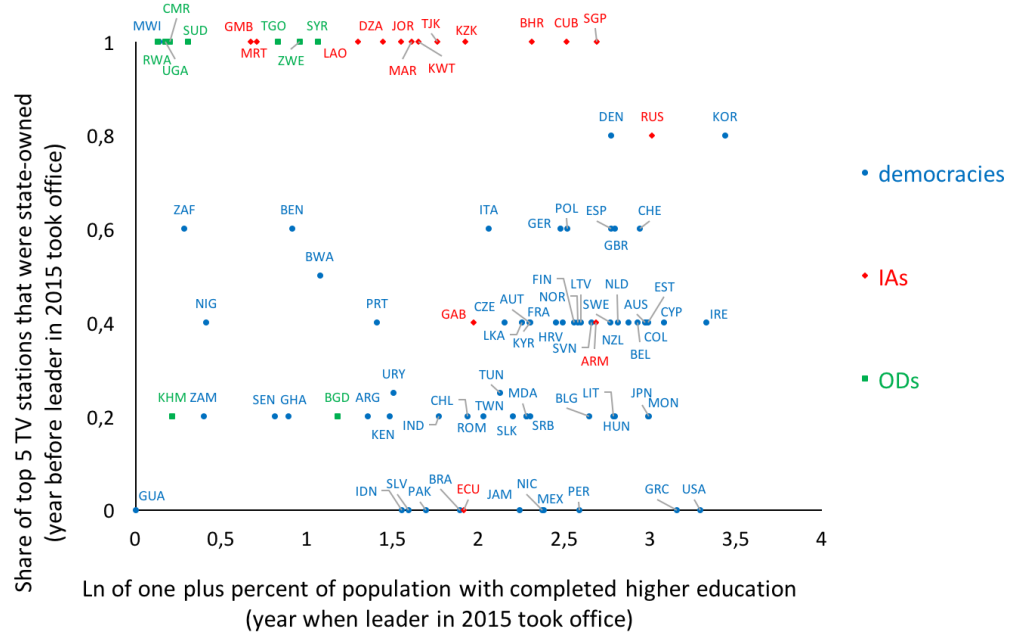
As a robustness check, we also reproduce graphs for the size of the elite proxied by education adjusted for quality using the two measures discussed earlier (see Figures A3 and A4 in the appendix). The results are very similar.

5   Conclusions

Unlike the majority of past dictators, most of today's non-democratic leaders no longer rely on mass repression. Instead they manipulate information. Co-opting or censoring elites and using

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[20]For convenience, we use the logarithmic scale for E, since the distribution is skewed.

Figure 4: Size of the informed elite, state media ownership and regime type.

Sources: Barro and Lee (2018), Polity IV, Guriev and Treisman (2019).
Note: non-democracies included only if 2015 leader had been in power for at least 5 years in non-democracy (so average violence level could be determined). IAs had fewer than 10 political killings per year.

propaganda to boost their popularity with ordinary citizens, they are able to remove constraints on their power while pretending to be democratic. This new model of authoritarian rule can survive in a world of international openness and market forces.

We present a theory of how such informational autocracies work. Our theory sheds light on why they have recently become more common. Information manipulation prevails when the informed elite is sufficiently large to make violent repression costly but not yet large enough to combat the state's dominance of the information space. If political sophistication continues to spread, and if independent media emerge to challenge regime messaging, such approaches become less effective. As the informed elite expands, co-optation and censorship become more expensive, and the leader faces increasingly tight trade-offs. The more resources are diverted towards silencing the elites, the lower are ordinary citizens' living standards—and the more likely they are to realize that the leader is incompetent and should be removed. Modernization can, thus, stimulate eventual democratization.

Our model captures a key dynamic in the current evolution of authoritarian regimes but inevitably leaves out other important elements. The end of the Cold War reduced the flow of military and other aid from the superpowers to many of their non-democratic allies, complicating authoritarian survival. At the same time, advances in surveillance technology may make less violent approaches to political control more effective and therefore attractive (e.g., Dragu and Lupu 2019).

Increased migration may also affect the logic. Repressive autocrats in the past often closed their borders, banning emigration. These days, many non-democratic leaders *encourage* dissidents to leave, apparently hoping that such "exit" will replace their "voice" (Hirschman 1970). This should reduce the size of the informed elite, thus increasing the regime's survival odds. However, the net impact of such outmigration is hard to judge. In an increasingly interlinked world, "exit" is less absolute than in the past. Government critics may evade censorship or harassment by setting up media abroad to target their home country (Williams 2015). At the same time, net outflows of educated dissidents are likely to be too small in most cases to affect the political equilibrium. Comprehensive cross-national data on emigration by education level are scarce. However, the median rate of net migration (for all education levels) for the 22 cases we classified as informational autocracies in 2015 was an outflow of .05 percent a year (calculated from UN 2017). Outflows of unskilled workers—due to conflict, economic crisis, or environmental hazards—seem generally more important than those of highly educated political dissidents.

A final issue for future study is how aspects of the media environment and information technology affect the costs of state and opposition political communications. Initial ownership of major TV networks, our proxy in Figure 4, is admittedly imperfect. Despite 100 percent private ownership of major national TV when he took office, Ecuador's Rafael Correa quickly turned the tables by seizing "television stations watched by about 40 percent of the news audience," driving others out of business, and introducing such new crimes as "media lynching" (Partlow 2008, Southwick and Otis 2018). A more fine-grained empirical analysis will require creating more discriminating data on countries' media settings.

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