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Costly signaling in autocracy

Robert Carroll[a] and Amy Pond [b]

[a]TUM School of Governance and the Bavarian School of Public Policy, Technical University of Munich; [b]Department of Political Science, University of Illinois, Urbana-Champaign

ABSTRACT

Those who would revolt against an autocrat often face a dilemma caused by uncertainty: they would like to revolt if the ruler would respond with democratization, but they would prefer to concede if the ruler would choose instead to violently suppress the revolution. Consequently, the autocrat must decide how to best signal his willingness to use violence in hope of deterring revolt. Using a simple signaling model, we find that rulers cannot meaningfully convey their type by transferring wealth to the citizenry. However, they *can* convey their type through shows of force, as long as the strong type of autocrat – who would use violent repression in the case of revolution – has a competitive advantage in displaying his strength. We additionally demonstrate that rulers favor shows of force when their willingness to suppress revolution is questioned and that citizens at times prefer to pay the direct cost of shows of force to learn about the ruler's type, rather than to remain uninformed. The results illustrate a more general result in costly signaling models: information transmission is only possible when the cost of the signal is smaller for the type that wants to distinguish himself.

Quienes se rebelarían contra un autócrata a menudo se enfrentan a un dilema causado por la incertidumbre: les gustaría rebelarse si el gobernante respondiera con la democratización, pero preferirían ceder si el gobernante optara por reprimir violentamente la revolución. En consecuencia, el autócrata debe decidir cuál es la mejor manera de señalar su predisposición a utilizar la violencia con la esperanza de disuadir la rebelión. Mediante la utilización de un modelo de señalización simple, descubrimos que los gobernantes no pueden transmitir de manera significativa su tipo al transferir riqueza a la ciudadanía. Sin embargo, pueden transmitir su tipo mediante demostraciones de fuerza, siempre y cuando el tipo fuerte de autócrata, que utilizaría la represión violenta en caso de una revolución, tenga una ventaja competitiva para demostrar su fuerza. Además, demostramos que los gobernantes favorecen las demostraciones de fuerza cuando se cuestiona su voluntad de reprimir la revolución y que los ciudadanos a veces prefieren pagar el costo directo de las demostraciones de fuerza para conocer el tipo de gobernante, en lugar de permanecer desinformados. Los resultados demuestran un resultado más general en modelos de señalización costosos: la

CONTACT Amy Pond Email ✉ amy.pond@tum.de ▢ Technical University of Munich, TUM School of Governance and the Bavarian School of Public Policy, Richard Wagner Str. 1, 80333 Munich, Germany.

transmisión de información solo es posible cuando el costo de la señal es menor para el tipo que quiere distinguirse.

Les personnes souhaitant se révolter contre un autocrate sont souvent confrontées à un dilemme causé par l'incertitude: elles voudraient se révolter si le dirigeant réagissait par la démocratisation, mais elles préféreraient céder si le dirigeant décidait plutôt de réprimer la révolution par la violence. Par conséquent, l'autocrate doit décider du meilleur moyen de signaler sa volonté d'avoir recours à la violence dans l'espoir de dissuader la révolte. Nous avons utilisé un modèle de signalization simple et constaté que les dirigeants ne pouvaient pas communiquer leur type de manière significative en transférant des richesses aux citoyens. Ils peuvent toutefois le communiquer par des démonstrations de force tout le temps qu'il est puissant – qu'il indique qu'ils auraient recours à une répression violente en cas de révolution – et qu'ils ont un avantage compétitif à afficher leur force. De plus, nous démontrons que les dirigeants favorisent les démonstrations de force lorsque leur volonté de réprimer la révolution est remise en question et que les citoyens préfèrent parfois payer le coût direct des démonstrations de force afin d'en savoir plus sur le type du dirigeant plutôt que de rester non informés. Nos conclusions illustrent un résultat plus général pour les modèles de signaux coûteux: la transmission d'informations n'est possible que lorsque le coût du signal est moindre pour le type d'autocrate qui souhaite se distinguer.

How do autocrats discourage political opposition and stabilize their rule? This question is central to understanding prominent topics in political science, including leadership turnover, regime change, accountability in autocracy, and political violence. Existing explanations emphasize the identity of the group threatening the leader's political power. The opposition may for example come from the military (Svolik 2013); from within the leader's coalition, and thus manifest as a coup (Ansell and Samuels 2010; Casper and Tyson 2014; Egorov and Sonin 2011; Svolik 2015); or from the public, appearing as a mass revolution (Acemoglu and Robinson 2001; Bueno de Mesquita et al. 2003).[1] Our study takes the latter form, emphasizing the threat to the leader from mass protest and revolt.

A large literature weighs the relative benefits of different strategies that autocrats use to prevent revolt. Autocrats may rely on violent repression, using force to make protest less attractive (Crescenzi 1999; Fransisco 1995) or targeted killings to eliminate the political opposition (Gregory, Schröder, Sonin 2011). Autocrats must be careful, however, as too much repression could backfire, triggering support for the opposition (De Jaegher and Hoyer 2019). Alternatively, autocrats may coopt the population, providing economic

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[1]See Gehlbach and Svolik (2016) for an overview of the literature on formal models of autocracy.

transfers or favorable policies to undermine support for the opposition (Acemoglu and Robinson 2001; Boix 2003; Bueno de Mesquita et al. 2003) and give them a stake in the leader's survival (Gandhi and Przeworski 2006, 2007). In practice, autocrats likely employ some combination of these policies (Moore 1998; Wintrobe 1998). Existing studies frequently highlight the direct effects of repression and transfers: repression makes revolution more costly and therefore less attractive, while transfers and other forms of cooptation make living under the autocratic regime more acceptable.

Repression and cooptation may also have indirect effects, providing information to autocrats or to potential revolutionaries about the preferences of other actors (Pierskalla 2010). For example, allowing protest or facilitating competition in limited elections and legislative institutions may inform autocrats about the preferences of citizens (regarding the protest, see Lorentzen 2013; for elections and institutions, see; Gandhi and Lust-Okar 2009; Little 2012). This information allows autocrats to more efficiently tailor concessions and prevent revolt. Alternatively, citizens may also learn about autocrats through their use of these strategies. Citizens may observe protest and learn that the pool of potential leaders is of sufficiently low quality that there is little benefit to revolution (Meirowitz and Tucker 2013).

This paper builds on the existing literature by considering, in a unified theoretical framework, how citizens can learn about an autocrat's strength through his use of economic transfers or shows of force. We begin with the assumption that autocrats prefer to remain in power, but they differ in the extent to which they would use violence to suppress the revolution and retain power. Strong autocrats are willing and able to violently suppress the revolution. Weak autocrats alternatively would not use violence and would instead prefer to democratize. Citizens do not know perfectly which type of autocrat they are dealing with; they would like to revolt if they knew that the autocrat is weak but would remain loyal if they knew the autocrat is strong. The ability of the autocrat to signal his type thus carries benefits for both autocrats and citizens: With complete information, autocrats need not engage in costly violence, and citizens can tailor their strategy accordingly, rebelling against weak autocrats and remaining loyal to strong autocrats.

In this paper, we model the strategic allocation of two policies that autocrats frequently use to prevent revolution: transfers and shows of force.[2] Transfers entail government payments, services, or policy concessions; they transfer wealth from the ruler to the population.[3] Shows of force alternatively can be thought of as low-intensity violence, for example, sending armed police into the street, disbanding protests, hosting military parades, or even arresting (but then releasing) opposition

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[2]As is conventional, the policies also have direct effects in the model with transfers making loyalty to the autocrat more attractive and shows of force making revolution more costly.

[3]They are different than cooptation, which could entail institutional design and may be related to democratization (Acemoglu and Robinson 2006) or could make future repression more efficient (Taylor 2011). Both transfers and shows of force also require state capacity; we here hold state capacity constant and assess the signaling ability of each of these actions.

figures. Shows of force are thus consistent with low-intensity violence or even nonviolent suppression of dissent. They contrast with violent repression in that repression entails high-intensity violence, like firing live rounds into groups of protestors, targeted killings, or long-term imprisonment, which we assume represents a full-scale conflict with revolutionary forces and undermines the opposition's ability to function. In the model, autocrats can use shows or force or transfers to prevent revolution. Following the revolution, the autocrat also decides whether to employ violent repression.

We further assume that the autocrat's ability to show force effectively is related to his ability to use violence. A strong autocrat, who would employ violence to repress revolution, has a lower cost of showing force when compared to a weak autocrat, who would not use violence. Put differently, keeping some level of displayed force fixed, strong autocrats pay lower costs than weak autocrats. In contrast, the autocrat's capacity to provide transfers depends only on his access to resources and is independent of his capacity to use violence. For example, a ruler with a powerful military under his command will have an easier time sending troops into the street to display his power, and he will have an easier time using these forces to violently suppress the political opposition. The capacity to display force is directly related to the capacity to use force, but they have vastly different implications for the political opposition.

We explore this subtlety to explain why autocrats differ in the number of transfers and shows of force that they employ. To signal their strength, strong autocrats can employ shows of force to an extent that would be prohibitively costly for a weak autocrat. In doing so, they can distinguish themselves from weak autocrats. As in other costly signaling models, the signal enables citizens to tailor their response to the autocrat's type. Transfers, however, cannot signal strength, because the weak autocrat would be willing to match any transfer that the strong autocrat would also be willing to make. Thus, shows of force can signal strength, while transfers cannot. While transfers may be an efficient way to prevent revolution, rulers forego the ability to demonstrate their type when they select transfers. We expect autocrats to especially rely on shows of force when their strength – in other words, their capacity and willingness to repress revolution – comes into question. By using shows of force to signal their strength, governments make violent repression and the high cost of life it entails unnecessary.

Our theory thus accords closely with the advice Machiavelli (1961 [1561], Chapter XVII) offered to the young prince:

> " … a prince must want to have a reputation for compassion rather than for cruelty; none less, he must be careful that he does not make bad use of compassion. Cesare Borgia was accounted cruel; nevertheless, this cruelty of his reformed the Romagna, brought it unity, and restored order and obedience."

Borgia's cruelty provided the foundation for a united, stable state. The opposition knew precisely how Borgia would respond to rebellion: immediate, unrelenting cruelty. Borgia's reputation thus eliminated opposition. By focusing on reputation, Machiavelli tasks the prince to think about the role public inference plays in determining how autocrats should act: the autocrat must assess how his actions signal his willingness to violently suppress revolution to the citizenry.[4] Cruelty and compassion differ in a number of important ways, and these differences introduce a subtlety to the signaling process, which we develop further here.

In considering both high- and low-intensity violence, our paper is closely related to Ritter (2014,114). Ritter expects that more secure authorities, those with longer tenures, are less likely to engage in repression and that the repression they do engage in will be more severe (114). Our findings instead point to the use of low-intensity violence as a signaling device. Consistent with Ritter's argument, secure autocrats may have less need to signal their strength if the opposition is aware of their type. However, when even secure autocrats need to signal their credibility, we expect them to engage in low-intensity violence.

Our paper contributes to a large literature on signaling credibility in both comparative politics and international relations. Several studies have explored the availability of costly signals that allow rulers to communicate information (for example, Slantchev 2005). They evaluate how the type of uncertainty affects the availability of an informative signal. Arena (2013) examines differences in the availability of signals when uncertainty is over resolve versus martial effectiveness – "such as unit cohesion, esprit de corps, professionalism," etc. He concludes that only the former can be communicated using a costly signal. Spaniel and Bils (2018) similarly show that the source of uncertainty matters for the ability to signal; it depends crucially on whether the uncertainty is over resolve versus over the postwar implementation plan (that is the extent to which "one side wishes to conquer the other"). In another paper, the availability of a costly signal depends on whether the uncertainty is over the probability of victory, the costs of fighting, or preferences over a policy (Bils and Spaniel 2017). Trager (2010) and Slantchev (2010) consider the need to signal strength, to get a better settlement, alongside the desire to signal weakness, to prevent the other side from preparing for conflict. The latter incentive may undermine costly signaling.

In this paper, we rely on a conventional type of single-sided uncertainty, where one actor is uncertain whether the other is willing to employ violence. Here, the political opposition is uncertain whether the value that the leader attaches to conflict is larger than the value that he attaches to peace. Rather than examining the source of uncertainty, we instead model how the richness of the

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[4]Though we follow Machiavelli's logic and focus on one-sided incomplete information, it should be noted that informational problems can be two-sided (Wintrobe 1998). For example, the stronger an autocrat is, the less the citizenry is willing to say in political discourse, meaning the less the autocrat knows about the citizens' beliefs and preferences.

strategy space available to the leader affects his ability to employ a costly signal. As is well known in these sorts of games, the cost of the signal must be smaller for the type who will distinguish himself in equilibrium. This prevents the other type from mimicking the signal. In this paper, we show that transfers will always be more acceptable to the weak ruler, thus making transfers an uninformative signal for the ruler's resolve. Only through shows of force, which are plausibly less costly for the strong autocrat, can he distinguish himself.

In the following, we first describe our theoretical framework and expectations. We predict that autocratic leaders will use shows of force when their strength comes into question. We describe the example of Saudi Arabia to show that even a relatively stable authoritarian regime may turn to shows of force and low-intensity violence to signal strength when international events raise uncertainty about the regime's willingness to violently repress revolution.

Formal Model

Here we outline and analyze a model of autocratic signaling and revolt. As is standard in signaling games, there are two players: a Ruler and the Citizens. The Ruler has private information about his strength: the Ruler's type is denoted $\theta \in \{S, W\}$, where S denotes a Strong Ruler and W denotes a Weak Ruler. The game proceeds in four stages:

1. Nature determines the type of Ruler; he is Strong with probability α and Weak with probability $1 - \alpha$[5];

2. The Ruler chooses a two-dimensional signal. The first dimension is a transfer, denoted $\tau \geq 0$,; the second is a show of force, denoted $\sigma \geq 0$. The signal, then, is $m = (\tau, \sigma) \in \mathbb{R}^2_+$;

3. Upon observing the signal, the Citizens decide whether to concede or revolt. If the Citizens concede, then the game ends and payoffs are realized; and

4. If the Citizens revolt, then the Ruler decides whether to democratize or to violently repress revolution. The game ends and payoffs are realized.

The game is depicted in Figure 1. There are three outcomes: one where the Citizens have conceded; one where the Citizens revolt and the Ruler democratizes; and a third where the Citizens revolt and the Ruler violently suppresses the revolution. We introduce payoffs for each in turn.

Citizens Concede

Here the Ruler's payoff is $YB - a_\theta \sigma - \tau$, where $Y > 0$ is the size of the economy; $B \in [0, 1]$ is the Ruler's share of the economy; σ is the level of force showing or

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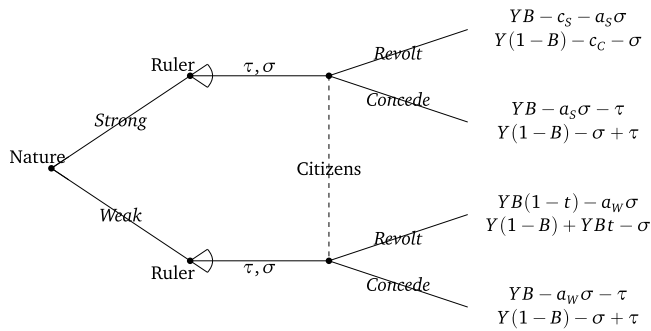
Figure 1. Sequence of moves.

low-intensity violence; and τ is the level of transfers. $a_\theta > 0$ is the marginal cost of shows of force; the magnitude of the cost is assumed to be smaller for Strong Rulers than for Weak Rulers, $a_W > a_S > 0$. This assumption is consistent with the idea that Strong Rulers are better equipped to display their capacity for violence and repress the population – that is what makes them strong.

Conversely, we assume that the cost of the transfer is the same across ruler types. The cost of transfers may be thought of as the price of a monetary transfer, which does not depend on the ruler's strength. The cost of a transfer will depend on the size of the transfer that is needed to prevent revolution. In the model here then, the cost of the transfer is determined endogenously and depends on the Citizens' cost to revolt, the chance that revolution is successful, and their returns following the revolution. The Ruler could use transfers to deter revolution by making the Citizens indifferent between revolt and concede.[6] For Citizens, the payoff for the concession is $Y(1 - B) - \sigma + \tau$, where $Y(1 - B)$ is the Citizens' share of the economy, σ is the cost of the show of force,[7] and τ is the transfer from the Ruler. The transfers could represent a broad range of outcomes, including monetary transfers but also government services. The transfer is thus only provided if the citizens concede.[8]

Citizens Revolt and Ruler Uses Violent Repression

Here the Ruler's payoff is $YB - c_\theta - a_\theta\sigma$, where $c_\theta > 0$ is the cost of using violence against citizens. We assume that the cost of violence is lower for the Strong Ruler, so $c_W > c_S > 0$. The Citizens' payoff for the violent outcome is

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[6]It is plausible that the marginal cost of transfers is lower for the Weak Ruler. Perhaps he is better equipped to provide transfers. This lower cost would enable the Weak Ruler to signal its weakness, but no government would want to communicate that information (reinforcing the results below). In equilibrium, larger transfers are incentive compatible for the Weak Ruler, because the cost of revolution is higher for him. This behavior is derived from the model.

[7]None of the results depend on show of force having a direct cost, but because it sometimes does and this could go against our findings, we wanted to allow the cost to enter the model.

[8]If we instead assumed that the leader makes the transfer regardless of the citizens' decision, the citizens' decision would be independent of the transfer, as they would receive it whether they revolt or not. This objective function abstracts from commitment problems by the government.

$Y(1 - B) - c_C - \sigma$, where $c_C > 0$ is the Citizens' cost of high-intensity violence and σ is the cost of shows of force. Because σ represents a simple display of force or low-intensity violence, we also assume here that $\sigma < c_C$.

Citizens Revolt and Ruler Democratizes

Here the Ruler's payoff is $YB(1 - t) - a_\theta\sigma$, where $t \in [0, 1]$ is the tax rate selected under the new democratic government. The tax provides a transfer to the Citizens, whose payoff is now $Y(1 - B) + YBt - \sigma$. We also assume that Citizens receive more from taxation in democracy than from transfers in autocracy, $YBt \geq \tau$. This implies that they prefer to revolt against the Weak Ruler, rather than to concede.

Note that when the leader knows that he must use violence or democratize in equilibrium, he will not show force, $\sigma = 0$, as he anticipates (correctly in equilibrium) that showing force would fail to prevent revolution. The payoff functions also demonstrate the deadweight loss from shows of force and from violent conflict. Both policies are costly to the ruler and to the citizens, and both could be avoided if the information was shared.

These utility functions induce two possible mechanisms by which the Ruler can encourage the Citizen to concede. First, and more obviously, increases in transfers, τ, directly increase the Citizen's payoff from conceding. If τ is sufficiently large, the Citizens will concede. Second, shows of force, σ, have two effects. They directly reduce the Citizens' utility,[9] and they have an informational effect. Because shows of force are cheaper for the Strong Ruler, it will be shown later that they may provide information about the Ruler's willingness to violently suppress revolution. Following a sufficient level of displayed force, the Citizens know that the ruler would use violent suppression to put down a revolt, and they choose to concede. Thus, shows of force indirectly affect the Citizens' decision. Here we emphasize the indirect effect, which we want to show is unique to shows for force. Put differently, we want to examine this more subtle informational effect in isolation with respect to the more obvious direct effect, and so we have designed the model to identify the effect of each mechanism – transfers and shows for force – independently.

We now make our key substantive assumption designed to capture the core incentives present in the strategic interaction. In particular, we assume that the Strong Ruler will always choose violent repression, $YB - c_S \geq YB(1 - t) \Rightarrow c_S \leq YBt$, and the Weak Ruler will always democratize, $YB - c_W \leq YB(1 - t) \Rightarrow c_W \geq YBt$. The payoffs in Figure 1 are reported accordingly: following the revolt, the Strong Ruler will employ violence and the Weak Ruler will democratize. Taken together, we have $c_S \leq YBt \leq c_W$.

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[9]Although σ has a direct effect, the reduction in utility occurs whether the Citizens revolt or back down, so it does not affect the citizens' decision.

This implies that the Citizens prefer to concede to the Strong Ruler, since it leads to $Y(1 - B) - c_C < Y(1 - B) + \tau$, which obtains for any $\tau \in \mathbb{R}_+$.

We study perfect Bayesian equilibrium behavior where the Ruler employs only one kind of signal at a time. Independent consideration of each strategy is sufficient here because the costs of the strategies are linear and independent of each other.[10] The leader will thus implement only the less costly strategy in equilibrium. We do so to examine how well Rulers can communicate their types with each kind of signal in isolation. There are thus two kinds of simple signaling; one where the Ruler uses transfers but does not use shows of force ($\sigma = 0$); and one where the ruler displays force but does not use transfers ($\tau = 0$). To assess the plausibility of communication under simple signaling, we assess whether a separating equilibrium is supportable for each kind of simple signal.

Deterring Revolution

Governments may draw on two general strategies to deter revolution. They may use a costly signal to convince the citizens that they are the Strong type; Citizens prefer to concede to the Strong Ruler. Or, they may buy the citizens' support, through economic transfers or by providing services.

Our analysis of signaling via transfers yields the following result.

Proposition 1: *There is no separating equilibrium in the game with transfers.*

All proofs are in the Appendix. Because no separating equilibrium exists, any equilibrium will be pooling,[11] and rulers cannot communicate their type through transfers. The intuition for the result is simple. The cost of violent repression is lower for the Strong Ruler than it is for the Weak Ruler. In fact, the Strong Ruler is willing to violently suppress revolutions, precisely because his cost of violence is small. The Weak Ruler is willing to expend more resources to prevent revolution because the cost he associates with revolution – from democratization – are higher. Due to these differences in the cost of revolution, the Weak Ruler will always be willing to spend more to prevent revolution than the Strong Ruler will, so any strategy that is incentive compatible for the Strong Ruler is likewise incentive compatible for the Weak Ruler.

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[10]Recall the leader's utility function: $YB - a_\theta\sigma - \tau$. The marginal cost of transfers is 1, which does not depend on shows of force. The marginal cost of showing force is a_θ, which does not depend on transfers. In equilibrium, the ruler will select the policy, transfers, or shows of force, that yields the smaller total cost. The decision is a bit more complex than just comparing the marginal cost, $1 \gtrless a_\theta$, because the size of the transfer and shows of force needed to prevent revolution differ.

[11]There is also no semi-separating or semi-pooling equilibrium, as these require the ruler to mix between the strategies played in the separating and the pooling equilibrium (which means he must be indifferent between them). Since the separating equilibrium is never supportable in pure strategies, it also cannot be played as part of a mixed strategy equilibrium – the ruler would never play a dominated strategy with positive probability in a mixed strategy equilibrium.

Because the Weak Ruler would also benefit from being perceived as a Strong Ruler – recall that the Citizens want to concede to a Strong Ruler – the Strong Ruler cannot distinguish himself using transfers.

(Figure 2) displays the difference in the two types' willingness to pay to prevent revolution. Here we plot the probability of revolution as a function of the transfer across types. The lines represent the incentive compatibility constraints for the weak and strong types. In short, the Weak Ruler is willing to spend more than the Strong Ruler to prevent revolution, so the Strong Ruler cannot use transfers to distinguish himself from the Weak Ruler.

Because the Ruler is unable to distinguish himself using transfers, the Citizens are unable to update their beliefs in a model with only transfers. Thus, any equilibrium would be pooling, and the Citizens' decision of whether to revolt is contingent on their prior belief about the type of the ruler, α. More precisely, the Citizens' decision depends on which side of the following equation is larger. The Citizen will revolt if:

$$\alpha[Y(1-B) - c_C] + (1-\alpha)[Y(1-B) + YBt] \geq Y(1-B) + \tau \Rightarrow$$
$$\alpha \leq \frac{YBt - \tau}{c_C + YBt}.$$

The expression implies that revolt is more likely when the economy is large, Y, and when wealth is unequally distributed in autocracy (B captures the extent to which the ruler controls wealth relative to citizens). This result provides a micro foundation for modernization theory (Przeworski et al. 2000), as well as for the effect of inequality (Acemoglu et al. 2001; Freeman and Quinn 2012). Revolt is also more likely when the leader is likely to
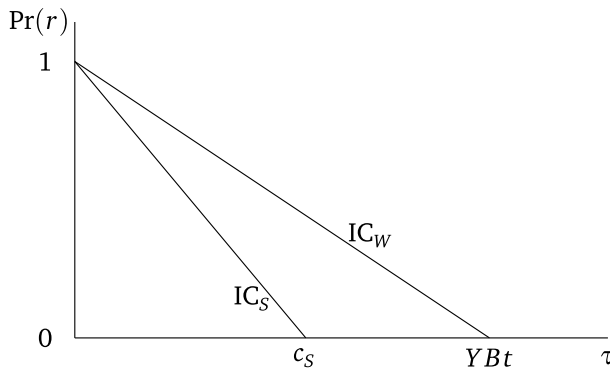
Figure 2. Indifference curves for strong and weak rulers using transfers. Note: τ is the number of transfers selected by the Ruler. $\Pr(r)$ is the probability of revolution given τ. The indifference curves show the number of transfers that each type would be willing to expend to reduce the probability of revolution from one to zero. Separation in equilibrium is impossible; separation would require transfers by the Strong Ruler such that $\tau_S \leq c_S$, but we know by assumption that $c_S \leq YBt$, so any signal that is incentive compatible for the Strong Ruler would likewise be compatible for the Weak Ruler, making separation impossible.

democratize (α small), when the Citizens' cost of violence is small (c_C), and when the gains to Citizens in a democracy are large (t). The gains to citizens from democracy are not likely to be large, and revolution is thus unlikely, when autocrats have found ways to control future policy, for example, through formal institutions or market liberalization (Albertus and Menaldo 2013; Pond 2018).

This result is disappointing, because conflict is costly, and the inability of the Strong Ruler to distinguish himself leads to the conflict under certain conditions. For example, if the probability that the ruler is strong, α, is sufficiently small, Citizens will revolt. Nevertheless, α is greater than zero, so with positive probability, the Ruler will be strong and will repress the Citizens.

The result also lends some insight into the role of information in causing conflict. Rationalists generally use problems of information, indivisibility, and commitment to explain war (Fearon 1995). Powell (2002) demonstrates that commitment is frequently the source of problems of indivisibility; otherwise, transfers could be used to allocate seemingly indivisible goods. Information problems are acute in the presence of disagreements about distribution, as incentives to misrepresent undermine communication (Morrow 1994). Commitment is a severe problem in the civil war context, as combatants must disarm (Walter 1997).

Consistent with recent work showing that the source of uncertainty affects the availability of a costly signal (Arena 2013; Bils and Spaniel 2017; Slantchev 2010; Spaniel et al. 2018; Trager 2010), the model here presents another source of informational conflict. Information transmission is not possible when the costs of signaling are equal or positively correlated with capacity across types. In the application here, symmetric costs undermine the ability of the Strong Ruler to differentiate himself, particularly when the Weak Ruler is willing to spend more to avoid revolution. Information transmission relies on the actors having a signaling apparatus available to them that is negatively correlated with the actors' types. Conflict origin is also about the richness of the informational environment and the availability of adequate signaling methods.

We now consider signaling where the Ruler may employ shows of force to communicate.

Proposition 2: *A separating equilibrium exists in the game with shows of force.*

Rulers can communicate their types through shows of force because showing force is more costly for the Weak Ruler than for the Strong Ruler – who can more cheaply wield and display his military might. This difference in costs enables the Strong Ruler to display a higher level of force than is incentive compatible for the Weak Ruler. Thus, after observing the show of force, the Citizens update their beliefs and know exactly which type of leader they face.

Figure 3 displays the result graphically. Unlike with transfers, shows of force are cheaper for the Strong Ruler than for the Weak Ruler. Consequently, there is a continuum of values of showing force that the Strong Ruler is willing – and the Weak Ruler is unwilling – to implement. This is precisely the level of force showing that reveals information to the Citizenry. If sufficient force is observed, citizens are able to update their prior information; they know that only a Strong Ruler would be willing and able to display so much strength.

There are three possible equilibria types of the game: There is a pooling equilibrium where both types of Ruler display no force and expend the smallest transfer necessary to get the Citizens to concede, and the Citizens concede. This equilibrium results when the posterior probability that the Ruler is strong is sufficiently large. There is also a pooling equilibrium where both types of Ruler provide no transfers and no shows of force and the Citizens revolt – as assumed above, the Strong Ruler then employs violence and the Weak Ruler democratizes. This equilibrium results when the posterior probability that the Ruler is strong is sufficiently small. There is also a separating equilibrium, where the Strong Ruler displays force to convey his type; the Citizens revolt when they observe force below this level and concede otherwise. Following the revolution, the Strong Ruler would employ violence and the Weak Ruler would democratize.

In sum, it is only through shows of force that the two types of rulers may distinguish themselves. And, although shows of force are costly, in equilibrium they make revolution unnecessary. The Strong Ruler is able to reveal his type, and in doing so the Weak Ruler is also revealed. In the former case, the
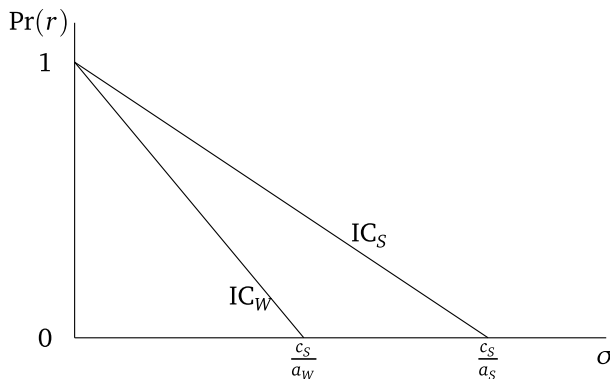
Figure 3. Indifference curves for strong and weak rulers using shows of force. Note: σ is the display of force selected by the ruler. $\Pr(r)$ is the probability of revolution given σ. The indifference curves show the level of force that each type would be willing to display to reduce the probability of revolution from one to zero. Separation is possible in equilibrium here, as $\sigma_S \in \left[\frac{c_S}{a_W}, \frac{c_S}{a_S}\right]$. This range always exists, as $a_W > a_S$.

Citizens avoid revolution by conceding. In the latter case, the Ruler democratizes. With only transfers available to the autocrat, this type of information revelation is impossible, and Citizens facing a Strong Ruler would – under certain conditions – revolt and violent repression would follow.

Preferences over Equilibria

Having established that only shows of force contain information, we now consider which equilibrium is preferred by each player. Table 1 reports the payoffs from each equilibrium, first to the Ruler and then to the Citizens. Figure 4a displays all the feasible equilibria for different values of α, the probability of a Strong Ruler, and τ^*, the size of transfers that would be needed to prevent revolution in equilibrium. Figure 4b identifies the equilibrium preferred by the Strong Ruler, chosen from the set of feasible equilibria. Figure 4c identifies the equilibrium preferred by the Weak Ruler, and Figure 4d identifies the equilibrium preferred by the Citizens again chosen from the set of feasible equilibria.

Comparison of the Citizens' utility from each of the equilibria shows that the Citizens always prefer the separating equilibrium to the pooling with revolt equilibrium.[12] This is because revolting against the Strong Ruler leads to large-scale, violent repression, which costs the Citizens, c_C. Alternatively, to discover which type of Ruler they face in the separating equilibrium, the Citizens pay for shows of force, $\sigma < c_C$. These costs can be compared directly because the citizens only incur the costs when they face the Strong Ruler (which they anticipate with probability α).

In many cases, the Citizens also prefer the separating equilibrium to the pooling with concede equilibrium.

Proposition 3: *As long as $\sigma \leq \frac{(1-\alpha)YBt-\tau}{\alpha}$, the citizens prefer the separating equilibrium to the pooling with concede equilibrium. In other words, the citizens*

Table 1. Payoffs from each equilibrium.

Ruler's Payoffs			
		Strong Ruler	Weak Ruler
	Separating equilibrium	$YB - a_s\sigma$	$YB(1 - t)$
	Pooling with revolt	$YB - c_s$	$YB(1 - t)$
	Pooling with concede	$YB - \tau$	$YB - \tau$
Citizens' Payoffs			
		Strong Ruler	Weak Ruler
	Separating equilibrium	$Y(1 - B) - \sigma$	$Y(1 - B) + YBt$
	Pooling with revolt	$Y(1 - B) - c_c$	$Y(1 - B) + YBt$
	Pooling with concede	$Y(1 - B) + \tau$	$Y(1 - B) + \tau$

[12]The Citizens' expected utility in the separating equilibrium is $a[Y(1 - B) - \sigma] + (1 - a)[Y(1 - B) + YBt$, which is always greater than their payoff from the pooling with revolt equilibrium $a[Y(1 - B) - c_C] + (1 - a)[Y(1 - B) + YBt]$, as $\sigma < c_C$.
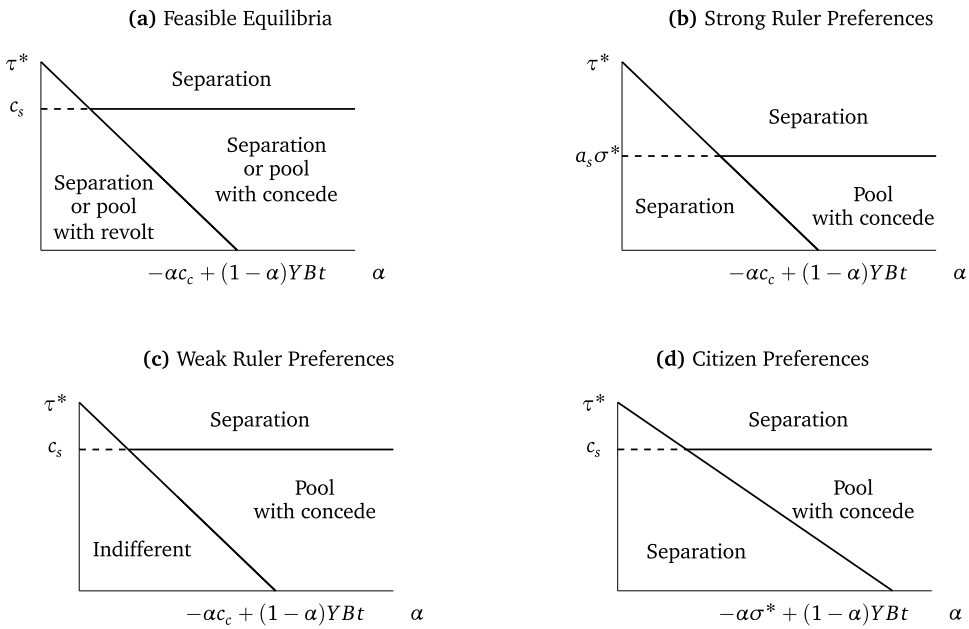
Figure 4. Equilibria and preferences. Note: τ^* is the equilibrium transfer that would be required to prevent the Citizens from revolting. a is the probability that the Ruler is strong. σ^* is the equilibrium show of force in the separating equilibrium.

would prefer to pay up to $\sigma = \frac{(1-\alpha)YBt-\tau}{\alpha}$ *in show of force costs in order to know the ruler's type with certainty.*

Although costly for both the Ruler and the Citizens, the Citizens want to pay for the signal due to the information it provides. Once the Citizens know which type of Ruler they face, they can behave optimally, revolting against a Weak Ruler and conceding to a Strong Ruler. The Citizens are willing to pay more when the benefits of democratization are larger, for example, due to large transfers in democracy or a highly unequal prior distribution of wealth.

The Strong Ruler prefers the separating equilibrium for a larger range of τ^* than the Weak Ruler – this is because shows of force are cheaper for him than they are for the Weak Ruler, who would rather use transfers to prevent revolution. The Strong Ruler only prefers transfers, when the transfers needed to prevent revolution are rather small and consequently cheaper even than signaling his type.

The Intuitive Criterion

We now turn our attention to what kind of equilibria one might expect in plausible settings. The discussion of the players' preferences over the equilibria is a helpful step in considering the Intuitive Criterion and the principle of

Equilibrium Dominance. The Criterion rules out any equilibria that include an action in the sender's strategy profile that is dominated by another action, assuming that the receiver is playing a best response (Fudenberg and Tirole 1991). The Criterion is meant to eliminate equilibria that rely on in some way puzzling beliefs, especially those that assign zero probability to a type – off the equilibrium path – who could actually gain from that action.

The Beer-Quiche game provides the seminal example. Player 1 may be either the surly or weak type and chooses whether to drink beer or eat quiche for breakfast. The surly type of player 1 prefers beer. The weak type prefers quiche. Both are willing to eat either breakfast to deter a fight. Player 2 observes 1's breakfast choice and then decides whether to fight or not. He would prefer to fight the weak type and not fight the surly type. There is a [Perfect Bayesian] equilibrium where the surly and weak types pool on eating quiche, because, following beer, player 2 believes that player 1 is the weak type and initiates a fight. Only the surly type could possibly benefit by deviating to beer, but, since beer is off the equilibrium path, these beliefs are consistent with Bayes' Rule. The Intuitive Criterion however eliminates this equilibrium.

In the application here, when $\tau^* < a_s\sigma^*$ and $\tau^* > -\alpha c_c + (1-\alpha)YBt$, two equilibria are possible: separation and pooling (with transfers and no show of force) where the Citizens concede. The separating equilibrium is sustained by the Citizens' beliefs that, if they observe a transfer and no show of force, they must face the Weak Ruler. However, the Strong Ruler could also gain from deviating to no show of force and providing transfers (as transfers are cheaper than show of force even for the Strong Ruler when $\tau^* < a_s\sigma^*$); the action of no transfers – as part of the separating equilibrium – is equilibrium dominated by the action of providing transfers for the Strong Ruler. The Citizens then should not believe that the Ruler is certainly Weak upon observing no show of force, but should rather believe that the Ruler is Strong with probability α, and the separating equilibrium is no longer supportable. Applying the Intuitive Criterion rules out the separating equilibrium whenever $\tau^* < a_s\sigma^*$ and $\tau^* > -\alpha c_c + (1-\alpha)YBt$, and it produces the unique prediction that the pool with concede equilibrium will apply.

Alternatively, consider the case where $\tau^* \geq a_s\sigma^*$, $\tau^* < c_s$, and $\tau^* > -\alpha c_c + (1-\alpha)YBt$. The separation or pooling (with transfers and no show of force) where the Citizens concede are possible equilibria for these parameter values. Under these conditions only the Strong Ruler can benefit from showing force, as part of the separating equilibrium (the Weak Ruler prefers the pooling with concede equilibrium), so the Citizens should believe that the Ruler is Strong when they observe the deviation to show of force (rather than the transfers needed to sustain the pooling on concede equilibrium). The pooling equilibrium requires that the Citizens believe the Ruler is Weak following show of force, which is ruled out by the Intuitive Criterion (as the transfer action played in the pooling equilibrium is equilibrium dominated

by show of force for the Strong Ruler). Applying the Intuitive Criterion rules out the pooling equilibrium with concessions whenever $c_s > \tau^* \geq a_s \sigma^*$ and $\tau^* > -\alpha c_c + (1-\alpha)YBt$, and it produces the unique prediction that the separating equilibrium will apply.

Finally, consider the case where $\tau^* < -\alpha c_c + (1-\alpha)YBt$. There are two feasible equilibria for these parameter values: separation and pooling (with no transfers and no show of force) where the Citizens revolt. The pooling equilibrium is sustained by the Citizens' belief that the Ruler is Weak after observing a show of force – otherwise, the Strong Ruler would benefit from deviating to a show of force. The no show of force acting in the pooling equilibrium is equilibrium dominated by using a show of force for the Strong Ruler. Applying the Intuitive Criterion rules out the pooling equilibrium with revolt whenever $\tau^* < -\alpha c_c + (1-\alpha)YBt$, and it produces the unique prediction that the separating equilibrium will apply.

Applying the Intuitive Criterion, as discussed above, allows us to identify the unique equilibrium for each set of parameter values. Figure 5 depicts the resulting equilibrium, as a function of the prior probability of the Strong Ruler, α, and the transfers needed to sustain the dictatorship, τ^*. The figure coincides completely with the preferences of the Strong Ruler. Now we formally state the following Proposition.

Lemma 1: *After applying the Intuitive Criterion, the unique equilibrium for each set of parameter values is the equilibrium preferred by the Strong Ruler.*

These unique equilibrium outcomes also allow us to consider the relative sizes of the equilibrium regions. When the Citizens begin to question the Ruler's credibility – this represents a *decrease* in α, which shifts the downward sloping line to the right – the size of the pooling equilibrium outcome decreases.
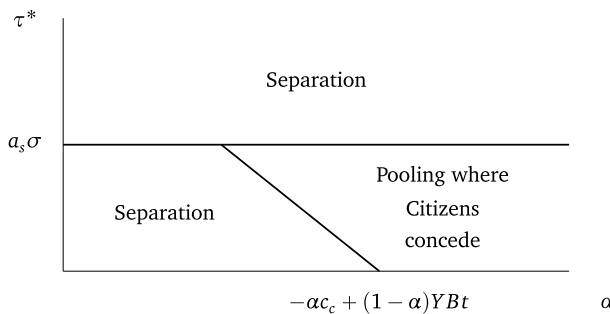
Figure 5. Equilibrium outcomes, using the intuitive criterion. Note: τ^* is the equilibrium transfer required to prevent the Citizens from revolting.

Proposition 4: *When the probability that the Ruler is Weak increases, the separating equilibrium becomes more likely.*

The proposition provides us with an expectation of when we should observe shows of force as a signal. When the Ruler's credibility is questioned, the Strong Ruler should show force to distinguish himself from the Weak Ruler, even if he could use transfers to make revolution less attractive. In the next section, we draw on anecdotal evidence from the Arab Spring to illustrate the final Proposition.

Saudi Arabia and the Arab Spring

The Arab Spring provides a unique opportunity to illustrate the model's key implications in Saudi Arabia. Revolutions in other gulf countries brought leaders' willingness and ability to violently suppress opposition into question. Regional tensions began with the self-immolation of a street vender, Mohamed Bouazizi, in Tunisia in December, 2010. His action sparked mass protests, which led to clashes with the police and eventually the failure of the government of Tunisia in January, 2011. The protests then spread to Algeria, Jordan, Egypt, and, to differing degrees, all over the Middle East. Governments fell in Egypt and Libya. Conflict and state failure followed in Yemen and Syria, and large-scale, violent repression ensued in Bahrain. The Arab Spring provides an external source of uncertainty about the government's willingness to violently suppress the opposition: Citizens question their rulers' credibility due to the inability or unwillingness of *other* leaders (for example, Kuran 1991; Lohmann 1994), in this case beginning with Tunisian leaders, to violently suppress the revolt.

The model anticipates that the government should use more shows of force, rather than co-optation, when the government's willingness to violently suppress revolution is uncertain. Since shows of force are a necessary condition for information transmission, we expect governments to use them in response to the diffusion of revolution during the Arab Spring as a way to signal their credibility. As proof of concept, we consider how this played out in the Saudi case.

Following events abroad, there were 2 weeks of scattered protests in Saudi Arabia in late February and early March, 2011 (Post Staff, 2011). The government responded rapidly. On March 6th and 7th, public protests were banned, and on March 11th, the police displayed its full force in Riyadh: "Security in Riyadh was high-profile and intense, with helicopters hovering overhead and police checks on cars and individuals heading for mosques, where protests were expected after prayers" (Black 2011).

These actions did not directly harm many dissidents.[13] Rather than suppressing all opposition, the Saudi government wanted to send a clear signal of strength. *Foreign Affairs* reported that "the government made clear it would respond to any further dissent by 'any mercenary or misled person' with 'an iron fist;'" this signal was reinforced when the government sent tanks across the border to suppress the neighboring uprising in Bahrain (Bradley 2011).

To be clear, the government also used some co-optation: King Abdullah "sought to defuse opposition demands for change by unveiling an unprecedented package worth about 37 USDbn (23bn) to pay for unemployment benefits, education and housing subsidies" (Black March 11, 2011). However, the announcement came after the initial show of force made the government's willingness to violently suppress revolution clear. The transfers may make the status quo more palatable, as they do in the model, but they do not provide information.

Conclusion

This paper explores the signaling potential of two strategies: economic transfers, and shows of force. Our model demonstrates that only shows of force provide information. Although transfers may be used to prevent citizens from supporting the revolution, it is not because they convey information. A Weak Ruler will always outspend a Strong Ruler to prevent revolution. Information transmission requires that the signal is too costly for the type that would misrepresent his strength. Only shows of force meet this criterion. Showing force is less costly for Strong Rulers, who can use it to distance themselves from Weak Rulers and communicate their willingness to violently suppress the revolution.

In considering the signaling apparatuses available to autocrats, the paper complicates our understanding of the causes of conflict. Conflict may result from informational asymmetries, if an actor is unable to communicate her type. When the preferences of the actors are diametrically opposed, communication is impossible if there is no available signal that is sufficiently costly to rule out mimicry by other actors. Indeed, both citizens and rulers may actually prefer the equilibrium where shows of force are used to signal credibility. Citizens and rulers are willing to pay in terms of limited violence to respond optimally to the ruler's type and prevent high-intensity, violent repression. Although shows of force are costly and therefore inefficient, for many citizens they are preferable to the unequal distribution of wealth in the autocracy, and they may view policy control in democracy as the only way to secure redistribution in the future. Democratization is thus sufficiently valuable that Citizens are willing to bear the costs of shows of force and the low-intensity violence they sometimes entail.

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[13]Police shot and killed at least two protestors on March 10, 2011, but violence was still limited (Black March 11, 2011).

In a normative sense, this is a tragic result, as some violence seems necessary for information transmission. Consequently, shows of force or low-intensity violence at least may be characteristic of autocratic rule. That is, the cost of showing force induces some inefficiency in autocracies, where Strong Rulers must use it to signal their strength. This is because violence carries more relevant information within it than does economic transfer. Although showing force is costly, the low-intensity conflict it entails may deter the high-intensity conflict that revolution would produce. Though disagreeable, autocratic shows of force may be more efficient than their alternatives. This, in turn, calls into question the idea that we should be consistently sanguine about the pacifying effect of institutions or buyoffs, which map better to transfer than to shows of force.

The normative differences between shows of force and economic transfer should not be downplayed. Autocratic signaling presents Public Choice problems of an extreme form (Tullock 1987), so it is unsurprising that many theoretically minded scholars (for example, Olson 1993) have focused on how low-intensity conflict affects development. Even limited conflict wastes lives, resources, and time. Transfers waste none of these things, but they may stave off meaningful political change. Indeed, transfers play an important role in the normative study of economic exchange, where they render any efficient outcome supportable (for example, Mas-Colell, Michael, and Whinston Jerry 1995, Proposition 16.D.1). Given these efficiency differences, we would hope that transfers prove to be useful signals, but we show that they do not.

ORCID

Amy Pond http://orcid.org/0000-0002-6908-2791

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