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Economic Crisis, Natural Resources, and Irregular Leader Removal in Autocracies

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Why do autocratic leaders escape revolution, coups, and assassination during times of economic crisis? I argue that the spike in natural resource revenues since the 1960s has increased autocratic crisis resilience. The availability of this alternative revenue stream provides autocratic leaders with a constant inflow of money, increases their ability to repress dissent, and improves their access to international credit. Extending the analysis back to 1875, I show that the relationship between economic crisis and irregular leader removal in autocracies is strong and robust before the 1960s, but disappears in more recent periods. Interaction analyses confirm that the effects of economic crisis are moderated by natural resource income. These findings are robust to an array of alternative specifications, including analyses that address endogeneity concerns via instrumental variable (IV) estimation. A more particular examination of the theoretical mechanisms also supports the argument. These findings challenge widely held beliefs in the literature of a strong, direct effect of economic crisis on autocratic leader survival; they explain why economic crisis seems to destabilize some autocrats, but not others.

Introduction

Recent political history is riddled with examples of autocratic leaders who weather periods of severe economic crisis without being removed from power through coups, assassinations, or revolutions. Examples of such crisis-resilient leaders include Fidel Castro in Cuba (who faced recession from 1986 to 1994), Mahatir Bin Mohammad in Malaysia (whose regime survived the 1998 Asian financial crisis), and Vladimir Putin in Russia (who faces an ongoing economic crisis). These cases are merely the tip of the iceberg.[1] The dominant pattern in recent decades is one of autocrats successfully coping with economic crises.

This presents something of a puzzle. As Bueno de Mesquita, Smith, Siverson, et al. (2005, 26–28) convincingly argue, economic crises hamper the ability of political leaders to provide sufficient resources to sustain political support and thereby jeopardize their political survival. In fact, a large and influential body of scholarship supports the proposition that economic crises have destabilizing effects in autocracies (for example, Haggard and Kaufman 1995; Przeworski, Alvarez, Cheibub, et al. 2000), leading Barbara Geddes (1999, 119) to proclaim it a well-established "stylized fact."

However, recent quantitative efforts to test this relationship on a global scale have produced inconsistent results. Some find that crises threaten leaders, but mainly in large coalition systems—that is, more democratic countries (see Bueno de Mesquita et al. 2005, 302–11). Bueno de Mesquita and Smith (2010) find the relationship to hold for small coalition systems (that is, more autocratic regimes) only. Burke (2012) finds no consistent support for the effect of economic performance on irregular leader removal in autocracies.

Even studies that focus on specific irregular events through which autocrats typically lose power present inconsistent findings. Some studies find that economic crises significantly increase the risk of coup attempts (see, for example, Johnson, Slater, and McGowan 1984; Alesina, Özler, Roubini, et al. 1996; Galetovic and Sanhueza 2000; Arriola 2009), some find no such relationship (see, for example, Londregan and Poole 1990; Thyne 2010; Powell 2012; Bazzi and Blattman 2014; Singh 2014), and some find a conditional effect (see, for example, Kim 2016). These disagreements are mirrored in analyses of civil war, where some studies report significant effects of fluctuations in economic performance (see, for example, Collier, Hoeffler, and Söderbom 2004, 2008; Miguel, Satyanath, and Sergenti 2004; Hegre and Sambanis 2006; Bohlken and Sergenti 2010) and others do not (see, for example, Bergholt and Lujala 2012; Dahl and Hoyland 2012; Koubi, Bernauer, Kalbhenn, et al. 2012; Bazzi and Blattman 2014).

So why are autocratic leaders often able to avoid irregular removals during times of economic crisis? All of the aforementioned studies on irregular leader removal—and most of the studies on coups and civil wars—study the period after 1960, which saw the rapid and substantial emergence of natural resource revenues. These revenues came from oil in particular, as well as more generally from other sources such as natural gas, coal, and precious metals.[2] As shown in Figure 1 and Figure 2, only a handful of countries

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[1] Cold War examples include Mobutu Sese Seko in Congo (recession in 1975–1983), Omar Bongo in Gabon (recession in 1977–1988), Hastings Banda in Malawi (recessions in 1980–1982 and 1986–1990), the Al-Sabah princes of Kuwait (recessions in 1972–1977 and 1980–1982), and Augusto Pinochet in Chile (recession in 1982–1983). Post–Cold War examples of crisis-enduring dictators include Biya in Cameroon (recession 1987–1994), Omar al-Bashir in Sudan (recessions in 1992–1993 and 2011–2012), Sheikh Khalifa in the United Arab Emirates (recession in 2005–2010), Hamad bin Isa Al Khalifa in Bahrain (recession in 2005–2011), and Qabus Bin Said in Oman (recession in 2010–14), to name a few.

[2] In this study, natural resource revenues are defined as income accruing from different types of fuel (for example, oil, gas, and coal) and precious metals

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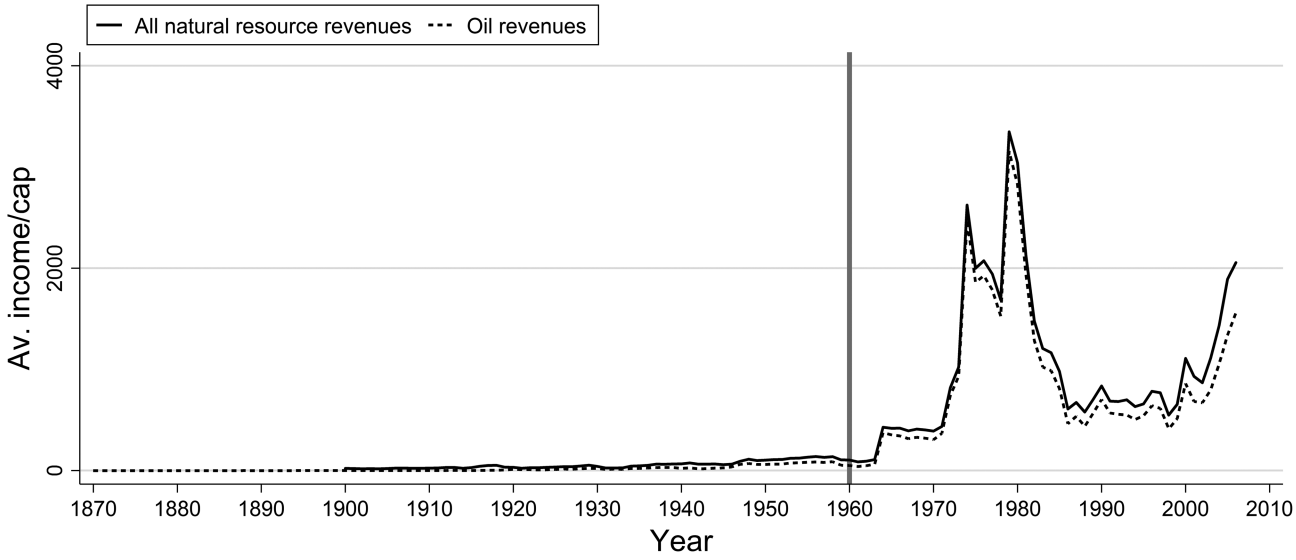

Figure 1. Developments in natural resource revenues over time in autocracies
Note: Average per-capita income from natural resources, stemming from different types of fuel (for example, oil, gas, and coal) and precious metals (for example, copper, gold, and iron) in autocracies. The dotted line shows separate trends for oil only. Data is from Haber and Menaldo (2011). Revenues are given in constant 2007 USD. Only autocratic country-years of independence are included in the calculations.

received important streams of income from natural resources before the 1960s, and even in these cases the amounts were quite modest. Beginning around 1960, the combination of new technology, booming oil prices, and large-scale nationalizations increased revenues from natural resources. In recent decades, many autocratic leaders have therefore had access to alternative revenue streams that were not available before the 1960s.

A comprehensive literature shows that such readily available natural resource rents stabilize autocrats by providing them with a stable influx of revenues that they can distribute to essential backers of the regime (see, for example, Smith 2004; Ulfelder 2007; Smith 2008; Morrison 2009; Bueno de Mesquita and Smith 2010; Lucas and Richter 2016; Bermeo 2017).[3] In this study, I argue that such rents have an often ignored side effect in autocracies: they ease the destabilizing consequences of economic crisis.

They do so in three ways. First, the constant inflow of natural resource windfalls enables autocrats to keep providing spoils for their essential constituents despite the poor state of the economy. Second, natural resources enable autocrats to suppress crisis-induced mobilizations by providing funds for repressive apparatuses, by increasing loyalty in the military ranks, and by mitigating the macroeconomic costs of repression. Third, resource-rich leaders enjoy easier access to cheap credit in the form of loans and grants, which further improves their ability to provide spoils and undertake countercyclical social spending. For these reasons, economic crises increase the likelihood of irregular leader removal for autocrats without access to natural resource revenues, but not for leaders with substantial natural resources at their disposal.[4]

To evaluate my claims, I extend my analysis back to 1875 and combine several empirical tests. The analysis shows that the effect of economic crisis on irregular leader removal in autocracies differs significantly before and after the 1960s: the effect is strong and robust before the 1960s but disappears afterward. Enlisting comprehensive natural resource data from Haber and Menaldo (2011), I find that the prevalence of natural resources after the 1960s contributes to these disparate temporal effects. Multiplicative interaction analyses reveal clear moderating effects both throughout the 1875–2009 period and during the more recent 1960–2009 period. These empirical conclusions are robust to an array of model specifications and estimation methods. Addressing endogeneity concerns through instrumental variable (IV) estimation—with average global economic crisis levels as the instrument for domestic economic crisis—does not alter the conclusions either. Finally, an examination of more detailed observable implications suggests that natural resources do indeed provide resource-rich autocrats with a constant inflow of income independent of fluctuations in the real economy, increase their ability to repress crisis-induced mass mobilization, and, to a lesser extent, increase their access to international credit.

Economic Crisis and Irregular Removal of Autocrats

Removals of autocratic leaders are irregular when they occur in ways that contravene explicit rules and established conventions. This typically happens as a result of the threat or use of force through coups, revolutions, civil wars, or

(for example, copper, gold, and iron). Not included are revenues accruing from nonmetal minerals, such as gypsum and clay, and reproducible resources like timber, rubber, and agricultural products.

[3] On the other hand, several studies have argued and shown that natural resources have direct, detrimental effects on stability (see, for example, Østby, Nordås, and Rød 2009; Fortna and Huang 2012).

[4] Given that autocratic leaders are able to utilize windfall revenues from natural resources to distribute private goods, and enhance their survival abilities, to a much higher degree than their democratic peers (Powell 2014; DiGiuseppe and Shea 2016), the argument examined here pertains first and foremost to nondemocracies.

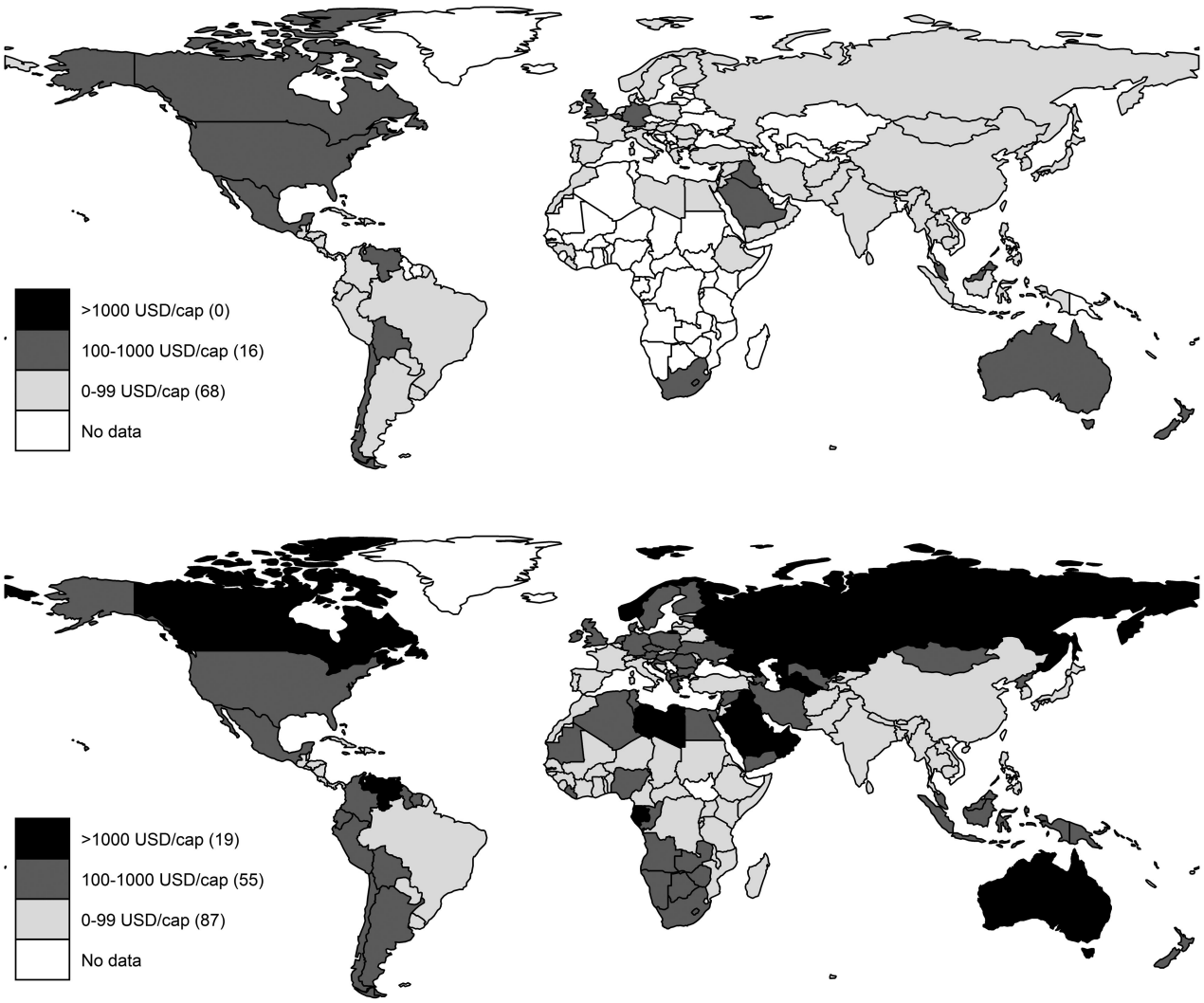

Figure 2. Average natural resource revenues 1875–1959 and 1960–2007
Note: Top panel shows average per-capita income from natural resources for 1875–1959 and bottom panel shows the values for 1960–2007. Data is from Haber and Menaldo (2011). Revenues are given in constant 2007 USD. Only country-years of independence are included in the calculations. Both autocracies and democracies are shown.

assassinations. This category does not include removals due to natural death, retirement, suicide, negotiated pacts, or direct foreign intervention. Since 1875, there have been around four hundred irregular removals in autocracies (Goemans, Gleditsch, and Chiozza 2009, 275). They include the German Kaiser Wilhelm II (1918), Benito Mussolini in Italy (1943), Rafael Trujillo in the Dominican Republic (1961), the Romanian dictator Ceaușescu (1989), and most recently, during the "Arab Spring" in 2011, Zine el Abidine Ben Ali in Tunisia, Hosni Mubarak in Egypt, and Muammar Gaddafi in Libya. As depicted in Figure 3, irregular removal of autocrats happens with some frequency, occurring on average in around 5 percent of all autocracies every year.[5]

Although scholars often assume that economic crises are an important factor in regime instability, studies on irregular leader removals have been rather sparse. The few studies that look into the effects of economic crisis on leader removal have produced inconsistent findings on this relationship. Most forcefully, Bueno de Mesquita et al. (2005, 302–11) discuss and test this relationship in their seminal work on the logic of political survival. Their starting point is the assumption that leaders, in order to stay in power, need the support of an essential portion of the population: the winning coalition. In closed autocracies this will be a handful of state elites, who would typically receive private goods in the form of rents, subsidies, trade policies, and so on. Essential supporters will back the leader in power if he or she provides them with more of such benefits than they might receive under alternative leadership. It follows from this that economic downturns put strain on the leader's ability to provide sufficient benefits to sustain political support and

[5] This is not to say that all autocratic leader removals are irregular. In fact, autocrats more often lose power through other events, be it natural deaths, retirement, suicide, foreign interventions, or regular turnovers of power (for example, hereditary succession in monarchies). Yet, the conditional relationship between economic crisis and natural resources should theoretically be strongest with respect to irregular leader removals (see argument below). In the supplementary materials, I extend the analysis to all leader failures and reach similar conclusions (see Table G1). I also show that the relationship does not maintain if I restrict the analysis to regular modes of autocratic transition only (see Table G2).

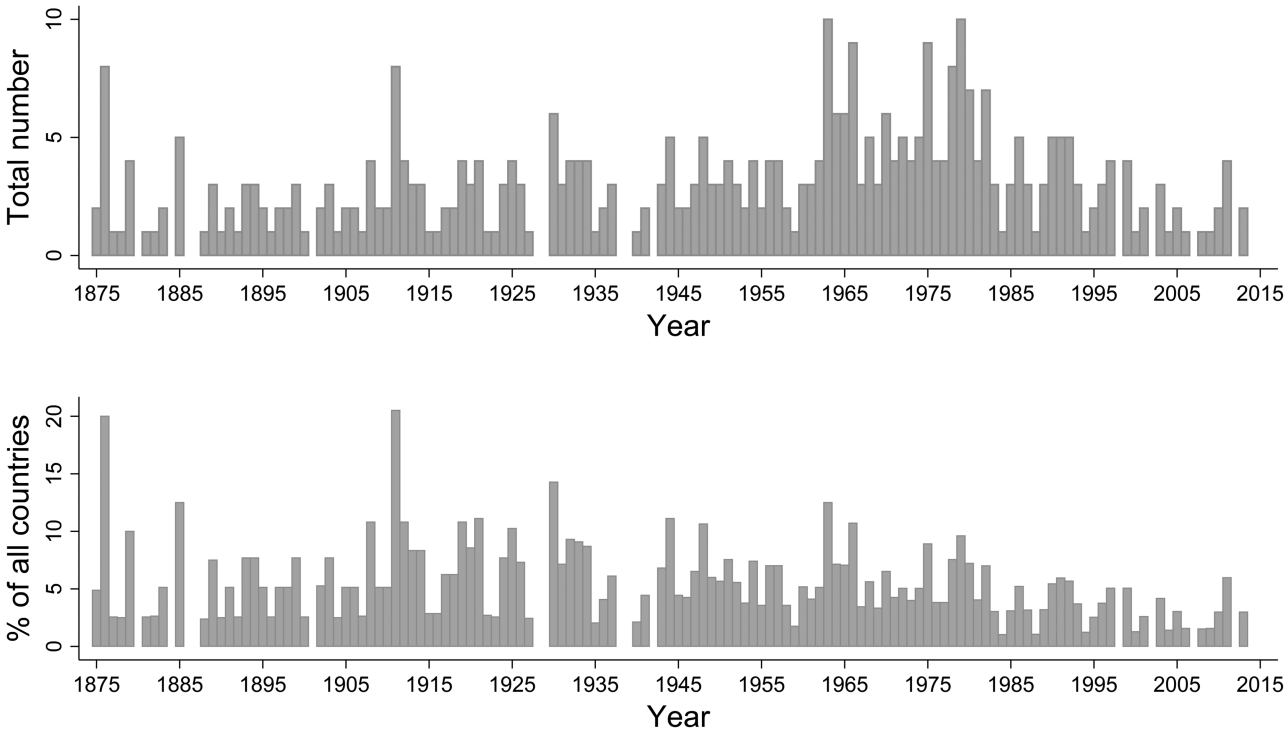

Figure 3. Irregular leader removals over time in autocracies
Note: Data is from Goemans, Gleditsch, and Chiozza (2009). Only autocratic country-years of independence are included in the calculations.

therefore threaten the likelihood of survival. Bueno de Mesquita et al. (2005, 302–11) expect this relationship to be strongest in democracies, as distributing public goods—such as economic growth—is a more effective strategy of satisfying large winning coalitions. But, given the budgetary constraints induced by crisis periods, we would also expect recessions to matter for autocrats' ability to provide private goods, and thereby for their survival chances. Bueno de Mesquita et al. (2005, 302–11) test this relationship in a global sample spanning the period from the early 1960s to mid-2000s and show that higher economic performance prolongs leader survival and that crisis periods increase the risk of leader removal. They find this relationship to be particularly strong for large coalition leaders and the effect to be weak and insignificant in autocracies after accounting for baseline risks and measurement issues.

In a more recent study, however, Bueno de Mesquita and Smith (2010) test this relationship—for a similar post-1960 period—with a different result: economic performance only matters for leaders in small-coalition systems but has no discernible effects for leaders in large-coalition systems.[6] Such contradictory results once again highlight the inconsistent vulnerability of political leaders during times of economic crisis.

Another example is Burke (2012), who argues that economic performance affects leaders' survival because it influences their ability to distribute spoils to essential supporters and the mass population. High economic growth increases general satisfaction with political leaders and makes them seem more competent, whereas an economic recession may leave essential elite and ordinary supporters discontented. In an empirical analysis of the 1962–2006 period, he adopts an IV approach using four instruments: commodity export price movements, export partner growth rates, precipitation, and temperature. The analysis shows that economic performance only has weak—and in most models statistically insignificant—effects on irregular leader removal in autocracies.[7]

The Shielding Impact of Natural Resources during Crises

This study examines one possible explanation for these inconsistent results. The majority of existing literature discussed above investigate the post-1960 era, a period that saw the rapid and substantial emergence of natural resource revenues. Before the 1960s, only a few autocracies—such as Mexico, Saudi Arabia, and Venezuela—generated notable income from natural resources. Yet during the 1960s and 1970s, a range of developments increased revenues from natural resources markedly. Most importantly, a series of oil expropriations combined with a boom in oil prices produced what has been termed "the big oil change" (Andersen and Ross 2014). As shown in Figure 1 (see the dotted line), the spike in oil income was the main driver of the general increase in natural resource revenues. Although oil prices fell relatively quickly afterwards, the overall level of oil income has remained high. Natural resource income stemming from precious metals also increased markedly and accrued mostly to a number of newly independent African countries.

[6] It is important to note here that neither Bueno de Mesquita et al. (2005) nor Bueno de Mesquita and Smith (2010) specifically investigate irregular leader removals but include all types—including regular leader removals.

[7] In some models, Burke (2012, 28) does find significant effects of economic shocks on irregular leader removals in autocracies, but he concludes that these effects are rather small.

It is important to account for such overall developments as around half of today's autocrats enjoy substantial natural resource incomes (see Figure 2). This factor is of course not the only important difference across time, but the sharp increase in natural resource revenues is crucial for understanding the changing nature of the relationship between economic crisis and irregular leader removal in autocracies. Existing studies argue that fluctuations in economic performance automatically lead to fluctuations in available revenues for the sitting leader. The new ways autocrats can access revenues today, however, weaken the link between real economic fluctuations and available revenues. By ignoring developments in natural resource income, existing studies search for an average effect of economic crisis that may be highly context-specific. In other words, the relationship between economic crisis and irregular leader removal may be strong and robust for some autocratic leaders but weak and insignificant for others. If scholars do not factor in this effect heterogeneity, empirical analyses are likely to produce weaker and more sensitive estimates than if these moderating factors had been taken into account. Below, I discuss how natural resources provide autocratic leaders with three different "shields" against economic crises and thereby render the relationship between economic crisis and irregular leader removal highly conditional.[8]

The Income Shield

When autocratic leaders are unable to provide sufficient resources to sustain political support, it threatens their ability to survive in office. During economic crises, elite groups may see their bank balances dwindle, lucrative businesses suffer, and corporate interests like military budgets or salaries cut. This is likely to increase discontent and a yearning for an alternative leader who is better able to secure their economic privileges. Periods of economic crisis thus invite irregular elite challenges, often through military coups or assassination attempts (Johnson et al. 1984; Galetovic and Sanhueza 2000).

The extent to which economic crises hurt elite groups depends on the type of revenue the dictator relies on. Generally, political leaders obtain revenues from two sources: taxation on domestic economic activities—such as labor, corporate profits, and goods—and revenues derived independently of such taxation—for example, from natural resources (Levi 1988; Feyzioglu, Swaroop, and Zhu 1998; Smith 2008). In the absence of natural resources, leaders derive most of their income from taxing domestic economic activity. It follows from this that fluctuations in domestic real economic conditions lead to fluctuations in available revenues for autocratic leaders, which in turn leads to fluctuations in the spoils they can distribute to essential backers. During economic crises, essential supporters thus receive fewer spoils and may become dissatisfied.

However, the presence of substantial amounts of natural resources relieves the dictator of such pressures. Resource-rich autocrats derive most of their income from sources other than the domestic economy and therefore generally set the country's tax rates at much lower levels (Beblawi and Luciani 1987; Bornhorst, Gupta, and Thornton 2009; Ross 2012, 2833). This means that periods of economic crisis have little effect on the inflow of revenues and, accordingly, on the spoils essential backers receive. As long as the inflow of natural resource income remains above the minimum level necessary to keep essential backers content, autocratic leaders will retain their support. Examples of such crisis-resilient, resource-rich regimes are legion. An extensive case-study literature shows how resource-rich regimes in, for example, Saudi Arabia (Entelis 1976), Russia (Ross 2012, 90–93), and Libya (Vandewalle 1998) have been able to provide spoils to key elite groups despite poor economic performance and crisis. Meanwhile, history offers several examples of autocrats in resource-poor countries that did not possess such crisis resilience. For instance, during the Great Depression, numerous natural resource-poor regimes in Latin America in particular saw successive irregular leader removals via coups d'état within a few years after the crisis had begun (see Drinot and Knight 2014).

The Repression Shield

Ordinary citizens also play an important role during times of crisis due to higher unemployment rates, lower incomes, and cuts in state-sponsored programs. Research demonstrates that mass-driven irregular challenges like antiregime campaigns (Brancati 2014) are often triggered by poor economic conditions. Such crisis-induced mass mobilizations pose a direct threat to the survival of the dictator. Additionally, mass mobilizations matter indirectly as they can act as a catalyst for coups undertaken by opportunistic elite challengers—lowering resistance and making justifications easier (Galetovic and Sanhueza 2000, 186–92)—or by genuinely concerned generals who may conclude that the removal of the incumbent leader is the only way to restore public order (Huntington 1968, 219–37). One way the leader can react to such mass challenges during times of crisis is with repression. Natural resources play a pivotal role in this regard for two main reasons.

First, the availability of discretionary resources enables natural resource-rich autocratic regimes to maintain large military budgets even during economic crises (Bellin 2004, 148). This is an indirect effect of the income shield described above, and it explains why even some poor autocracies have well-funded militaries. On top of this, key sections of the military are often paid directly from the natural resource funds, and top generals generally have economically privileged positions in resource-related businesses (Ross 2012, chap. 3). This ensures loyalty from military leaders, especially during crises, as their economic well-being hinges on the regime's survival. The ability to pay soldiers and generals, and retain their loyalty, is especially important during economic crises when mass mobilization is extensive and the autocratic leader ultimately relies on the willingness of the military to quell the opposition.

Second, during economic crisis, the availability of natural resource revenues makes repressive strategies less costly. One of the main disadvantages of suppressing the population is that it reduces its productivity and economic activity and thereby hurts the economy even further. Autocratic leaders who rely on taxing domestic economic activity thus find this solution less attractive. Leaders who can collect natural resource revenues, on the other hand, see repression as a viable strategy, as the inflow of natural resource revenues is

[8] An important qualification should be mentioned here. Economic crises can result from bank collapses, bursting housing bubbles, sovereign defaults, spikes in inflation, exhaustion of domestic and export markets, and so on (see Reinhart and Rogoff 2009, 3–14). But sometimes they derive from a sharp drop in natural resources—recently exemplified by the unstable situation in Venezuela. An economic crisis and a simultaneous drop in natural resource revenues should exert the same destabilizing effect as a similar crisis in situations where no natural resources were present to begin with. In such a scenario, resource-reliant autocrats will also find themselves with inadequate funds to distribute among essential backers. Thus, the scope condition for the argument presented below is economic crises that do not derive from sudden drops in natural resource revenues. I return to this issue in the empirical analysis below.

unaffected (Smith 2008, 781; Bueno de Mesquita and Smith 2010, 936–37). The constant revenue stream from natural resources thus offsets the decrease in domestic economic revenues induced by the repressive response. This further enables autocrats to suppress mass protests and other expressions of dissatisfaction that typically occur during crisis periods.

The Credit Shield

Autocratic leaders who face extensive mass mobilization during economic crises may also opt for more accommodating strategies. During the economic and political turmoil of the "Arab Spring," the oil-rich Saudi Arabian government announced a social welfare package for its citizens that included pay raises, loan forgiveness, and new public jobs, at a total cost of more than 90 billion US dollars (USD). Such policies require extensive amounts of readily available capital, and natural resource revenues might not always be sufficient in themselves.

Yet, leaders in natural resource-rich autocracies have an indirect advantage as well. As sovereign debt markets reward access to natural resource revenues, resource-rich autocrats enjoy better opportunities to borrow money with fewer conditions attached (Ross and Voeten 2015; Wellhausen 2015). In addition, due to strategic and economic considerations, resource-rich leaders often constitute an attractive ally for the United States, which generally values secure access to energy supplies (Ross and Voeten 2015, 3). They are therefore more likely to receive privileged treatment in US-dominated international organizations such as the International Monetary Fund (IMF) (Dreher and Jensen 2007), and they often receive higher levels of US aid as well (Berthélemy 2006, 187). In recent years, China's quest for natural resources has also led to an extensive inflow of Chinese cash and aid to resource-rich regimes, especially in Africa (Taylor 2006; Bader 2015, 25). This allows fortunate autocrats to smooth out cyclical fluctuations in economic activity by borrowing money from international credit markets. In crisis situations where revenues from natural resources might otherwise be inadequate in the short run, they therefore have ample opportunities to fund countercyclical social programs that alleviate crisis grievances among the population.

In addition, autocrats often use access to credit markets to secure a fixed inflow of money and thereby a fixed provision of private rents to inner-circle elites (DiGiuseppe and Shea 2015, 560–61; DiGiuseppe and Shea 2016, 345–51). The stable nature of such credit ensures that essential backers are kept content even in crisis situations where short-term illiquidity and budget constraints might otherwise have increased elite dissatisfaction. Such funds may also help the leader in distributing spoils and funding repressive apparatuses and thereby reduce the threat of mass mobilization in the same manner as discussed above. The availability of credit is thus a positive externality, further reinforcing the stabilizing effects that natural resources exert during times of crisis.

In general, any of the three shields may alleviate crisis hardships for both elites and the masses. They are likely to be at work simultaneously because they stem from the same underlying source—the availability of natural resources—but different leaders may choose to use the different shields to various extents. In any case, they serve to diminish grievances and instability during times of crisis, and they therefore enable autocratic leaders to survive such periods with fewer challenges to their authority. The overall claim to be tested is thus:

Hypothesis: *Economic crisis increases the probability of irregular leader removal in autocracies, but this effect is weaker the more that leaders have access to natural resources.*

The focus here is on the shielding effects of natural resources during *crisis* periods, but one could argue that such resources will also play a role during *growth* periods.

Take, for example, the income-shield argument. Given that fluctuations in the real economy affect autocratic leaders with natural resources less, it follows that such insensitivity to real economic fluctuations exists in both crisis and growth periods; during economic crises, revenues to resource-rich autocrats decrease less than revenues to their resource-strapped peers, but increases in revenues to resource-rich autocrats are also less dramatic during growth periods. The implication is that the moderating effect of natural resources should be present in the whole spectrum of economic performance. However, this does not seem to apply to the same extent to the remaining two shields. Natural resources make repressive strategies toward crisis-induced antigovernment mass mobilizations more feasible, but this does not entail that progovernment demonstrations during growth periods will be repressed as well. Likewise, resource-rich autocrats' improved ability to gain credit during crisis periods does not mean that they are similarly worse off on the international credit markets during growth periods.

The implication is that the moderating effect of natural resources should pertain mostly to crisis periods, but, given the symmetrical nature of the income shield, a less visible effect could be present during growth periods as well. I take this into consideration in the empirical analysis below.

Research Design and Data

To investigate the hypothesis outlined above, this study undertakes several empirical analyses. The main analysis, which consists of two parts, extends the examination of economic crisis and irregular leader removal back to 1875. First, a structural break analysis investigates the varying effect of economic crisis on irregular leader removal before and after 1960. This analytical step exploits clear variations in the availability of natural resource revenues across time and examines whether economic crisis has stronger effects on the likelihood of irregular leader removal during the period 1875–1959 than during the period 1960–2011. As factors other than natural resource revenues can vary across either time period, the second empirical step directly tests the argument through multiplicative interaction models. This part of the analysis investigates how the effect of economic crisis on irregular leader removal changes at different levels of natural resource revenues, both throughout the 1875–2009 period and the more recent 1960–2009 period.[9]

In addition to this main analysis, I undertake two other empirical examinations. First, I add a two-stage least squares (2SLS) IV analysis that uses the average global level of economic crisis as a source of exogenous variation in domestic economic crisis for a given country. This addresses endogeneity concerns of economic crisis and improves the ability to draw causal interpretations from the empirical results. Second, in order to provide illustrative evidence of the theoretical mechanisms, I investigate a series of observable implications of the three "shield" arguments.

[9] The slightly shorter time period in this analytical step is due to data availability on natural resource revenues (see below).

Table 1. The relationship between economic crisis and irregular leader removal in autocracies

	Structural break		*Natural resource interaction*			
	1875–2011	*1875–2011*	*1901–2009*	*1960–2009*	*1901–2009*	*1960–2009*
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Temporal split	−0.032	−0.296				
	(0.229)	(0.265)				
Temporal split = 0 × Economic crisis$_{t-1}$	−0.151**					
	(0.072)					
Temporal split = 1 × Economic crisis$_{t-1}$	0.001					
	(0.027)					
Temporal split = 0 × Economic crisis (≤ 1)$_{t-1}$		−0.374**				
		(0.160)				
Temporal split = 1 × Economic crisis (≤ 1)$_{t-1}$		0.012				
		(0.049)				
Economic crisis$_{t-1}$			−0.131**	−0.111**		
			(0.057)	(0.053)		
Natural resources (log)$_{t-1}$			−0.029***	−0.030***	−0.038***	−0.029**
			(0.010)	(0.010)	(0.014)	(0.014)
Economic crisis$_{t-1}$ × Natural resources (log)$_{t-1}$			0.023**	0.021**		
			(0.009)	(0.008)		
Economic crisis (≤ 1)$_{t-1}$					−0.202**	−0.115
					(0.099)	(0.096)
Economic crisis (≤ 1)$_{t-1}$ × Natural resources (log)$_{t-1}$					0.035**	0.022*
					(0.014)	(0.013)
Temporal split = 0 × GDP/cap (log)$_{t-1}$	0.027	0.023				
	(0.023)	(0.023)				
Temporal split = 1 × GDP/cap (log)$_{t-1}$	0.006	0.007				
	(0.009)	(0.009)				
Temporal split = 0 × Population size (log)$_{t-1}$	−0.008	−0.004				
	(0.024)	(0.024)				
Temporal split = 1 × Population size (log)$_{t-1}$	−0.004	−0.000				
	(0.025)	(0.025)				
Temporal split = 0 × Democracy level$_{t-1}$	0.001	0.001				
	(0.002)	(0.002)				
Temporal split = 1 × Democracy level$_{t-1}$	0.003**	0.003**				
	(0.001)	(0.001)				
Temporal split = 0 × Ongoing civil war$_{t-1}$	0.094**	0.094**				
	(0.039)	(0.040)				
Temporal split = 1 × Ongoing civil war$_{t-1}$	0.074***	0.074***				
	(0.017)	(0.017)				
GDP/cap (log)$_{t-1}$			0.017	0.013	0.017	0.013
			(0.012)	(0.010)	(0.012)	(0.011)
Population size (log)$_{t-1}$			−0.004	−0.040*	−0.002	−0.040*
			(0.016)	(0.023)	(0.016)	(0.022)
Democracy level$_{t-1}$			0.003***	0.003**	0.003**	0.003**
			(0.001)	(0.001)	(0.001)	(0.001)
Ongoing civil war$_{t-1}$			0.077***	0.069***	0.077***	0.071***
			(0.017)	(0.017)	(0.017)	(0.017)
Constant	0.093	0.301	0.047	0.441**	0.090	0.436**
	(0.218)	(0.253)	(0.148)	(0.219)	(0.151)	(0.219)
Countries/observations	130/5849	130/5849	126/5251	117/3886	126/5251	117/3886
Country F-E	√	√	√	√	√	√
Year F-E	√	√	√	√	√	√
Cubic polynomials (t,t^2,t^3)	√	√	√	√	√	√

Notes: (1) Standard errors (clustered on country) in parentheses; statistical significance levels: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.
(2) Cubic polynomials (t, t^2, t^3) and their interactions with the temporal split variable are not shown in order to save space.

Below, I present the empirical strategy of the main analysis. Design considerations of the two subsequent analyses are presented later on.

Estimation Methods

The main analysis was undertaken by employing a series of linear probability models (LPM) given by:

$$I_{i,t} = \zeta E_{i,t} + \gamma N_{i,t} + \varphi(E_{i,t}N_{i,t}) + \boldsymbol{\beta}\mathbf{X_{i,t}} + \alpha_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

for $i = 1, \ldots, n$ countries and $t = 1, \ldots, T$ years, where the outcome denotes the linear probability of experiencing an irregular leader removal, $I_{i,t}$.

Equation (1) constitutes the natural resource interaction model—shown in Table 1, Models 3–6–with economic crisis, $E_{i,t,}$ natural resource revenues, $N_{i,t,}$ and their interaction, $E_{i,t}N_{i,t}$, included. In this model the coefficient for the product term, φ, documents the interaction effect. Together with average marginal-effects plots of economic crisis, $E_{i,t,}$ over different values of natural resource revenues, $N_{i,t,}$ this analytical step directly tests whether the effect of economic crisis on irregular leader removal is moderated by natural resource revenues. $\mathbf{X_{i,t}}$ is a $k \times 1$ vector of all control variables, and $\boldsymbol{\beta}$ is a $1 \times k$ vector of coefficients. The error term is given by $\varepsilon_{i,t}$.

Models 1–2 in Table 1 constitute a modified analysis of equation (1). Specifically, these initial models present a structural break analysis with a binary temporal split variable, taking the value 0 for the period 1875–1959 and 1 for the period 1960–2011. This variable is then interacted with economic crisis, $E_{i,t,}$ and a $k \times 1$ vector of all control variables in $\mathbf{X_{i,t}}$ (without including their constitutive terms), respectively. This yields two coefficients for each interacted variable, one for the period 1875–1959 and one for the period 1960–2011. A Wald test subsequently determines whether the two coefficients are significantly different from each other. In the supplementary material I provide analyses with alternative temporal splits from 1950 to 1970 (see Table B1).

All models in both analytical steps include country fixed effects, $\alpha_{i,}$ and year fixed effects, λ_t. The inclusion of country fixed effects, $\alpha_{i,}$ is pivotal for addressing endogeneity issues: countries that are generally exposed to severe economic crises and frequent irregular leader turnovers—such as Argentina—are likely to be different from more stable countries—like Saudi Arabia—on a range of unobservable confounding characteristics such as history, political culture, and geographic location. By including country fixed effects, the models control for such unobservable, time-invariant factors. The included year-dummies, $\lambda_{t,}$ control for common yearly shocks such as the two World Wars, the dissolution of the Soviet Union, and the 9/11 terror attacks in 2001.

All models in the analysis are restricted to autocratic regimes (measured as country-years with a lagged Polity IV score below 6). For example, Argentina is included in the estimations during the periods 1875–1973 and 1977–1983, but not during 1974–1976 and 1984–2011. Lagging the Polity IV score by one year ensures that irregular leader removals that take place in democracies, but due to the very same irregular removal transform the country into an autocracy, are not included in the analysis. That is, the irregular removal of Juan Perón in 1955 is included in the analysis whereas the removal of Isabel Perón in 1976 is not. Observations where a country democratizes—that is, moves from below 6 on the Polity IV score to 6 or above—are censored.

The LPM estimation method ensures that countries in which no irregular leader removal has taken place remain in the analyses. This is a clear advantage over traditional logit regression models that, when including country fixed effects, drop all countries that have no variance on the dependent variable.[10] Given that the case universe is already restricted to autocracies only, the inclusion of up to 130 countries in the LPM estimations, in contrast to the maximum of eighty-five countries in logit models, is preferable. Yet, employing ordinary least squares (OLS) estimation on binary dependent variables might induce heteroscedasticity problems (Wooldridge 2010), and Table C1 in the supplementary materials therefore reports all main analyses with logit estimations as well. The results are very similar.

Measures

Data for the dependent variable, irregular leader removal, $I_{i,t,}$ is taken from the Archigos dataset (Goemans et al. 2009). This data provides information on individual leader spells globally from 1875 to 2015 as well as how leaders exited power. The variable takes the form of a binary indicator where 0 is given for years without an irregular leader removal and 1 given for years with an irregular leader removal.

Measuring the main independent variable, economic crisis, $E_{i,t,}$ is not straightforward. A frequently employed strategy is to simply use the annual growth rate. This may be perfectly well suited to capture positive growth years: an economy that grows 6 percent one given year, 8 percent the next year, and 10 percent the third year will correctly be considered an increasingly expanding economy as the growth rate increases from year to year. However, this approach is not ideal for measuring economic crisis levels. Consider the opposite situation: the economy contracts by 10 percent the first year (a −10 percent growth rate), by 8 percent the next year (a −8 percent growth rate), and by 6 percent the third year (a −6 percent growth rate). Should this be considered an improving economy? According to the annual growth rate logic it should, as the growth rate is improving year after year. However, in most cases this would be an invalid assumption as the country is sinking deeper and deeper into its economic slump.

In this study I therefore develop and employ an alternative economic crisis measure, based on recent work in economics (see, for example, Pritchett 2000; Jerzmanowski 2006; Hausmann, Rodriguez, and Wagner 2008; Hall 2011): the current-trend (CT) ratio. This measure calculates the ratio between the current level of gross domestic product per capita (GDP/cap) and the average GDP/cap level of the previous five years. In other words, it calculates a country's wealth today (current) compared to the average wealth it once had (the trend) to measure the *depth* of the economic crisis. For a country *i* at year *t* the approach is formally given by:

$$CT_{i,t} = \frac{GDP/cap_{i,t}}{\sum_{k=1}^{n} \frac{GDP/cap_{i,t-k}}{n}} \quad (2)$$

where n denotes the number of years back the average should be calculated—in this case, five. This approach is il-

[10] This is so because the fixed-effects logit estimator only utilizes variation within countries. Countries that do not have any variation on the outcome variable—that is, if no irregular leader removal has taken place—do not provide any information to the model and are therefore automatically dropped.

lustrated in Figure 4. For the year 1983 with n set at 5, the CT simply takes the GDP/cap level in the year 1983 (1023 USD) divided by the previous five-year average (1236 USD), which yields the ratio 0.83. The substantial meaning of this coefficient is that, at this point, the economy had lost almost one-fifth of its five-year average output and found itself in a 17 percent slump. This approach thus measures the depth of the economic crisis at a given point in time and captures the degree to which economic activity and government revenues have declined. In the analyses below, I employ both a full-range measure that captures slump periods (displaying values less than 1) and "hill" periods (displaying values more than 1) as well as a censored measure that is only based on variation in slump periods (all values more than 1 are restrained to the value 1). In the supplementary materials (see Table D1–D9), I perform robustness checks with different values between 2–10 on n in the CT measurement, and I conduct analyses with several alternative crisis measures: a three-year moving average of economic growth, a censored three-year moving average of economic growth that only takes negative values and constrains all positive values to 0, a current-peak (CP) ratio approach that calculates the ratio between the current level of GDP/cap and the peak GDP/cap level of the previous five years, and an economic slump dummy that is often used in the economics discipline.[11] The findings are robust across all these different crisis specifications.

Data for natural resource revenues is taken from Haber and Menaldo (2011), which provides values on total natural resource revenues per capita for the period 1900–2007. Included in this category are different types of fuel (for example, oil, gas, and coal) and precious metals (for example, copper, gold, and iron). Taking the ratio of natural resource revenues in per-capita terms is preferable to dividing by GDP, as we would otherwise not know whether an increase in the score is due to an increase in the numerator (natural resource revenues) or a decrease in the denominator (GDP).[12] As natural resource revenues can be stockpiled as "slack resources," I take the three-year moving average. In order to account for decreasing returns and outliers, I take the natural logarithm of the values for this variable.[13]

A set of control variables is included in $X_{i,t.}$ The total level of wealth and the overall size of the country have been shown to be important determinants of the likelihood of economic crisis and degree of instability. I include GDP/cap (log) from Maddison (2010) and updated population size (also logged) from Gleditsch (2002). Moreover, violent conflicts may induce confounding effects by decreasing the level of growth and increasing the likelihood of irregular leader removals. A dummy variable of civil war incidence—taking the value 0 for peace years and 1 for all conflict years—from the Correlates of War project (Sarkees and Frank 2010) is therefore included. I also control for level of democracy, measured with updated Polity IV scores (Marshall, Gurr, and Jaggers 2016), in order to account for different survival dynamics in closed autocracies on the one hand and more open anocracies on the other.

Finally, in order to account for time dependencies, I follow the method of Carter and Signorino (2010) and include cubic polynomials (t, t^2, t^3) of how many years a leader has been in office at a particular point in time. In the supplementary materials I provide descriptive statistics for all variables (see Table A1).

Results

Table 1 reports coefficients from the effect of economic crisis, and the control variables, on the linear probability of irregular leader removal. Models 1–2 report the structural break analyses where the temporal split variable is included and interacted with all other independent variables. In Model 1, the varying effect of economic crisis is given by the two interactions: *Temporal split = 0 x Economic crisis*$_{t-1}$ and *Temporal split = 1 x Economic crisis*$_{t-1}$. The first coefficient represents the average effect of economic crisis on irregular leader removal during the 1875–1959 period. Table 1 shows that the effect is negative and statistically significant. This suggests that economic crisis matters for the risk of irregular removal in autocracies in this early period. When an economic crisis deepens (the CT ratio decreases its value), the risk of irregular leader removal increases, and when the economy improves (the CT ratio increases its value), the likelihood of autocratic removal is gradually reduced. The second interaction coefficient represents the average effect of economic crisis during the 1960–2011 period. Here the coefficient is close to 0 and not statistically significant. This suggests that economic crises have no significant effect in this later period. A Wald test further confirms that these two coefficients are significantly different from each other (p-value of 0.045). Model 2 reruns the same analysis, this time with the censored crisis variable instead of the full-scale measure. The overall pattern remains the same, and the Wald test documents that two interaction coefficients are again significantly different from each other (p-value of 0.023). These results show that economic crises have markedly disparate effects on the likelihood of irregular leader removal before and after 1960.

Interestingly, a joint Wald test of all control variables reveals that none of these has significantly different effects across the two time periods. If it were something other than the specific crisis-shielding impact of natural resources that mattered before and after 1960, we would expect the effects of other variables to vary over time as well. The fact that only economic crisis shows this pattern thus further supports the hypothesis.

Models 3–6 present the multiplicative interaction results with natural resources. In Model 3 the coefficient of economic crisis reports the direct effect of economic crisis on irregular leader removal when natural resource income is 0 (cf. Brambor, Clark, and Golder 2006). The statistically significant and negative coefficient suggests that economic crisis increases the likelihood of leader removal for autocratic leaders who do not have natural resource revenues. This also means that economic crises that coincide with a sudden halt in natural resource income increase the probability of irregular leader removal. The statistically significant and positive product term, in turn, reveals that this destabilizing effect of economic crisis is gradually attenuated as natural resource income increases. In other words, the more natural resource revenue leaders enjoy, the less vulnerable they are to bouts of economic crisis. This pattern is similar in Model 4, which restricts the temporal period to the post-1960 period, and in Models 5–6, which include the censored crisis variable.

Figure 5 illustrates the conditional effects by depicting the average marginal effects of economic crisis (Y-axis) for different values of natural resource revenues (X-axis) for both the main CT specification and the censored one. The

[11] See the supplementary materials for more detailed descriptions.

[12] For similar approaches, see Escribà-Folch, Meseguer, and Wright (2015) and Bermeo (2017).

[13] I add 1 to the values before taking the natural logarithm.

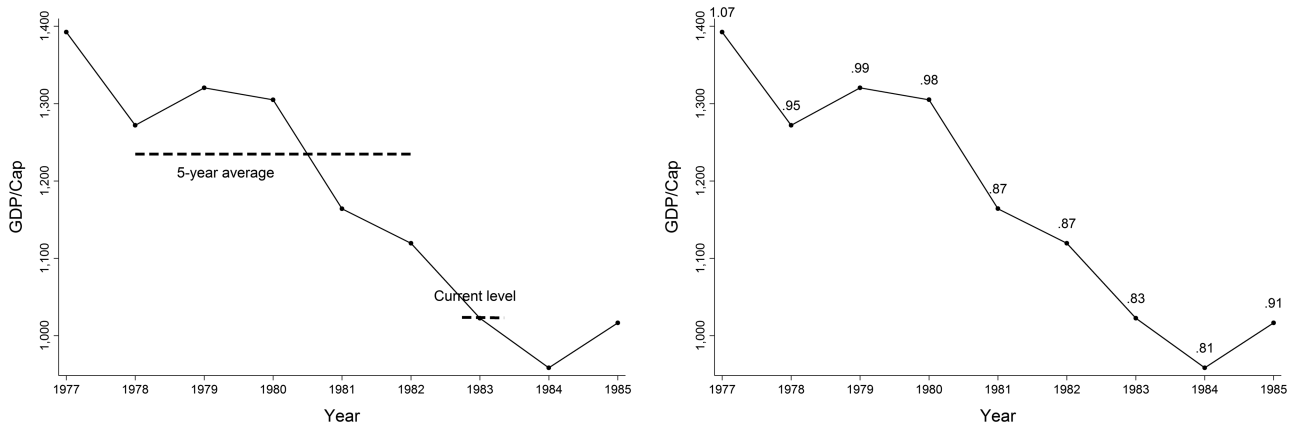

Figure 4. Example of current-trend calculation
Note: Left panel illustrates the CT calculation in 1983. Right panel shows all CT ratios for the period 1977–1985 in Nigeria. Data for GDP/capita values is taken from the Maddison dataset (Maddison 2010).

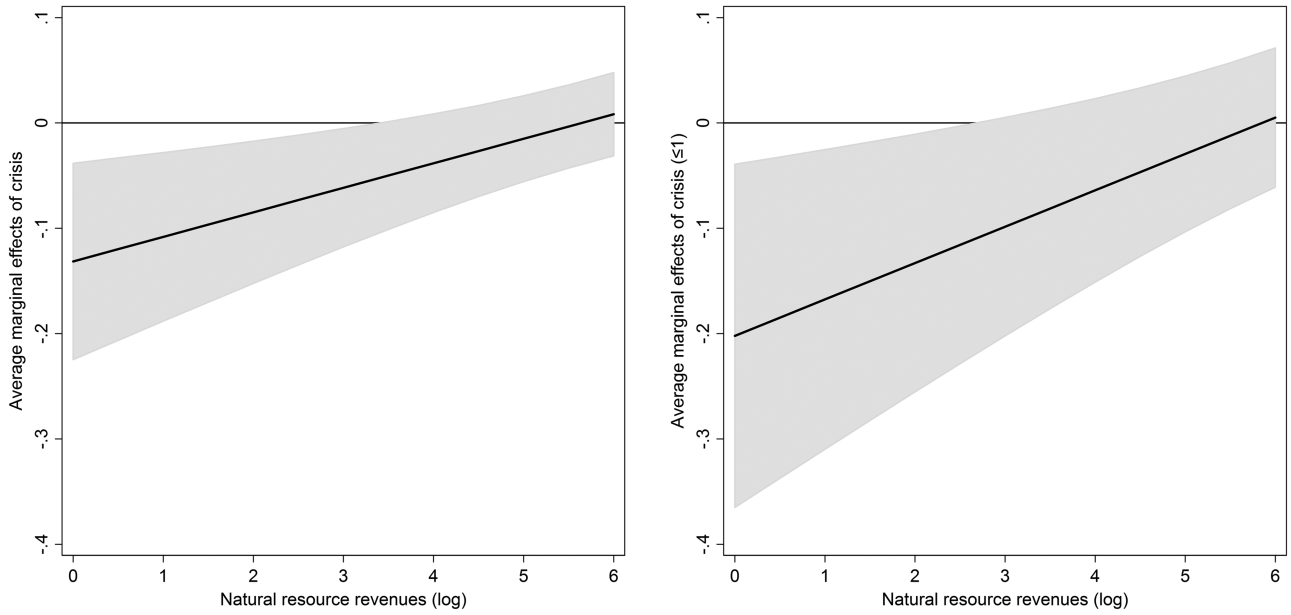

Figure 5. The conditional effects of economic crisis
Note: Left panel shows average marginal effects of the main economic crisis specification. Right panel shows average marginal effects of the censored economic crisis specification.

two graphs show that economic crisis has significant destabilizing effects for leaders with no or low levels of natural resource income. For leaders with no natural resources at their disposal, the intercept at −0.131 (the same value as the economic crisis coefficient in Model 3) shows that for every 0.1 drop on the CT measure—equaling a 10 percent drop in output compared to the previous five-year trend—the probability of irregular leader removal increases by 1.3 percent points. The intercept at −0.202 for the censored variable (the same value as the censored economic crisis coefficient in Model 4) shows the substantial effect to be notably larger, namely around 2 percent, suggesting that the effects are strongest in the crisis spectrum of the CT variable. At first sight, these average marginal effects may seem modest. Yet, considering that irregular leader removals are rare events, with an average yearly risk of around 4.7 percent in autocracies, these effects in fact suggest that the crisis impact is substantial. The risk of irregular leader removal for leaders without natural resources—holding all controls constant—thus increases by approximately 28 percent and 43 percent. Apart from this, the most important feature in Figure 5 is the slope of the graph. As resource revenues increase, the effect of economic crisis gradually weakens and finally becomes indistinguishable from zero. This clearly corroborates the proposed hypothesis and attests to the importance of taking into account alternative revenue streams when studying the destabilizing effects of economic crisis.

In the supplementary material, I report the results of several further robustness checks. They are not detailed here due to space constraints, but the following analyses all produce very similar results: Table B1 conducts robustness checks for the temporal split analyses by delimiting the splits at different points in time, Table C1 estimates the parameters with logit regressions, and Tables D1–D9 report

analyses with different economic crisis specifications. In addition, Tables E1–E4 show results with different natural resource revenue specifications, and Table F1 provides more extensive model specifications by including autocratic regime controls for party dictatorship, military dictatorship, and monarchy (personalist dictatorship as reference category), based on original data collection work by Anckar and Fredriksson (2018). Finally, Tables G1–G2 show analyses with different modes of leader removal. The fact that these analyses all corroborate the main finding increases the overall credibility of the results.

Addressing Endogeneity of Economic Crisis

The main analysis discussed above goes a long way toward alleviating concerns about potential endogeneity biases induced by observable, time-varying factors (through the control variables); by unobserved, time-invariant, country-specific factors (through country fixed effects); or by common yearly shocks (through year dummies). Still, several unobservable, time-varying factors could potentially bias the results. For example, predatory policies undertaken by the leader in order to satisfy core elite groups may lead to economic crisis but at the same time increase the leader's odds of survival. Economic ailments such as the "Dutch disease" syndrome are often the consequence of such poor policies, and the resulting systematic biases may potentially attenuate the coefficients toward zero. Another possibility is reverse causality: political instability induces low investment and capital outflows, in turn leading to poor economic performance. If such reverse causation is robust and strong, it may bias the coefficients upward.

In order to address issues of endogeneity, I supplement the main analysis with a 2SLS instrumental variable approach, using the average level of global economic crisis as a source of exogenous variation in domestic economic crisis for a given country.[14] The two-stage estimator is given by:

$$I_{i,t} = \zeta E'_{i,t} + \boldsymbol{\beta_2 X_{i,t}} + \alpha_i + \varepsilon_{2i,t} \quad (3)$$

$$E'_{i,t} = \delta W_{i,t} + \boldsymbol{\beta_1 X_{i,t}} + \alpha_i + \varepsilon_{1i,t} \quad (4)$$

for $i = 1, \ldots, n$ countries and $t = 1, \ldots, T$ years, where equation (4) constitutes the first stage, with $W_{i,t}$ as the instrument, and equation (3) the second stage. OLS estimation is employed in both stages due to the inclusion of country fixed effects, α_i .

The idea of employing average global economic crisis as an instrument is to isolate the part of the variation in domestic economic crisis that is determined outside the realm of domestic politics in a given country. The identification strategy is based on the observation that, since the late nineteenth century, countries have traded with each other extensively, and capital and investment flows have been highly mobile across borders (O'Brien and Williams 2016, chap. 6). Global economic crisis levels should therefore be a strong and robust predictor of domestic economic crisis throughout the period 1875–2011. In order to test this assumption, all models report F-statistics.

The IV approach yields consistent estimates under the exclusion restriction that—conditional on the controls included in the analysis—world economic crisis affects irregular leader removals in a country only through its effect on the domestic economic crisis in that same country (Wooldridge 2013, chap. 15). This assumption seems valid as it is unclear how general global economic trends could affect domestic leader stability if not through domestic economic crisis. Empirically, I test this assumption by enlisting year-to-year fluctuations in rainfall and temperature (data taken from Kim 2016) as additional instruments in a series of overidentification tests. Hansen's J statistic documents p-values on 0.63 (with rainfall deviation as additional instrument), 0.60 (with temperature deviation as additional instrument), and 0.89 (with the inclusion of both rainfall and temperature as additional instruments).[15] The failure to reject the null hypothesis—which states that the instruments are valid—provides additional empirical support for the validity of the global economic crisis instrument.

However, one potential pathway from global economic crisis to domestic irregular leader removal could be through regional instability. That is, a global economic downturn may increase the overall instability level in specific regions—for example, by increasing the frequency of coups, protests, and low-scale conflicts—which in turn could create domestic instability. To account for these concerns, I have rerun the models with a variable that measures the percentage of countries in a given country's region that have experienced an irregular leader removal in the previous five years. This variable blocks a potential pathway from global economic crisis to irregular leader removal via regional instability. However, including a posttreatment value implies a risk of postestimation bias (cf. Acharya, Blackwell, and Sen 2016). I therefore also report the models without this variable in the supplementary material (see Table G1). The results are similar. A final concern is that political instability in a single country could affect global economic performance. This only seems plausible with major countries, such as Saudi Arabia, Russia, or China, but excluding these countries yields almost identical results.

The results of the IV analyses are presented in Table 2. Panel B shows first-stage results. World economic crisis is shown to be strongly and significantly correlated with domestic economic crisis in all models. Moreover, all F-statistics are well above conventional thresholds (cf. Stock, Wright, and Yogo 2002). This attests to the strength of the instrument.

Panel A reports the corresponding second-stage results of economic crisis on irregular leader removal. The models are presented as a set of split-sample analyses. Models 7 and 8 provide estimates for the 1875–1959 period and show that the local average treatment effect of economic crisis yields negative and significant effects on the probability of irregular leader removal. Models 9 and 10 perform the same analyses for 1960–2010 and produce weak and insignificant estimates. These results further support the conclusions of the temporal analyses in Table 1. Models 11 and 12 provide the estimates for a "no resource revenue" sample, which includes all country-year observations from the period 1875–1959 plus all countries in the 1960–2008 period that do not possess natural resource revenues.[16] As expected, economic crisis matters a great deal for leaders in these countries, again suggesting that nonresource leaders are highly vulnerable to economic crises—even when these are caused by external events. Models 13 and 14 present the estimates for a "resource revenue" model that includes all country-years with natural resource revenues above median values (3.3. on

[14] The instrument, $W_{i,t}$ is measured as the global unweighted average on the CT measure (either the full-scale or the censored one, depending on which crisis variable is used in $E'_{i,t}$)for every year.

[15] The tests are run on the model specification of Table 2 Model 11.

[16] Investigating only nonresource countries in the 1960–2009 period was infeasible due to the low number of observations, which yielded empty matrices and sensitive point estimates.

Table 2. IV regressions of economic crisis on irregular leader removals

	1875–1959		*1960–2010*		*No resource rev.*		*Resource rev.*	
	(7)	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*	*(14)*
Panel A: two-stage least squares								
Economic crisis	−0.368***		0.003		−0.329**		−0.023	
	(0.140)		(0.066)		(0.150)		(0.058)	
Economic crisis (≤ 1)		−0.848***		0.006		−0.769**		−0.055
		(0.326)		(0.153)		(0.353)		(0.140)
GDP/cap (log)	0.060*	0.033	−0.007	−0.007	0.065**	0.046**	0.012	0.012
	(0.031)	(0.028)	(0.012)	(0.011)	(0.027)	(0.022)	(0.009)	(0.008)
Population size (log)	−0.021	−0.003	−0.024*	−0.024*	−0.035	−0.025	−0.002	−0.001
	(0.040)	(0.044)	(0.014)	(0.014)	(0.026)	(0.027)	(0.015)	(0.014)
Democracy level	0.003	0.004	0.003**	0.003**	0.003	0.003	0.000	0.000
	(0.003)	(0.003)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Ongoing civil war	0.124***	0.129***	0.087***	0.087***	0.116***	0.115***	0.103***	0.103***
	(0.041)	(0.044)	(0.017)	(0.018)	(0.032)	(0.034)	(0.026)	(0.026)
Regional irregular leader removals	0.742***	0.694***	0.747***	0.747***	0.783***	0.752***	0.617***	0.611***
	(0.261)	(0.262)	(0.185)	(0.187)	(0.205)	(0.209)	(0.192)	(0.191)
Panel B: First-stage estimates for economic crisis								
Global economic crisis	0.821***	0.356***	1.088***	0.469***	0.707***	0.302***	1.242***	0.519***
	(0.102)	(0.053)	(0.115)	(0.072)	(0.094)	(0.052)	(0.130)	(0.076)
Kleibergen-Paap F statistic	66.59	45.73	86.00	40.77	55.55	33.10	90.32	47.22
Countries/observations	68/1840	68/1840	119/3966	119/3966	88/2545	88/2545	108/3134	108/3134
Country F-E	√	√	√	√	√	√	√	√
Cubic polynomials (t,t^2,t^3)	√	√	√	√	√	√	√	√

Notes: (1) Standard errors (clustered on country) in parentheses; statistical significance levels: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$. (2) Panels A and B report coefficients from the second and first stage of two-stage estimations. (3) First stage controls and cubic polynomials (t, t^2, t^3) are not reported in order to save space.

the logged natural resource revenue variable). This model reveals that economic crisis has no substantial or significant effect on irregular leader removal for leaders with access to substantial natural resource revenues.

In sum, the IV analyses suggest that the results presented above are not simply an artifact of systematic biases in economic crisis, and they increase our confidence in the causal interpretation presented in this article.

What is Driving the Results?

I have argued that the availability of natural resources shields autocratic leaders from the destabilizing effects of economic crises because it provides them with a constant inflow of money, increases their ability to repress, and improves their access to international credit. I now examine these mechanisms via quantitative analysis of specific observable implications of each shield argument. All models are estimated using OLS regressions—as in equation (1)—but with different outcomes. I perform unit root tests and analyses with error-correction models in the supplementary materials (see Table I1).[17]

Models 15–16 in Table 3 examine observable implications of the income-shield argument. As argued above, natural resource-rich autocratic leaders are less sensitive to economic crises as they collect a smaller proportion of their revenues from real economic activity and a higher proportion from natural resources, which are relatively unaffected by such fluctuations. By enlisting data on government revenues from the International Centre for Tax and Development (ICTD 2016), I am able to test three observable implications of this argument. First, I examine whether natural resource revenues do indeed accrue to the government. The significant and positive coefficient of natural resources in Model 15 suggests that this is the case.[18] This is exemplified in Figure 6, which shows that natural resources constitute a major proportion of total government revenues in resource-rich countries like Bahrain, Angola, and Kazakhstan but only a minor proportion in countries such as Tunisia, Zambia, and Haiti.[19] Second, the insignificance of the economic crisis coefficient in the same model supports the argument that this type of revenue is unaffected by real economic fluctuations.

The combination of these two findings points to a third, more general observable implication: we should expect natural resources to moderate the relationship between economic crisis and total government revenues. In other words, the total amount of revenues available to leaders in countries such as Tunisia, Zambia, and Haiti should be more affected by real economic fluctuations than for leaders in countries such as Bahrain, Angola, and Kazakhstan. Model 16 examines this by regressing total government revenues for a given autocratic regime in a given year on the

[17] More specifically, I perform a series of Fisher-type tests, which allows for unbalanced panels (Choi 2001). The null hypothesis here is that all the panels contain a unit root. The tests did not reject the null hypothesis of unit root for the natural resource revenue variable in Model 15 and the credit rating variable in Model 20. These are therefore analyzed in Table I1 with error-correction models. The results are very similar.

[18] I add 1 and take the natural log of all revenue outcome measures (Models 15, 16, and 19) in this analysis.

[19] In the supplementary materials (see Table I2), I show that this is not only the case in countries that have nationalized their oil and other natural resource production firms (for example, Bahrain), but also persists for countries that receive natural resource revenues primarily by taxing private extraction firms (for example, Angola). As such tax revenue data has better coverage than total revenue data, this alternative analysis addresses the low number of observations in Model 15 as well.

Table 3. Illustrating theoretical mechanisms

	Income shield		*Repression shield*		*Credit shield*	
	Resource revenues 1980–2009 (15)	*Total revenues 1980–2009 (16)*	*Physical 1981–2009 (17)*	*Instability 1960–2009 (18)*	*US aid 1960–2009 (19)*	*Credit rating 1990–2004 (20)*
Economic crisis	0.363	1.045**	0.761*	−29.251***	0.583	4.784
	(0.230)	(0.420)	(0.452)	(5.304)	(4.819)	(2.987)
Natural resources (log)	0.413***	0.235***	−0.190**	−3.820***	1.068*	−0.180
	(0.125)	(0.080)	(0.073)	(1.025)	(0.621)	(0.405)
Economic crisis × Natural resources (log)		−0.159***		3.018***		
		(0.060)		(0.908)		
GDP/cap (log)	0.642*	1.075***	0.310	−2.448	−5.289	7.915***
	(0.349)	(0.131)	(0.284)	(1.507)	(3.353)	(2.206)
Population size (log)	0.688	0.917***	1.932**	−8.963***	9.938	4.553
	(0.483)	(0.331)	(0.933)	(3.477)	(11.161)	(5.780)
Democracy level	−0.019	−0.002	0.055***	0.160	0.307	−0.015
	(0.015)	(0.007)	(0.020)	(0.103)	(0.413)	(0.094)
Ongoing civil war	0.011	−0.120	−1.760***	18.331***	0.053	−2.757**
	(0.140)	(0.097)	(0.230)	(1.238)	(1.897)	(1.314)
Constant	−7.047	−9.076***	−14.480	137.257***	−36.139	−68.244
	(5.208)	(3.256)	(8.886)	(34.430)	(99.871)	(57.122)
Observations	737	1357	1976	3448	3505	1638
Country F-E	√	√	√	√	√	√
Year F-E	√	√	√	√	√	√

Note: Standard errors (clustered on country) in parentheses; statistical significance levels: $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

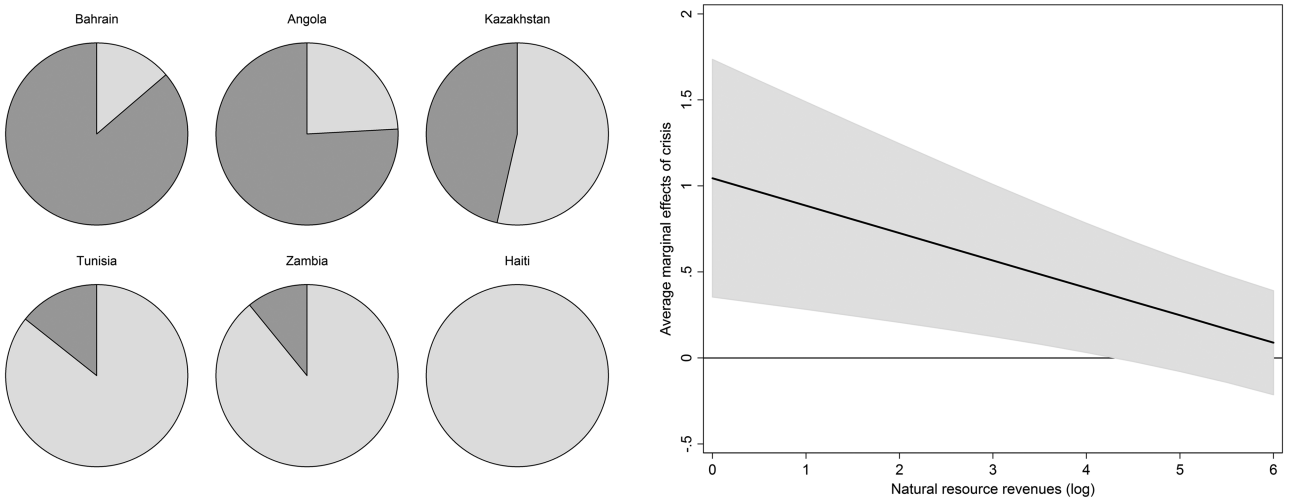

Figure 6. Examining the income shield
Note: Left panel shows revenue composition of six selected countries in 2010. Natural resource revenues are marked in dark gray and nonnatural resource revenues are marked in light gray. Revenues from foreign grants are not included. Right panel shows average marginal effects of economic crisis on (logged) total government revenue for different values of natural resource revenues.

covariates. The highly significant and positive coefficient of economic crisis suggests that, for autocrats without any natural resources, economic crises lead to fewer revenues. The negative and significant product term in turn reveals that this connection between economic crisis and total revenues is mitigated by the natural resources a given autocrat has available. This is further illustrated in the right-hand panel of Figure 6. Overall, these analyses corroborate the income-shield argument.

Models 17–18 examine observable implications of the repression shield mechanism. The argument is that natural resource revenues enable autocrats to suppress mass protests and other expressions of dissatisfaction that typically occur during crisis periods. Two strategies can be employed to examine this argument. One approach would be to look at the overall level of repression across regimes with different levels of natural resources. This is done in Model 17, which regresses the physical integrity violations with data from the CIRI Human Rights Data Project (Cingranelli, Richards, and Clay 2014) on the covariates.[20] The negative and significant coefficient of natural resources shows that the more

[20] The dependent variable is measured as an additive index constructed from the torture, extrajudicial killing, political imprisonment, and disappearance indicators. It ranges from 0 (no government respect for these four rights) to 8 (full government respect for these four rights).

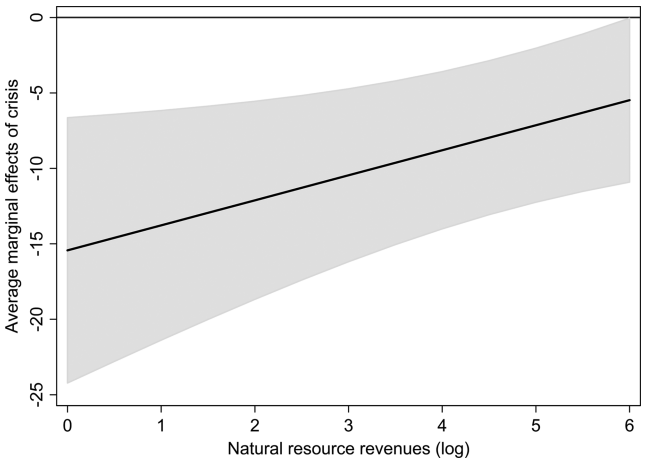

Figure 7. Examining the repression shield
Note: The graph shows average marginal effects of economic crisis on number of instability events for different values of natural resource revenues.

natural resources autocrats possess, the more they suppress the physical integrity rights of their population in general.

Model 18 uses another approach to examine the effects of such repression. If natural resource-rich leaders are indeed able to repress mass mobilization, we should expect to especially see this during crisis periods with frequent grievance-induced mass protests. The model presents an interaction analysis on the weighted instability measure from the Cross-National Time-Series Data Archive (CNTS) (Banks and Wilson 2016).[21] The significantly negative crisis coefficient shows that deeper economic crises increase the number of instability events for autocratic leaders without natural resources. The significant and positive interaction term in turn shows that this relationship is gradually mitigated as natural resources increase. This suggests that natural resource-rich autocrats are better able to curb mass mobilization events during economic crises.[22] Figure 7 illustrates this conditional effect by illustrating how the effect of economic crisis on protest events gradually weakens as natural resource revenues increase. Interestingly, it reveals that even autocrats with ample natural resource revenues see significant increases in the number of protests during crises—but to a much smaller extent. These findings generally corroborate the repression-shield argument.

Finally, Models 19–20 examine observable implications of the credit-shield argument. Resource-rich regimes should enjoy privileged treatment by resource-reliant superpowers, such as the United States, and moreover enjoy better access to international credit. Model 19 examines an indirect implication of the first part of this argument by regressing the total amount of military aid from the United States—with data from the United States Agency for International Development (USAID) Greenbook database (USAID 2016)—on the covariates. The positive and significant coefficient of natural resources in Model 19 suggests that resource-rich regimes are strategically more important to the United States. Resource-rich autocrats, who already enjoy constant income streams and a high capacity to repress, also receive favorable treatment from the world's major superpower. Model 20 examines whether the availability of natural resources leads to more favorable access to international credit markets. It regresses the credit rating published by *Institutional Investor* magazine (country-year data are taken from DiGiuseppe 2015)[23] on the covariates. The credit-shield argument encounters some difficulties here as the natural resource coefficient is not significant at conventional levels. The examination of the credit-shield argument therefore yields only partial support for this mechanism and suggests that the moderating impact of natural resources primarily works through a constant inflow of income and an increased ability to repress.

Conclusions

With the advent of the Great Recession in 2008, it seems more relevant than ever to examine how economic crises affect different political developments. This is especially important in autocracies, where leaders seemingly have become quite resilient to periods of economic crisis lately. In this study, I argue that this resilience partly stems from the constant inflow of revenues that natural resources provide. The availability of natural resources shields autocratic leaders from the destabilizing effects of economic crises, as they have access to a constant inflow of money, are better able to repress, and enjoy better access to international credit. In contrast, autocrats who do not have access to such income streams are more vulnerable during economic crises and experience markedly higher risks of being irregularly removed.

These insights can be used to assess the breakdown-risk in modern-day, crisis-ridden regimes. In Venezuela, for example, the country is experiencing what might be the most severe economic crisis in its modern history, with a deep economic slump combined with uncontrollably high inflation. Naturally, this has led to extensive public dissatisfaction with the regime, and antiregime protests occur almost daily. At the time of writing, however, the regime seems able to survive. It owes part of this ability to its natural resources, which have provided an alternative revenue stream from which it has distributed rents to essential regime backers in the military. Tellingly, the regime was much more fragile when oil prices were low, but its crisis resilience seems to have improved as revenues have increased.

More generally, the conclusions of this article question widely held beliefs in a strong direct effect of economic crisis on leader survival and support a much more conditional relationship than hitherto assumed. While the survival dynamics and the need for economic spoils may have remained constant over time, the way political leaders collect these rents has changed in important ways. Many leaders today have revenue streams at their disposal that are very different from those available sixty or seventy years ago. Failing to account for such income sources may lead to inconsistent and biased results. Future studies on related events—such as coups, civil wars, or regime breakdowns—would do well to consider this when investigating determinants of political instability. This would bring a welcome addition to our current knowledge of the conditional impacts of economic crisis in autocracies and potentially provide a sound basis from which analysts, pundits, and policy-makers can make

[21] This weighted index consists of a weighted average of assassinations (25), strikes (20), guerrilla warfare (100), government crises (20), purges (20), riots (25), revolutions (150), and antigovernment demonstrations (10), where the weights are given in parentheses.

[22] Table I2 in the supplementary materials hones in on crisis-induced protest events by focusing only on the total number of antigovernment demonstrations added to the number of strikes as the dependent variable. The results remain the same. I also present results with Poisson count models instead of the OLS method. The conclusions are, again, similar.

[23] It ranges from 0 to 100, with 100 representing the highest level of creditworthiness.

assessments about how best to manage crisis-ridden autocratic regimes in today's world.

Supplementary Information

Supplementary information is available at http://pure.au.dk/portal/da/persons/suthan-krishnarajan(285ac08c-2c2d-4322-a6c5-1bd5a8ee5769).html and the *International Studies Quarterly* data archive.

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