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Oil price volatility and political unrest: Prudence and protest in producer and consumer societies, 1980–2013

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ABSTRACT

Revenue from oil makes countries susceptible to the "resource curse" since rulers have ready access to finance for buying off opposition rather than reform. We explore this issue by examining whether oil price volatility affects anti-government unrest. We argue that in oil-producing countries, *low* price years generate anti-government protest conditional on a state's access to foreign exchange reserves. The prudent management of oil revenue during boom years can allow some oil-rich states to manage political dissent while others fail. Contrarily, in oil-importing countries, *high* oil price years increase anti-government dissent, but again, conditional on access to foreign exchange reserves, which allow governments to ease the pain of austerity. Using panel data covering 165 countries between 1980 and 2013 (34 years), we find clear evidence in support of these propositions. Oil-producer countries that are able to resist political Dutch disease and save for "rainy days" are more capable of weathering low-price years. Similarly, oil import-dependent states face higher dissent during *high* oil price years, but conditional on access to foreign reserves. These results are in line with others that show that some oil producers avoid civil war through heavy public spending. Oil-rich countries should manage oil revenues in ways that allow them to survive the low price years, perhaps by avoiding both economic and political Dutch disease, which will only lead to inevitable regime challenge. The results are robust to alternative data, measurement, sample size, and estimation methods.

1. Introduction

The question of natural resource extraction and economic and political failure is debated across many disciplines in the social sciences (Frankel, 2012; Ross, 2012; van der Ploeg, 2011). Arguments about the exact role of natural resources in causing political violence is particularly contentious (Brunnschweiler and Bulte, 2009; Collier et al., 2009; Fearon, 2005; Ross, 2006). While resource wealth might encourage rapacious behavior by rulers, which could provoke political dissent, it may also allow rulers the revenue to buy off potential challengers (Basedau and Lay, 2009; Smith, 2004). Indeed, oil wealth may allow bad leaders to remain comfortably in office by sowing oil wealth, staving off economic reforms and repressing dissent (Acemoglu and Robinson, 2012). Consider that many oil-rich states managed to weather the Arab Spring in an era of high oil prices, and the current political instability in many oil-rich states—as in Iran recently—is blamed on the collapse of the oil price (Ross, 2011). Even in many non-oil-producing countries, political imperatives stemming from the importance of fuel for critical aspects of people's lives, such as food, cooking, and transportation, explain a variety of policy choices (Cheon et al., 2013). While questions relating to climate change and food price shocks are heavily investigated, the question of fuel price shocks and political violence is noticeably neglected (Buhaug 2014). We fill this gap in the literature by arguing that the nature of a state's response during oil price hikes in both producer and non-producer countries is dependent on the availability of foreign reserves, which is a proxy for political prudence and sound management of "Dutch disease".[1] Unlike previous studies that have focused on violent conflict, we examine anti-government protest, accounting more stringently for the actual financial constraints on a government for maneuvering through crises.

Using the latest available data on anti-government protest (violent and non-violent) contained in the Cross National Time Series (CNTS)

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[1] The term Dutch disease was coined to explain the variety of problems that arose in the Dutch economy after the discovery of off-shore gas. The drop in competitiveness of the Dutch economy was attributed to the rise of the real exchange rate relative to trading partners.

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database for a sample of 165 countries between the years 1980 and 2013, we find robust evidence to suggest that oil-producing countries suffer anti-government protests conditional on *low* oil prices, whereas oil-import dependent states experience more anti-government protests during periods of *high* oil prices. In both cases, however, adequate foreign exchange reserves are shown to condition the likelihood of protests, suggesting a role for prudent governance that resists profligate spending in good years and saves for the lean ones. These effects, however, were less robust in the case of oil-importing countries, which are less likely in general to have had oil-based patronage spending. The results are robust to several alternative models, data, and estimating techniques, including country and time fixed effects, and analyses using instrumental variables for addressing endogeneity. We examine more closely the theoretical underpinings for our propositions below.

2. The argument

In the broadest sense, the study of oil price volatility and civil unrest is a study of income shocks on a population. One of the most noteworthy findings on the causes of civil war is that poor countries, the most susceptible countries to price shocks, show the highest risks (Collier et al., 2009; Fearon and Laitin, 2003). Many report that low economic growth *causes* civil war (Miguel et al., 2004). Others find that countries dependent on primary commodity exports experience conflict because of the volatility of commodity prices through either opportunity cost effects, or rapacity effects (Dube and Vargas, 2013). The evidence from Africa suggests that negative price shocks of commodities generate civil wars in commodity-dependent countries (Brückner and Ciccone, 2010). Some others suggest that violence is more likely due to state capacity rather than societal grievances because shocks can constrain the choices of states highly dependent on natural resources (Fearon, 2005). While many studies aggregate all commodity prices, a few studies disaggregate them. Bazzi and Blattman (2014) report no effect of price shocks on violent conflict, but they find that high prices shorten ongoing civil wars because states can outspend rebels (Bazzi and Blattman, 2014). Others report that the effect of price shocks are indeterminate because observed advantages to one party in conflict from a commodity price shock should lead to concessions by the other, but price volatility, where there is uncertainty about future prices, should predict more violence because of the commitment problem (Morgan and Reinhardt, 2015).

We depart from these civil war-focused studies in several significant ways. First, we focus on anti-government protests that may or may not be violent. As some report, non-violent protests can sometimes be more effective at achieving reforms than violent rebellions (Chenoweth and Stephan, 2011). We focus on the interaction between states and citizens, or at least social groups more broadly affected by price shocks than more narrowly-based rebel organization. Anti-government protests and revolts are often precursors to larger-scale armed violence and more broadly representative of a social grievance that spills over onto the streets (Chenoweth and Stephan, 2011). Moreover, the absence of violence despite a shock might very well result from a state's interventions that cauterize violence, or states may repress dissent, or even concede to reform. Nevertheless, any of these strategies are likely to be a function of how constrained a state's financial position is for maneuvering through crises. A state that has access to adequate foreign exchange reserves might be able more effectively to deal with an economic shock by easing austerity, or even buying off well-placed groups. Thus, our study examines broadly-shared grievances that are better captured by mass protests, riots, and strikes rather than simply violent rebellions, which might occur for diverse ends, organized by narrower interests.

Anti-government protests can occur for structural reasons, such as level of development and a lack of political rights, but there seems also to be a high degree of agency in terms of when and where they occur (Chenoweth and Ulfelder, 2017). We argue that oil-rich governments face anti-government protests when populations face austerity, a factor determined by the oil price. Leaders of protests are likely to use this window of opportunity to press for reform given broad dissatisfaction with the status quo (Costello et al., 2015). Conditions of austerity weaken the status quo, inviting protest from reform-minded groups when oil prices fall because they can capitalize on general dissatisfaction. Indeed, many economists recognize that prudent states are those that manage volatility of commodity prices, partly by saving for rainy days (Frankel, 2012). Importantly, however, we also examine the effects of price shocks on oil import-dependent states, which could for example lower taxes on fuel, or subsidize consumers in other ways, conditional on access to adequate foreign exchange (forex, hereafter) reserves. Studies that pool producers and importers in their analyses are susceptible to get mixed results based on the differential effects of price shocks on these two groups. Moreover, we focus on oil price shocks because fuel tends to have the most powerful repercussions among both producer and consumer economies due to its pervasive importance. The degree of austerity that price shocks force on a society, we argue, will be dependent on a government's access to revenue for attenuating austerity.

Empirical evidence on the natural resource curse in terms of political stability and democratization is mixed, both in terms of findings and theoretical argumentation (Basedau and Lay, 2009; Ross, 2012). The ambiguities are played out in the Arab Spring: some autocrats that faced protests and demonstrations succumbed while others solidified their positions, often without much violence. We submit that oil-wealthy rulers, particularly in the Gulf region, might have been more susceptible to being ousted if not for the high oil prices they enjoyed, allowing countries, such as Saudi Arabia, greater leverage at home and abroad. Saudi Arabia even intervened militarily in countries, such as Bahrain and Yemen, to help prop up friendly regimes. We argue that the oil price and access to forex reserves are two important conditioning factors for predicting *when* oil wealth leads to anti-government protest. We also argue that high price periods might be destabilizing in many oil import dependent states, which are subject to the constraints of low forex reserves. First, however, we explain how oil-producers become vulnerable to price shifts.

2.1. Why oil, and how does it matter?

Unlike other commodities, oil is often thought to be special (Ross, 2012). First, oil is a "point source" resource, which is a natural resource extracted from a concentrated geographic area that is easier for political elites to control (Le Billion, 2001). Because of its concentrated location and the technical skills required to run the extraction process, oil is thought to be more easily monopolized than diffuse resources, which are resources that are widely spread out and might be subject to a chain of activity requiring multiple actors in the extraction and marketing process (Le Billon, 2001). As such, the state is often heavily involved in the extraction process of oil, for example through state owned enterprises, where the profits, or rents accrue directly to the state. Point resources, such as oil, are more easily protected by a state and less exposed to being looted (Bulte et al., 2005). The political regime of oil-wealthy states, thus, are often viewed by the populace as guardians of the "national wealth" and the purveyors of "public welfare." In other words, a point-source resource ties the state to welfare provision and state-led economic development, which some have termed "precocious Keynesianism," which makes these states vulnerable to real and perceived economic failure and a target of blame (Waldner, 1999). People's expectations about benefiting from oil, realistically or not, are heightened and more focused on states.

Secondly, oil wealth tends to dominate an economy because of its relatively high value and the sheer quantities extracted. Indeed, oil and natural gas tend to dominate total production compared with rents from other resources. Thirdly, oil is characterized by its price volatility because demand and supply do not remain constant. In a study of price volatility from 1945 to 2005, Regnier (2007) found that both crude oil and refined petroleum were more volatile compared with 95 percent of domestic products. In 2007, oil prices were more volatile than 65

percent of other primary products (Regnier, 2007). The volatility of oil markets can be explained by the (in)elasticities of supply and demand (Hamilton, 2008; Smith, 2009). Demand is inelastic in the short run because reducing the use of oil in the production of goods require both time and access to a substitute, or a technical solution that makes oil more efficient. In other words, the cost of adjustment to oil price change is high and time-consuming.

The supply of oil is also inelastic in the short run. This is because increasing the productive capacity of oil fields requires planning and technological innovation. Furthermore, the Organization of the Petroleum Exporting Countries (OPEC) has implemented policies to reduce the quantity of oil extraction as well as limiting resources devoted to finding and developing new sources (Smith, 2009). Exporting and importing countries alike generally hold inventories, but these are not sufficient to reduce the effect of supply and demand inelasticity on the oil market. Because both supply and demand are inelastic in the short run, the price must be driven much further before an equilibrium is reached. For these reasons, inelasticity of supply and demand lead to volatility in the price of oil (Smith, 2009). These periods of price booms and busts are referred to as the oil price cycle, and the fluctuations in price naturally affect oil importing states as well as oil exporting states (Hunt et al., 2001).

2.2. Oil exporters

The oil-exporting state's woes due to oil price fluctuations stem from the difficulties of managing adverse economic effects from "Dutch disease" (Sachs and Warner, 1995). In essence, Dutch disease refers to how high price periods affect the non-oil tradable sectors because of a rising real-exchange rate and the shift of resources away from the tradable to the resource sector, effectively making the country more dependent on extraction, and thus, more vulnerable to downturns in oil prices (Auty and Gelb, 2000; Sachs and Warner, 1995). Because oil is a point resource, extraction is mostly managed by state-owned enterprises, causing economic influence and political power to be highly concentrated (Karl, 1997). The supply of resource rents equals a non-tax revenue to the state (Ross, 2012). As such, the state's political regime is tasked with managing and allocating these extra resources. How these resources are managed will be of utmost importance for the resource abundant country's development. While poor revenue management may lead to dependence upon oil and increased vulnerability to oil price fluctuations, responsible resource management can reduce symptoms of Dutch disease, and thus, reduce the dependence on oil (Mehlum et al., 2006; Robinson et al., 2006; Ross, 2015). In this respect, preexisting institutions such as democracy, respect for property rights, transparency and an independent bureaucracy will influence the state's opportunity and possibly willingness to make appropriate policy choices (Eifert et al., 2003). While Dutch disease is a term used to explain the economic effects, the term "political Dutch disease" has been used to explain the political effects, particularly a regime's incentives for being less prudent economically for achieving political ends—such as reghime survival (Bueno de Mesquita and Smith, 2011).

Dutch disease theory suggests that the boom-period may be harmful to the oil economy, while the bust-period is relatively harmless (Sachs and Warner, 1995; Krugman, 1987). In terms of political stability, however, the bust-period could be critical, simply because lower access to revenues destabilizes a regime's hold on power (Bueno de Mesquita and Smith, 2011; Smith, 2004). The bust-periods will hit especially hard for two reasons. First, the failure to diversify away from the oil sector will enhance the effect of the bust due to the lack of a continuous and alternative source of revenue to alleviate the pressure on oil rents. In the long run, this will also inhibit economic growth and social development due to lower investment and public goods provision (Ross, 2012). Second, because government spending is found to be so closely related to resource rents in oil dependent states (Eifert et al., 2003), the economy and the population will be extremely vulnerable to both negative and positive economic shocks. The price volatility of oil itself will have a negative influence on investment, economic growth, income distribution and poverty alleviation because of expansionary spending during booms for reasons of political Dutch disease and the inevitable austerity during busts (Gary and Karl, 2003).

Resource rents make dependent states prone to economic mismanagement and excessive public spending in boom-periods (Auty, 2000; Lane and Tornell, 1996). During boom-periods, the government typically increases expenditures through public sector employment, wage increases, generous unemployment benefits, lower taxes, food subsidies and spending on education and healthcare programs (Basedau and Lay, 2009; Eifert et al., 2003). Expenditure levels are allowed to rise because governments tend to regard boom-periods as permanent and bust-periods as transitory (Devlin and Lewin, 2005). Furthermore, when foreign borrowing occurs, it often happens during the boom-period because resources are used as collateral (Ross, 2012). This exuberance is also manifested as heightened expectations of better welfare among the population, which invariably shatters during bust periods (Ross, 1999). Future expenditure commitments are also established during boom-periods, limiting the government's ability to adjust fiscal policy when oil prices and revenue fall (Devlin and Lewin, 2005). If one focuses only on the economic effects of Dutch disease and neglect the political aspects attached to regime survival, one is likely to miss the question of how boom periods lead to imprudent economic behavior.

When oil prices and revenues are volatile, then, fiscal policy and government (welfare) spending will be volatile, as will aggregate demand and the supply of welfare services (Devlin and Lewin, 2005). Borrowing countries will have to repay their debt with interest, causing further discrepancy between disposable income and expenditure commitments (Manzano and Rigobon, 2001). These fluctuations create spill-over effects throughout the whole economy. In addition to the cuts in welfare spending (health care, education, labor market benefits), low price periods have been associated with decreased real GDP, lower income and higher unemployment rates in oil-exporting countries (Cantore et al., 2012). Oil revenue in an oil-dependent country, thus, determines a society's welfare directly. More importantly, many oil states are autocracies that need to have access to revenues with which to buy off key supporters, such as the military (Bueno de Mesquita and Smith, 2011; Karl, 1997). Finally, social control in oil-rich states tend to be tenuous due to weak development of a state's bureaucracy and administrative capacity (Fearon, 2005). Since oil revenues can replace the need to collect taxes from society the administrative edifice of these states remain thin. Weak bureaucracies do not provide avenues for addressing social grievances, making it more likely that social dissent spills over onto streets, as witnessed recently in Iran and Venezuela.

2.3. Oil importers

The reverse of what we discussed might be generally true in oil-importing countries. Because oil is a key source of energy, required for production and transportation, and because fuel is used in everyday life from heating to cooking, it affects everyone. A high oil price makes production more costly, thereby decreasing aggregate output (Doğrul and Soytas, 2010). Periods in which oil prices are high are associated with lower growth rates, declining productivity, rising unemployment and higher inflation in oil-importing countries (see for example Doğrul and Soytas, 2010; Hamilton, 2000; Cantore et al., 2012). The reduction in output and productivity thus reduces real GDP and causes inflation. The impact of an oil price spike on economic growth has further consequences for employment levels. As marginal cost rises and productivity falls, unemployment rises (Doğrul and Soytas, 2010). In the short run, the economy is incapable of absorbing the excess labor, causing unemployment. One would think that because an increase in the price of oil affects the importing economy negatively, a price decline would constitute an equivalent positive effect. However, the effect of an oil price shock on economic growth is asymmetric. While oil price spikes

have empirically been shown to have a negative effect on the importing economy, the magnitude of a price drop is smaller, if it exists at all (Hamilton, 2000; Jiménez-Rodríguez and Sanchez, 2005).

Consumers are exposed to volatility because oil is relevant for the production, consumption and transportation of a host of other goods. Price levels of durable goods, heating, and food, for example are heavily dependent on the oil price (Hamilton, 2000). These price changes are more easily transmitted for oil-based products than most other raw materials, reducing consumer demand in oil importing states (Regnier, 2007). Oil-based goods, taken together, make up a very large portion of the basket of goods that producers and consumers purchase in any economy, meaning that the impact of an oil price shock will be far-reaching (Regnier, 2007). Important in this regard is perhaps transportation costs of vital non-durable goods such as food. This will cause food prices to increase, affecting the poorer parts of the population, particularly in urban areas that depend on food transported from rural areas.

The association between oil prices and food prices may be the most important, given that an oil price change often constitutes a change in the costs of goods necessary for survival. Because fuel prices are so transmittable, the consequences of volatility are far-reaching in nature, affecting producers and consumers alike. Typically, price hikes are thought to be the main reason people get on the streets, as seen recently in Iran. Oil exporting and oil-importing countries both subsidize petroleum through implicit as well as explicit policies, precisely because they fear dissent (Baig et al., 2007). Both types of states keep reserves, although it is costly to simply store supplies indefinitely. These facts alone indicate that governments do seem to understand the political costs of oil price shocks and prepare for them. Yet, inventories are not sufficient to offset the rigidity of demand and supply, and oil subsidies have been criticized for being inefficient and poorly targeted (Baig et al., 2007; Smith, 2009). Try as they may, governments may not be capable of sufficiently countering the effects of a negative oil price shock, but they could lessen the pain of volatility by intervening financially. Maneuvering such crises, thus, depends heavily on access to forex reserves for easing austerity. Many of these cash-strapped governments can of course borrow, but borrowing often implies making cuts in government spending and increasing austerity. Such a process was clearly at work in the early 1990s, when India had to take broad liberalizing measures when high oil prices put heavy pressure on the country's forex reserves, and the government had run out of options for increasing debt (see Kahn and Vivek, 2007). As we write, we are witnessing precisely such a process unfolding in the case of massive demonstrations in Lebanon.

2.4. Political prudence

Whatever the nature of states and the nature of economic shocks to society, people suffer collective action problems when it comes to challenging the power of incumbent rulers (Olson, 1965; Skocpol, 1979). Whether a government is a democracy or a repressive autocracy, various forms of political activity and contentious politics exist, sometimes spilling onto streets and at other times not (Tilly, 2006). Consider that a strict autocracy, such as China has many protests and riots, whereas a fairly weak and incompetent state, such as Sudan, which is far less autocratic than China, suffers fewer protests. Long established democracies, such as France and India, also suffer many forms of contentious political movements, strikes, riots, and protests. In many states, these public forms of dissent are legalized, an institutionalized form of political activity that allows ordinary people to air grievances (Chenoweth and Stephen, 2011). How incumbent regimes act in such cases might be critical for determining whether or not a non-violent movement becomes violent (Chenoweth and Ulfelder, 2017). The deeper the crisis of austerity, the broader and more intense the anti-government protests are likely to be (Dreher and Gassebner, 2012). Access to finance increases a government's options for patronage spending, possibly staving off large-scale reform.

Oil-exporting and oil-importing states can both be discerned as having prudential versus profligate governments. We have already discussed the various ways in which oil-rich states suffer political Dutch disease, which among other factors is marked by a tendency to follow "precocious Keynesian" policies, tending to be more reckless and exuberant spenders. Oil-importing countries, which have poorer governments might also follow similar policies out of political reasons. Indeed, many developing countries have governments that face debt and balance of payment crises due to misgovernance. Prudent governments, whether dictatorships or democracies, oil exporters or oil import dependent states, adopt countervailing policies to cauterize potential anti-government threats. Indeed, harmful economic policies, such as food and gasoline price controls, exist because they are good politics (Bates, 1988; Bueno de Mesquita and Root, 2000).

Prudent governments might save for a rainy day by building up foreign exchange reserves and other policy-based strategies that allow them to weather crises. In fact, several IMF reports suggest that oil exporters, such as Norway, Russia, Saudi Arabia, United Arab Emirates, Qatar, Kuwait, among others are shielded from economic and political uncertainties in the wake of low oil prices because they draw on their forex reserves and sovereign wealth funds to finance the public goods and services, fiscal and other investment requirements for easing the pain of a crisis (Arezki et al., 2015; Husain et al., 2015). Less prudent governments, such as Hugo Chavez' Venezuela, followed populistic, expansionary policies, so that the crisis of austerity has spilled onto the streets. Krugman (2016) argues that in such countries there is a non-linear relationship between oil prices and domestic spending on public goods and services (Krugman, 2016). Meaning, when oil prices decline, domestic spending too falls sharply, resulting in political unrest, or in extreme cases, even civil war (Bodea et al., 2016). We suggest that the propensity of a state to experience anti-government protest during oil price shifts is conditional on their ability to rely on forex reserves for easing the pains of austerity.

3. Data and methods

We use panel data for 165 countries[2] during 1980–2013 period (34 years). Our dependent variable, anti-government protest, is a mixture of a number of violent and non-violent protest events registered for country ***i*** in year ***t***. We use Arthur Banks' (2015) Cross-National Times Series (CNTS) Data Archive, which allowed us to create a variable for anti-government protests capturing *riots* – counts the number clashes with at least 100 participants involving the use of physical force; *anti-government demonstrations* – counts public gathering of at least 100 people voicing opposition to government policies (excluding foreign policy issues); and *revolutions* – counting the number of attempts by demonstrators to change the government. As far as we are aware, Arthur Banks' (2015) data is one of the most widely used data for capturing protests directed against a government (Collier and Rohner, 2008).[3] The descriptive statistics show that there are 1.26 protests on average covering the 165 countries during our study period with a standard deviation of 3.88 protests per country. The largest number of protests occurred in Syria in 2011 (82), while Yemen registered 79 protests in the

[2] See Appendix 1 for list of countries.

[3] The only alternative dataset on protests and political unrest is the Nonviolent and Violent Campaigns and Outcomes (NAVCO) v. 2.0 data developed by Chenoweth and Stephan (2011). The major disadvantage of NAVCO 2.0 is that the data are available only until 2005 and only cover major non-violent upheavals. We want to capture both violent and non-violent protests because any kind of protest signals people's displeasure with the government. How minor protest becomes a major movement, of course, is highly dependent on a state's response. For this reason, we stay with the CNTS data as many others have done.

Table 1
Impact of oil wealth on protests.

	(1)	(2)	(3)	(4)	(5)	(6)
	Protests	**Protests**	**Protests**	**Protests**	**Protests**	**Protests**
Oil Rents/GDP (t-1)	−0.00860			−0.0899		
	(0.00667)			(0.0836)		
Oil Exports/Total Exports (t-1)		−0.00329			−0.00358	
		(0.00249)			(0.0573)	
Oil Production/GDP (t-1)			−0.00718			0.566**
			(0.00828)			(0.257)
Per capita GDP (log) (t-1)	−0.0434	−0.0345	−0.0518	−0.326	−0.499*	−0.825***
	(0.141)	(0.156)	(0.130)	(0.226)	(0.265)	(0.276)
Democracy (t-1)	−0.249***	−0.338***	−0.326***	−0.522***	−0.497***	−0.535***
	(0.0899)	(0.0906)	(0.0848)	(0.149)	(0.183)	(0.173)
Autocracy (t-1)	0.0481	0.00917	−0.0702	0.265*	0.248	0.234
	(0.0981)	(0.100)	(0.0906)	(0.145)	(0.167)	(0.181)
Economic Crises (t-1)	0.275***	0.260***	0.258***	0.544***	0.595***	0.408**
	(0.0839)	(0.0844)	(0.0803)	(0.160)	(0.209)	(0.161)
Population (log) (t-1)	0.148	0.234	−0.171	0.391	0.860	4.537***
	(0.288)	(0.296)	(0.267)	(0.602)	(0.525)	(1.459)
Trade/GDP (t-1)	0.00105	0.00261	0.000387	0.00980	0.00420	−0.000710
	(0.00191)	(0.00195)	(0.000783)	(0.0106)	(0.00404)	(0.00105)
Civil conflict (t-1)	0.422***	0.445***	0.519***	0.586***	0.547***	1.060***
	(0.0813)	(0.0840)	(0.0756)	(0.127)	(0.109)	(0.149)
Constant	−2.519	−4.050	2.887	−2.296	−8.422	−44.19***
	(5.126)	(5.321)	(4.725)	(9.772)	(8.101)	(4.003)
Estimation Technique	NBREG	NBREG	NBREG	IV-poisson	IV-poisson	IV-poisson
Pearson goodness-of-fit	12724***	13091***	13939***	–	–	–
Hausaman test (p-value)	0.986	0.000	0.000	0.000	0.000	0.000
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of Countries	127	147	151	127	147	151
Total Observations	3820	4063	4558	3820	4063	4558

Notes: Robust standard errors in parenthesis; Statistical significance: ***p < 0.01, **p < 0.05, *p < 0.1.

same year. The dependent variable is a count measure, which is strongly skewed to the right (with an accumulation of observations at zero) and displays overdispersion, with the variance being greater than the mean. Thus, the appropriate econometric technique is negative binomial regression (Cameron and Trivedi, 2013). Note that the 'goodness-of-fit' test, reported in our Tables, supports the use of negative binomial over the Poisson estimation method. The model we estimate is denoted by the following equations. The expected value and the variance be given by:

$$E(y_{it}) = e^{(\alpha_i + \beta' X_{it})} = \lambda_{it} \quad (1)$$

$$Var(y_{it}) = \lambda_{it}\ (1 + \delta_i) \quad (2)$$

Wherein, $y_{it}$is the count of the protests in country i in year t, $\alpha_i$are the country-specific effects and $X_{it}$is the vector of explanatory variables. The dispersion (i.e., variance divided by the mean) is given by $1 + \delta_i$and is constant over time for each country. We employ country-specific fixed effects to capture time invariant factors that remain constant across countries. To account for common shocks, we include year-specific fixed effects and heteroscedasticity consistent, robust standard errors (Beck and Katz, 1996). Note that the Hausman test favors negative binomial with fixed effects over pooled negative binomial regressions.

We employ three different measures of oil wealth. First, we use *oil rents per GDP* obtained from the World Development Indicators (WDI, hereafter) (World Bank, 2016).[4] Rents are defined as unit price minus the cost of production times the quantity produced. In our sample, the average oil rents to GDP is 6.1% with a maximum of 80.3%. Secondly, following previous studies, we use *oil exports as a share of total exports* (Collier and Hoeffler, 2004). The average oil exports to total exports is 18.5% with a maximum of 100% registered for Libya in 1980. The bivariate correlation between these two variables is $r = 0.84$, suggesting that fuel export dependence and oil rents per GDP measure the value of oil to an economy fairly consistently. Thirdly, it is argued that usage of the oil rents variable is problematic because the amount of rents is based on price (Ross, 2012). We use a measure of *oil production per GDP* which is obtained by disaggregating the oil rents variable into oil production and price parts developed by Ross (2012) and Haber and Menaldo (2012). This variable has much wider coverage than the World Bank's oil rents and exports measures. The bivariate correlation between oil production and oil rents, oil exports measure is $r = 0.78$ and 0.74 respectively.

The vector of control variables includes potential determinants of protests gleaned from the existing literature (Bodea et al., 2016; Goldstone et al., 2010). We avoid the "garbage can model" and limit our control variables for easing interpretation of results (Achen, 2005). We follow the conservative strategy of accounting only for known factors that may confound the effect of resources. First, we include per capita GDP (log) in US$ 2005 constant prices obtained from the WDI as a measure of the level of economic development. Income per capita is a 'catch all' variable for factors, such as the quality of institutions and the individual opportunity costs associated with rebellion. Next, we control for regime type. The lack of democracy fuels protests against governments when people keen for greater political voice are repressed. Democracies also tolerate protest. We include a measure of democracy using the Marshall and Jaggers (2002) Polity IV index, which is recoded as a discrete variable taking the value 1 if the Polity index is above +6 (on the −10 to +10 scale), and 0 otherwise. Likewise, we create a discrete measure of strict autocracy, which takes the value of 1 if the Polity index is below −5 and 0 otherwise because high political repression can dampen open anti-government activity. We control for economic crises by including a dummy variable experiencing any one of the three crises: currency, debt, and systematic banking crises (Laeven and Valencia, 2013). Including non-oil-price-related crises separately is important for identifying the precise source of crisis. We also include a measure of trade openness using total trade as a share of GDP to capture

[4] For a detailed explanation of methodology and the calculation of rents, see: http://databank.worldbank.org/data/.

Table 2
Oil price effect – the conditional effect of oil price shifts on protests.

	(1)	(2)	(3)
	Protests	Protests	Protests
Oil Rents/GDP (t-1) X Low oil prices (t-1)	0.0118**		
	(0.00515)		
Oil Rents/GDP (t-1)	−0.00929		
	(0.00675)		
Oil Exports/Total Exports (t-1) X Low oil prices (t-1)		0.00341*	
		(0.00177)	
Oil Exports/Total Exports (t-1)		−0.00425*	
		(0.00255)	
Oil Production/GDP (t-1) X Low oil prices (t-1)			0.0409***
			(0.0133)
Oil Production/GDP (t-1)			−0.0497***
			(0.0164)
Low Oil prices (t-1)	−0.902***	−0.942***	−0.818***
	(0.182)	(0.183)	(0.172)
Per capita GDP (log) (t-1)	0.00812	−0.00301	−0.0159
	(0.143)	(0.157)	(0.130)
Democracy (t-1)	−0.258***	−0.349***	−0.316***
	(0.0900)	(0.0908)	(0.0849)
Autocracy (t-1)	0.0262	−0.0115	−0.0855
	(0.0981)	(0.100)	(0.0906)
Economic Crises (t-1)	0.267***	0.253***	0.251***
	(0.0840)	(0.0845)	(0.0803)
Population (log) (t-1)	0.206	0.245	−0.118
	(0.290)	(0.296)	(0.268)
Trade/GDP (t-1)	0.000363	0.00243	0.000570
	(0.00194)	(0.00194)	(0.000778)
Civil conflict (t-1)	0.425***	0.451***	0.516***
	(0.0813)	(0.0840)	(0.0754)
Constant	−3.726	−4.378	1.764
	(5.156)	(5.321)	(4.744)
Estimation Technique	NBREG	NBREG	NBREG
Pearson goodness-of-fit	12324***	13091***	13885***
Hausaman test	0.000	0.000	0.000
Country Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Number of Countries	127	147	151
Total Observations	3820	4063	4558

Notes: Robust standard errors in parenthesis; Statistical significance: ***p < 0.01, **p < 0.05, *p < 0.1.

Table 3
Oil price effect on protests in oil-import-dependent countries.

	(1)	(2)	(3)
	Protests	Protests	Protests
Oil Imports/Total Imports (t-1) X High oil prices (t-1)		0.0205***	
		(0.00584)	
High Oil prices (t-1)		0.562***	
		(0.198)	
Oil Imports/Total Imports (t-1) X Low oil prices (t-1)			−0.0205***
			(0.00584)
Low Oil prices (t-1)			−0.562***
			(0.198)
Oil Imports/Total Imports (t-1)	0.00874**	−0.00761	0.0129***
	(0.00437)	(0.00650)	(0.00452)
Per capita GDP (log) (t-1)	−0.125	−0.140	−0.140
	(0.166)	(0.166)	(0.166)
Democracy (t-1)	−0.340***	−0.343***	−0.343***
	(0.0928)	(0.0926)	(0.0926)
Autocracy (t-1)	0.0804	0.0699	0.0699
	(0.106)	(0.106)	(0.106)
Economic Crises (t-1)	0.271***	0.285***	0.285***
	(0.0868)	(0.0869)	(0.0869)
Population (log) (t-1)	0.0202	0.0495	0.0495
	(0.314)	(0.316)	(0.316)
Trade/GDP (t-1)	0.00350*	0.00259	0.00259
	(0.00207)	(0.00210)	(0.00210)
Civil conflict (t-1)	0.455***	0.440***	0.440***
	(0.0858)	(0.0858)	(0.0858)
Constant	−0.471	−1.391	−0.829
	(5.629)	(5.600)	(5.662)
Estimation Technique	NBREG	NBREG	NBREG
Pearson goodness-of-fit	12797***	12741***	12741***
Hausaman test	0.999	0.000	0.000
Country Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Number of Countries	153	153	153
Total Observations	3934	3934	3934

Notes: Robust standard errors in parenthesis; Statistical significance: ***p < 0.01, **p < 0.05, *p < 0.1.

any trade-shock effects. We also include the size of the population since countries with large populations are more difficult to control. Finally, we test the effect of oil dependence on protests holding constant ongoing violent armed conflict defined as a war between a state and a rebel group where at least 25 deaths have occurred in a single year (Gleditsch et al., 2002). These data are taken from the website of the Uppsala Conflict data program (UCDP). The descriptive statistics are reported in Appendix 2, and details on definitions and sources are provided in Appendix 3.

3.1. Endogeneity

Failing to account for endogeneity could yield biased results because our measures of oil might be affected by omitted variables or reverse causality. To deal with this issue we follow Meyersson, Padro i-Miquel and Qian (2008) who use two instruments affecting oil wealth. First, we use total world consumption per capita minus the consumption per capita of *i*th country in question (log) sourced from the WDI. Second, we use total world consumption of petroleum minus the petroleum consumption of *i*th country in question (log) measured in barrels per day sourced from the Energy Information Administration (EIA). As demand for oil in the world increases, countries producing oil will increase their production and exports to the rest of the world more than those who do not produce oil.[5] In all likelihood, this increase in oil exports to rest of the world (and thereby increase in oil rents) as a result of an increase in demand for oil will be orthogonal to political unrest in that country. These two measures of consumption drive the demand for oil and hence are more likely to be exogenous to the dependent variable – political unrest in country ***i***.

3.2. Two-way interaction effects - the oil price effect

Our main hypothesis is that a significant decrease in the oil price is associated with anti-government protest in oil-exporting states. Likewise, we expect the opposite in oil-importing states. We use historical oil price data adjusted for inflation sourced from the EIA.[6] Using the historic oil price data we create low and high oil price years as discrete variables. The *low oil price* period takes the value 1 for those years for which the oil price over the 1980–2013 period is below the median value and 0 if not. A *high oil price* period takes the value 1 for those years for which the oil price over the 1980–2013 period is above the median, and 0 if not. We do this to investigate whether oil resource-dependent countries are more (or less) likely to suffer protests when oil prices are lower (or higher), independent of all the controls in the model. Next, we do the same analyses using the oil price periods and their interactions with oil importing states, measured as *oil-imports-to-GDP*.

[5] We estimate first step regressions to assess the relevance of the instruments. These results are reported in Table J in the online appendix.

[6] Oil price data are available here: http://www.eia.gov (last accessed January 2018).

Table 4
Forex Reserves effect - Interactions of oil wealth, oil prices, and access to Forex reserves on protests.

	(1)	(2)	(3)
	Protests	Protests	Protests
Oil Rents/GDP (t-1) X Low oil prices (t-1) X Forex Reserves/GDP (log) (t-1)	−0.0141***		
	(0.00470)		
Oil Rents/GDP (t-1) X Low oil prices (t-1)	0.0481***		
	(0.0126)		
Oil Rents/GDP (t-1) X Forex Reserves/GDP (log) (t-1)	0.0142***		
	(0.00352)		
Oil Exports/Total Exports (t-1) X Low oil prices (t-1) X Forex Reserves/GDP (log) (t-1)		−0.00312**	
		(0.00154)	
Oil Exports/Total Exports (t-1) X Low oil prices (t-1)		0.0111***	
		(0.00382)	
Oil Exports/Total Exports (t-1) X Forex Reserves/GDP (log) (t-1)		0.00382***	
		(0.00115)	
Oil Production/GDP (t-1) X Low oil prices (t-1) X Forex Reserves/GDP (log) (t-1)			−0.0308**
			(0.0125)
Oil Production/GDP (t-1) X Low oil prices (t-1)			0.103***
			(0.0324)
Oil Production/GDP (t-1) X Forex Reserves/GDP (log) (t-1)			0.0346***
			(0.0119)
Low oil prices (t-1) X Forex Reserves/GDP (log) (t-1)	0.0371	0.0768	0.0414
	(0.0503)	(0.0541)	(0.0458)
Oil Rents/GDP (t-1)	−0.0452***		
	(0.0119)		
Oil Exports/Total Exports (t-1)		−0.00853**	
		(0.00334)	
Oil Production/GDP (t-1)			−0.111***
			(0.0321)
Low Oil prices (t-1)	−1.031***	−1.100***	−0.948***
	(0.213)	(0.216)	(0.200)
Forex Reserves/GDP (log) (t-1)	−0.138***	−0.169***	−0.121***
	(0.0426)	(0.0466)	(0.0401)
Per capita GDP (log) (t-1)	0.00511	0.145	−0.0390
	(0.152)	(0.164)	(0.133)
Democracy (t-1)	−0.245***	−0.281***	−0.268***
	(0.0936)	(0.0935)	(0.0872)
Autocracy (t-1)	0.0284	−0.00515	−0.0589
	(0.105)	(0.106)	(0.0948)
Economic Crises (t-1)	0.234***	0.228***	0.233***
	(0.0882)	(0.0877)	(0.0830)
Population (log) (t-1)	0.441	0.237	0.00667
	(0.317)	(0.310)	(0.286)
Trade/GDP (t-1)	0.00208	0.00297	0.000794
	(0.00208)	(0.00202)	(0.000811)
Civil conflict (t-1)	0.402***	0.422***	0.522***
	(0.0859)	(0.0864)	(0.0777)
Constant	−7.419	−4.964	0.0766
	(5.647)	(5.556)	(5.040)
Estimation Technique	NBREG	NBREG	NBREG
Pearson goodness-of-fit	11719***	12056***	13423***
Hausaman test	0.001	0.001	0.001
Country Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Number of Countries	125	142	151
Total Observations	3600	3906	4380

Notes: Robust standard errors in parenthesis; Statistical significance: ***p < 0.01, **p < 0.05, *p < 0.1.

3.3. Three-way interaction effects - the forex reserves effect

In the final step, we examine if some oil-wealthy states are able to stave off anti-government protest during lean price years because of their access to foreign exchange reserves. In order to test this proposition, we introduce three-way interactions in which we interact the low oil price period dummy with our oil wealth measures and access to forex reserves. We use the data on total accumulated foreign exchange reserves measured in US$ millions current prices as a share of GDP sourced from the WDI. The mean value of reserves is 13.3% of GDP per country with a minimum value of zero and a maximum value of 302% of GDP. It is noteworthy that there is a significant variation in the data distribution. For instance, 99% of the forex reserves data are less than 110% of GDP, and the majority of cases fall between 0 and 100%. We use two different operationalization of forex reserves variables: **(1)** Log forex reserves/GDP to address the problem of skewness; **(2)** We exclude data points above 110% of GDP, which is roughly less than 1% of the total data.

4. Empirical results

Table 1 reports the impact of oil wealth on protests. While columns 1–3 present the results of oil rents as a share of GDP, oil exports-to-total exports and oil-production-to-GDP. Note that the results in columns 4–6 are estimated using the IV Poisson estimator to address potential endogeneity. As seen in column 1–3, all three measures of oil wealth are positive and statistically not significant. These results remain statistically not significant when additional controls – economic crises, population, trade, and civil conflict – are added. As expected, economic crisis, independent of resource wealth, increases protests, as does an ongoing armed conflict between a government and a rebel group(s). Strong democracy seems robustly related to lower protests while strong autocracy has a marginal statistical divergence from zero. Interestingly, per-capita income is not statistically significant in most of the models, which suggests that insofar as per-capita income captures state capacity and wealth, people are no less likely to protest. Notice that oil rents and oil exports remain statistically insignificant when estimating the IV model in column 4–5, suggesting that alternative measures of oil wealth make no difference. However, the oil production variable is positive and statistically significant at the 5% level. These results taken together suggest a positive but statistically weak direct effect of having oil wealth on the risk of anti-government protest.

In Table 2, we examine the conditional effects between oil wealth and low oil price periods on protests. In columns 1–3, we report the interaction between our three measures of oil wealth and the low oil price dummy. As seen there, the conditional effect of oil wealth and low prices increases protest, results which are statistically significant. Interestingly, the low-price period when oil wealth is zero shows highly significant negative effect. This hints at the beneficial effects of low oil prices for political stability provided oil wealth is not a significant share of a country's income. The results taken together suggest that countries dependent on oil experience political unrest conditional on low oil prices, while non-producers enjoy stability.

For easy interpretation of the results, we compute the incidence-rate ratios (IRR). The IRR computes a one unit change in the corresponding variable (i.e., oil rents-to-GDP conditional upon low oil price) on the expected change in the number of protest events (IRR of coefficient–1) × 100 percent. An IRR of a variable above 1 indicates a positive association with political unrest while the reverse is true for values below 1. The lower-bound of the IRR is zero, which suggests that the expected variation in the dependent variable is zero for one unit increase in variable × (i.e., a change by −100 percent).

In column 1, at the mean of oil rents-to-GDP (roughly 6%) there is an expected increase in the number of protests by only 2% under low oil price conditions. However, a standard deviation increase in oil rents-to-GDP (about 12.63%) above the mean, holding other controls constant at their mean values, increases the expected number of protests by 18% conditional on low oil prices. Substantively, these effects are large. For example, consider a country enjoying the maximum of oil rents-to-GDP (which is 80.24% in our sample), then the expected increase in protests during low oil price periods would increase by over 173%. Very similar substantive effects also hold for oil export share and oil production to GDP. These results support the view that price shocks have significant effects on oil producers, but only when oil prices are low.

In Table 3, we turn to oil import dependent countries. Column 1 reports results on the direct effect of being dependent on importing oil

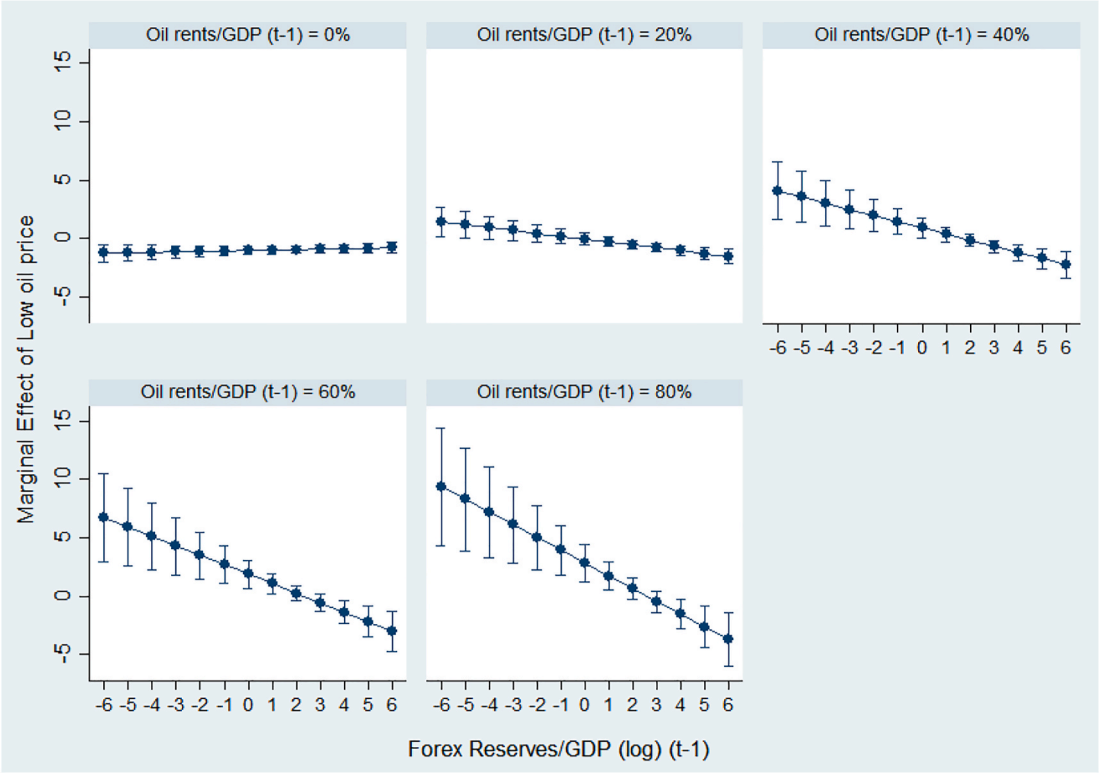

Fig. 1. Low oil prices, Forex Reserves, Oil rents & Mariginal effect on protests.

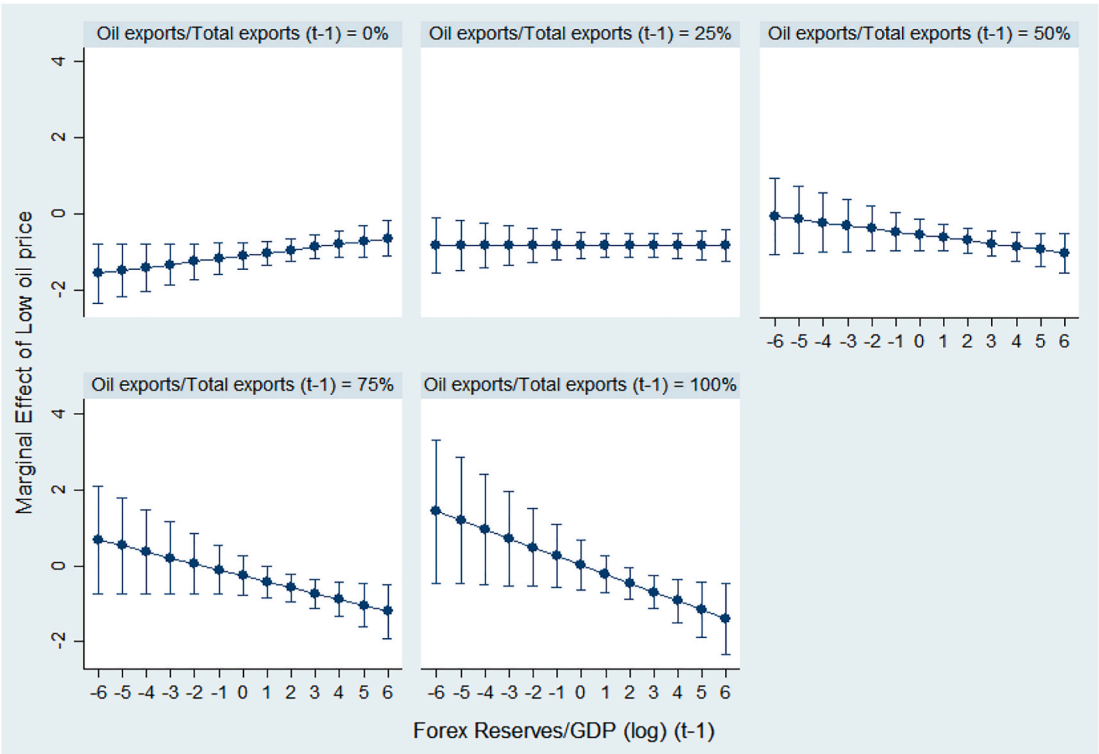

Fig. 2. Low oil prices, Forex Reserves, Oil Exports & Mariginal effect on protests.

and the incidence of anti-government protest. As seen there, greater import dependence on fuel is associated with higher protest, but as column 2 shows, the positive effects of oil import dependence are driven entirely during high price years. Contrarily, results in column 3 suggest that countries that are dependent on imports suffer lower anti-government protests than others when prices are low, a result which is significantly different from zero at the 1% level. Substantively, a standard deviation increase in oil imports/total imports above the mean

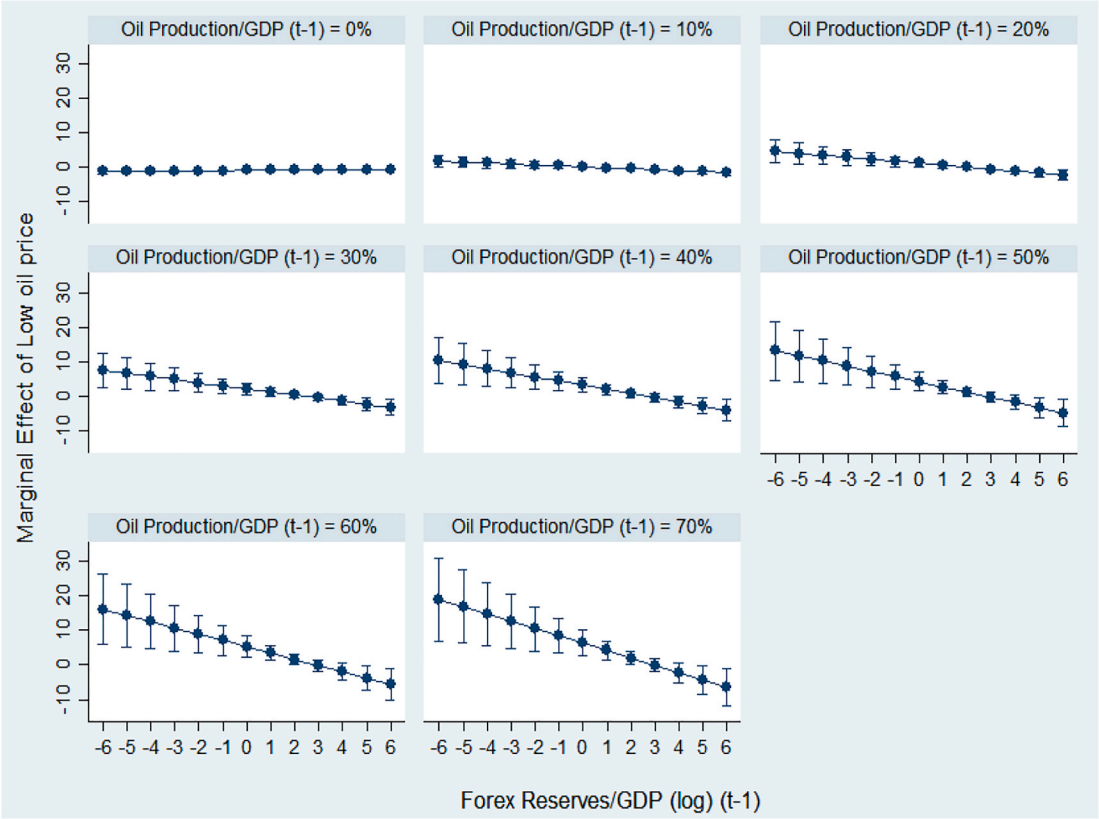

Fig. 3. Low oil prices, Forex Reserves, Oil Production & Mariginal effect on protests.

increases the expected number of protests by 33% when oil prices are high. But, increasing the oil imports by the maximum value (i.e., 64.14% of total imports) would increase protests by 312% when oil prices are high. Notice that the high oil price dummy on its own would increase the expected number of protests by over 78%, which is significantly different from zero at the 1% level (column 2). These results suggest that oil-import dependent countries are vulnerable to increases in the price of oil.

Next, in Table 4, we examine whether declines in anti-government protest in oil wealthy states during low oil price periods is in turn conditional upon the degree of political prudence measured by the accumulation of forex reserves. Accordingly, we introduce three-way interaction between the low oil price dummy, oil rents/GDP, and forex reserves/GDP (log) in column 1. In columns 2 and 3, we replace oil rents with the share of oil exports and oil production in GDP. In column 1, the conditional effect between low oil price, oil rents and forex reserves is negative on protests, a result which supports our hypothesis that some oil-wealthy countries stave off protests when oil prices are low, conditional on access to adequate forex reserves. Importantly, low oil prices on its own, i.e., when the value of oil rents and forex reserves are set to 0, has a stronger negative effect on protests, which is significantly different from zero at the 1% level. Also, the two-way interaction between oil rents and low oil prices, i.e., when forex reserves are set to 0, has a positive and statistically significant effect on protests. These effects suggest clearly, that in the absence of forex reserves, low oil prices are associated with anti-government protest. The results hold in columns 2 and 3 when we replace oil rents with fuel export share and oil production share.

The three-way interactive effects are best assessed with margins plots presented in Figs. 1–3. It is important to note that the interpretation of the interaction term in non-linear models like the negative binomial is not similar to interpreting linear models. Consequently, a simple *t*-test on the coefficient of the interaction term is not sufficient to examine whether the interaction is statistically significant (Ai and Norton, 2003).

We rely on marginal plots as shown in Fig. 1, which depict the magnitude of the interaction effects. To calculate the marginal effect of low oil price at different levels of oil rents/GDP, we consider both the conditioning variable (i.e., forex reserves/GDP log) and the three-way interaction term, displaying graphically the total marginal effect conditional on oil rents/GDP and forex reserves/GDP (log). The y-axis of Fig. 1 displays the marginal effect of low oil price period, and the marginal effect is evaluated on the forex reserves/GDP (log) on the x-axis at various levels of oil rents/GDP. Note that we include the 90% confidence interval.

As seen, low oil prices decrease the expected number of protest for countries with oil rents of 20% of GDP conditional on forex reserves (log) being higher than 2, which is roughly 8% of reserves to GDP. The substantive effects show that when oil prices are low, a country with 20% of oil rents/GDP accumulating forex reserves by 8% of GDP would see a decline in the expected number of protests by 42%. We also see that the expected number of protest would decline by 69% if countries with 40% oil rents/GDP accumulate forex reserves of roughly 55% of GDP. Finally, in the case of countries with oil rents worth 80% of GDP, the expected number of protests decline by 93% if forex reserves are roughly 300% of GDP, which is significantly different from zero at the 1% level.[7] However, what is striking is if oil wealthy countries (with 80% of oil rents to GDP) with no forex reserves would increase the expected number of protests by as much as 420% during low oil price period.

It is noteworthy that the interaction effects are similar when estimating the three-way interactions with oil-export-share- and oil-

[7] Our results remain robust to using the alternative data on forex reserves/GDP (log) wherein we eliminate the outliers. The maximum value of forex data without outliers is 98% of GDP. These results are reported in Table 1 in online appendix.

Table 5
Forex Reserves effect - Interactions of oil imports, oil prices and access to Forex reserves on protests.

	(1) Protests
Oil Imports/Total Imports (t-1) X High oil prices (t-1) X Forex Reserves/GDP (log) (t-1)	−0.00328
	(0.00508)
Oil Imports/Total Imports (t-1) X High oil prices (t-1)	0.0259***
	(0.00971)
Oil Imports/Total Imports (t-1) X Forex Reserves/GDP (log) (t-1)	−0.000979
	(0.00468)
High oil prices (t-1) X Forex Reserves/GDP (log) (t-1)	0.0179
	(0.0824)
Oil Imports/Total Imports (t-1)	−0.00814
	(0.00937)
High Oil prices (t-1)	0.602**
	(0.246)
Forex Reserves/GDP (log) (t-1)	−0.0492
	(0.0677)
Per capita GDP (log) (t-1)	−0.0656
	(0.168)
Democracy (t-1)	−0.303***
	(0.0942)
Autocracy (t-1)	0.0749
	(0.110)
Economic Crises (t-1)	0.258***
	(0.0891)
Population (log) (t-1)	0.105
	(0.325)
Trade/GDP (t-1)	0.00299
	(0.00217)
Civil conflict (t-1)	0.445***
	(0.0866)
Constant	−2.705
	(5.746)
Estimation Technique	NBREG
Pearson goodness-of-fit	12142***
Hausaman test	0.000
Country Fixed Effects	Yes
Year Fixed Effects	Yes
Number of Countries	147
Total Observations	3820

Notes: Robust standard errors in parenthesis; Statistical significance: ***p < 0.01, **p < 0.05, *p < 0.1.

production-share-to-GDP (see Figs. 2 and 3).

Next, we examine the three-way interactions on our oil import dependent-states in Table 5. If oil-importing countries are vulnerable to high oil prices (as seen in Table 3), are some of these states able to reduce their vulnerability to protests if they have healthy forex reserves? As seen in column, the three-way interaction term is negative but is statistically not significant. However, we know that a simple *t*-test on the coefficient of the interaction term is not sufficient. We rely on the margins plot as shown in Fig. 4, which depicts the magnitude of the three-way interaction effect.

The y-axis displays the marginal effect of the high oil price scenario, and the marginal effect is evaluated on forex reserves/GDP (log) on the x-axis at various levels of oil import dependence. As seen, high oil prices decrease the expected number of protests for oil-importing countries as they accumulate forex reserves. For instance, high oil prices increase the expected number of protests by 280% among countries that are oil import dependent at 39% of total imports if their forex reserves are at 0. However, the expected number of protest could be reduced by 130% if forex reserves are about 300% of GDP.

It is noteworthy that these results are not robust as the marginal effect of high oil prices is insignificant at the higher end of forex-reserves-to-GDP (log) in the category of oil imports of 52% and 65% of total imports. The two-way interaction between oil imports and the high oil price period dummy is positive and significantly different from zero, which corroborates our earlier findings reported in Table 3. Notice also that the individual effect of high oil prices, that is when the values of oil imports and forex reserves are set to 0, is positive and statistically significant at the 5% level. Overall, our three-way interactions show that while oil prices do have political effects in both producer and import-dependent countries, prudent governance that ensures adequate forex reserves can reduce protests in bad times, most likely due to a government's financial ability to ease austerity.

4.1. Robustness checks

We subject our main findings to a barrage of robustness checks. First, following Vadlamannati and De Soysa (2017), Bodea et al. (2016), we estimate all our models by excluding outliers in our oil rents and oil exports variables that have more than 75% oil rents as a share of GDP, 90% oil exports to total exports and 40% oil production to GDP. Excluding the outliers does not change our main results. These results are reported in Table A in the online appendix. This suggests that our results are not driven by outliers in the oil variables. Second, we use a new definition to create low and high oil price dummies. Accordingly, the low oil price dummy takes the value of 1 for those years for which the oil price over 1980–2013 period was below one standard deviation of the mean value, which is about 76 US$ and 0 otherwise. Similarly, high oil price scenario takes the value of 1 for those years for which the oil price over 1980–2013 period was one standard deviation above the mean value and 0 otherwise. Estimating our models with these new oil price measures does not drastically change our results (Table B, online appendix).[8] All three-way interaction effects are upheld (Figures in online appendix). Third, we exclude high-income Western democracies from our sample as some of the high-income countries like Australia, Canada and Norway are highly democratic with relatively low levels of corruption (Vadlamannati and Cooray, 2016). The exclusion of this group of countries from our sample makes little difference to the basic results reported above (Table C). Fourth, our baseline models do not account for temporal dynamics of political unrest. To account for this, we drop country fixed effects and include the temporal lag of the outcome variable. Our results (in Table D, online appendix) remain firmly robust to the inclusion of a temporal lag.

Additionally, we tease out potential causal mechanisms by estimating a three-way interaction between low price of oil, oil rents, and government consumption[9] per capita (log) sourced from the WDI. Our results (in Table E, online appendix) suggest that when oil prices are low, countries which are dependent on oil wealth would see a decline in anti-government protest when government consumption increases. Likewise, we also estimate a three-way interaction between low oil price, oil rents, and control of corruption index sourced from the ICRG. We find that oil dependent states see a decline in protests when corruption decreases (Table F). Next, it is argued that some resource rich states can reply on other policy instruments to prevent protests (Ross, 2001). We control state repression using the Political Terror Scale (PTS) based on Amnesty International reports, but our basic results hold. These results are reported in Table G in online appendix. Finally, we are conscious of not overfitting our regression models. To address this problem we adopt two approaches. First, following Vadlamannati (2020) we drop all controls that are statistically insignificant in all our models, retaining only those controls which are significant at conventional levels. Second, we estimate all our models dropping one control variable at a time. The basic results (Table H) are not affected when we drop the variables which are statistically insignificant. Overall, these findings suggest that our results are robust to the size of the sample, alternative methods of operationalization, and estimation techniques.

[8] The two-way interaction results are statistically insignificant when using the new measure of low and high oil price dummies.

[9] We use government consumption data instead of government expenditure as the latter is not available for 165 countries over 34 years.

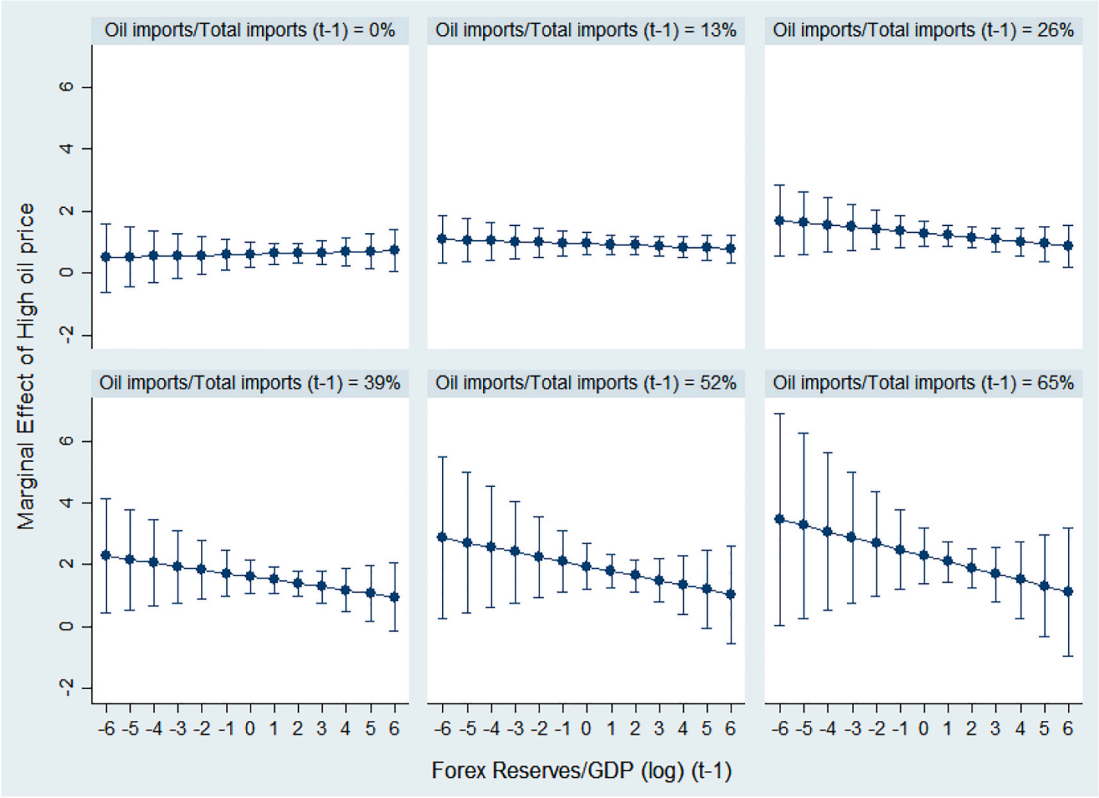

Fig. 4. High oil prices, Forex Reserves, Oil Imports & Mariginal Effect on protests.

5. Conclusion and policy implications

During the Arab Spring, petro-capitalist states, such as Saudi Arabia, remained stable while many of her neighbors, such as Egypt, were wracked by anti-government protest. Countries, such as Venezuela, which have a tightly state-controlled petroleum industry seems to have enjoyed stability as long as prices remained high, but today Venezuelans suffer deep austerity, resulting in large anti-government protests and unrest (Cawthorne and Ulmer, 2016). Similar incidents have flared up recently in Iran, apparently due to price hikes of essentials, such as food and perceived government corruption. Oil-importing states, even in rich industrial settings, such as France, suffered violent protests due to fuel price hikes. Indeed, many aspects of the resource curse are thought to exist precisely because oil wealth allows rulers to buy off opposition, perpetuating bad policy (Acemoglu and Robinson, 2012; Basedau and Lay, 2009). Can oil prices explain the differential effects of high price and low prices in producing and consuming countries?

We argue that the effect of oil wealth on political unrest is conditional upon oil price volatility. More specifically, oil-producing states can be vulnerable to political instability when oil prices are low because of austerity. The same effects hold for oil-consuming states when oil prices are high. The mechanism explaining political unrest, however, is the relative austerity experienced by the general population. However, accumulation of foreign exchange reserves by oil-producing and consuming states can attenuate the effect of oil price volatility. Our arguments are robustly supported in the data. The effects are not just statistically significant, but they are substantively fairly large. Although we find similar results for oil-importing countries when oil prices are high, the results are not as robust for the hypothesized mechanisms as for oil producers. Nevertheless, these results highlight the important role for prudent governance of oil wealth argued by many (Auty and Gelb, 2000; Eifert et al., 2003; Mehlum et al., 2006). The results also support those that suggest that prudent governance in terms of public spending on education may conditionally lower the risk of destabilization (Bodea et al., 2016). Future research might more closely examine how leaders of dissent react to economic crises in terms of their timing and tactics. Ultimately, our results support the view that prudent leadership and management of the economy are necessary to avoid political instability in oil-wealthy states vulnerable to shocks. Countries that follow strategies to reduce the effects of economic and political Dutch disease are likely to be best placed for avoiding high levels societal dissent, but the incentives for prudential leadership is most likely to be absent where easy money from natural resource extraction place political survival in the short-term over longer-term planning.

CRediT authorship contribution statement

Krishna Chaitanya Vadlamannati: Conceptualization, Methodology, Software, Data curation, Writing - review & editing, Writing - original draft. **Indra de Soysa:** Supervision, Writing - review & editing, Writing - original draft.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.enpol.2020.111719.

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