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Declining Oil Production Leads to More Democratic Governments

Jørgen J. Andersen, Jonas H. Hamang, and Michael L. Ross

Abstract

Many oil-rich countries have authoritarian governments. How will these governments be affected by a global transition away from fossil fuels? We use new, detailed oil data and an event-study design to analyze political change in 36 oil-producing countries that experienced at least 10 years of declining production. We find that when their production starts to decline, they become significantly more democratic, relative to both the overall sample trend and the parallel pre-peak trends. Ten years after their oil peak, 33 of the 36 countries had become more democratic. After 15 years, their relative democracy scores increased by an average of 9 percentage points. For countries that transitioned after 1980, these scores rose about 13 percentage points, and for larger producers, by about 20 percentage points. Our findings suggest that a global transition toward renewable energy may make the governments of oil-rich countries significantly more democratic.

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Introduction

Dozens of countries in Africa, the Middle East, Latin America, and Asia are economically dependent on their oil and gas wealth. Many of these oil exporters are also under authoritarian rule. Prior research explains the connection between these two facts: when countries discover significant quantities of oil and gas wealth, their governments tend to become less democratic, more corrupt, and more conflict-prone. Large oil revenues and lucrative foreign contracts give incumbent leaders both an incentive to stay in office and the resources to bribe voters and stifle dissent (Girod et al., 2018; Lall, 2017; Paler, 2013; Robinson et al., 2006; Ross, 2001; Tsui, 2011). Today many of the world's oil-dependent countries — including Russia, Saudi Arabia, Algeria, Venezuela, Angola, Congo Republic, and Kazakhstan — are significantly less democratic than similar countries without oil wealth.

To meet the terms of the 2015 Paris Agreement and keep future global warming to well below 2 degrees C, and if possible 1.5 degrees C, countries will have to sharply curtail their fossil fuel consumption and leave much of the oil, fossil gas, and coal reserves below the ground (Fawcett et al., 2015; McGlade and Ekins, 2015; Welsby et al., 2021). We investigate how a global shift away from fossil fuels will affect the "political resource curse" of the oil-rich countries. Over the last 60 years, many of them have gone through boom-and-bust production cycles, first exploiting and then depleting their petroleum wealth. We document political change in these countries both before and after their production peak. While the political effects of rising production have been extensively studied, to our knowledge this is the first study of the political consequences of declining production.

Using proprietary data on the life cycles of oil fields, we focus on the 36 countries that,

between 1960 and 2019, reached a production peak and experienced at least a decade of declining production. Although the approximate volume of a country's oil and gas reserves may be known in advance, the exact timing of the production peak is produced by a complex mixture of geological, economic, policy and regulatory conditions for many independent oil fields and is difficult to anticipate. We use data from the Varieties of Democracy (V-Dem) project to track each country's overall democracy trends, as well as the incidence of pro-democracy protests, the competitiveness of elections, and the extent of political repression for ten years before and twenty years after their production peaks.

We establish five new stylized facts about the relationship between oil production and governance. Collectively, they suggest that when oil production begins to decline, governments become more accountable to their citizens. We suggest this pattern can be given a causal interpretation.

The first stylized fact is that once the 36 countries in our sample passed their peak year of oil production there was a significant rise in their democracy scores. We use the raw data to display this in Fig. 1, where countries' peak-years are set to year $t = 0$, their oil production levels (grey-black shades) are normalized to 1 (right axis), and their democracy scores (red and green circles) are normalized to 0 (left axis). For illustration, the figure includes linear approximations (solid lines) for the observed democracy trends for ten years before and 20 years after the peak. While the pre-peak democracy trend appears to be flat, the post-peak trend has a positive slope.

To evaluate the data more rigorously we use an event-study analysis that allows us to estimate democracy trends more flexibly while controlling for unobserved country characteristics and the general time trend within our sample of oil-producing countries. We uncover a similar pattern: once their oil production starts to decline, governments show higher scores on the

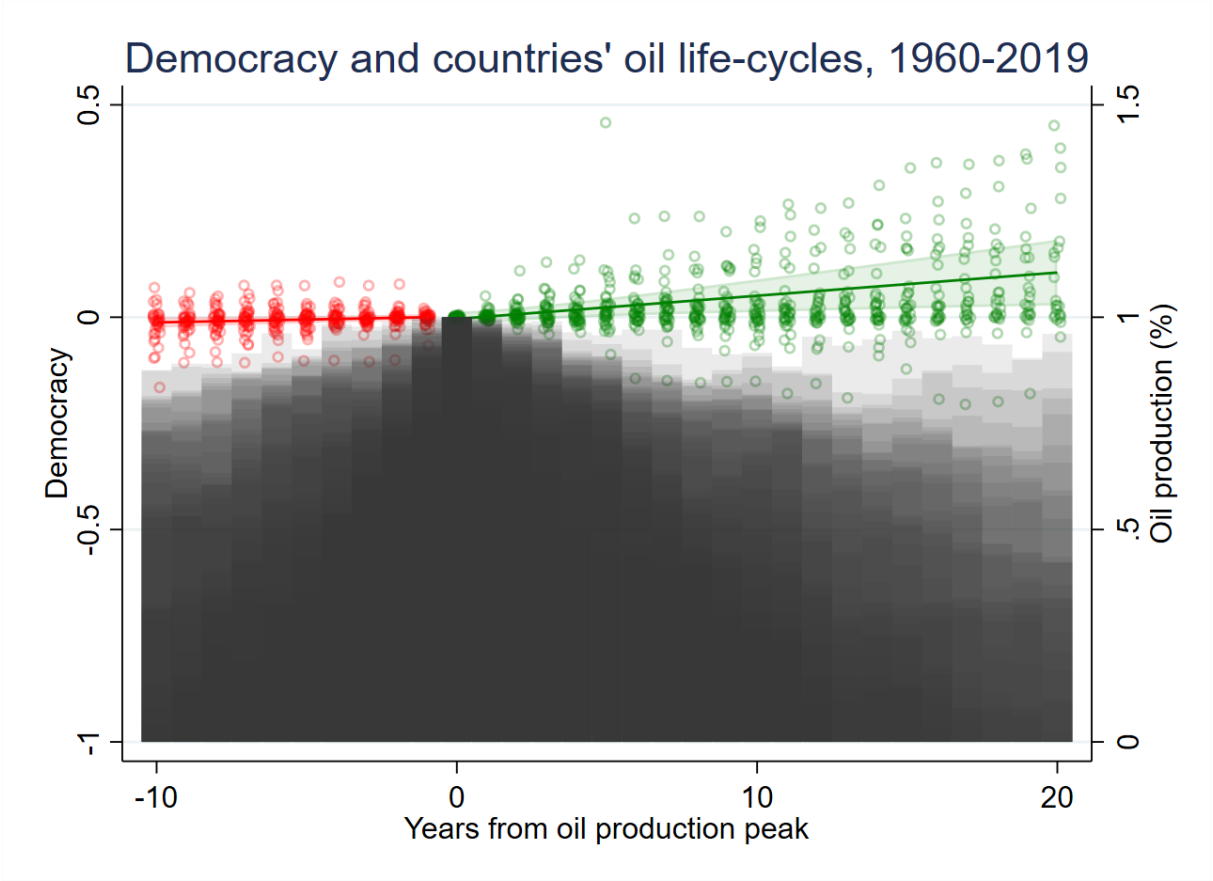

Figure 1: This figure shows the VDEM polyarchy score and oil production profiles (per capita) of all 36 countries in our main sample, relative to the peak production year, at time $t = 0$ (horizontal axis). The grey circles show the countries' democracy scores, normalized to 0 at $t = 0$. The black shaded area is created by laying the production profiles on top of each other. We have restricted the period to 10 years before and 20 years after the peak. The red and green lines are created by fitting a linear trend on the democracy score in the pre-peak and post-peak period, respectively. The y-axis is truncated to 1.5.

democracy index relative to the average democracy trend in this sample. The effect is sizeable: after 15 years the mean democracy score rises by about nine percentage points relative to the trend.

Second, this democracy effect was primarily driven by countries that passed their oil peak after 1980. Most theories of the resource curse suggest that the anti-democratic effects of oil are greater when governments collect more oil revenues. The oil revenues captured by governments grew dramatically after the 1970s, when most petroleum-exporting countries nationalized their industries and seized control of oil rents previously collected by foreign companies (Andersen and Ross, 2014). Consistent with this structural change we find that, before 1980 the post-peak rise in democracy scores was about 8 percentage points (and not statistically significant), while after 1980 it was about 13 percentage points (and statistically significant at the 95% level).

Our third stylized fact is that the post-peak shift toward democracy was larger in countries with more oil. When we divide our post-1980 sample into countries above and below 20 barrels per capita we find a marked difference: among the low-oil countries, democracy rose about 14 percentage points after 15 years; among the high-oil countries it rose about about 20 percentage points. Since these subgroups of countries are small, however, the differences between them are not statistically significant.

Fourth, other data patterns are consistent with the mechanisms that apparently link oil production to authoritarian rule. Earlier research suggests that oil hinders democracy through a three-step process: first, it generates a large stream of non-tax revenues for the government; second, the incumbent ruler uses these revenues to keep taxes low and public spending high, a combination that dampens pro-democracy pressures; and third, the government spends heavily to purchase the loyalty of the armed forces, who act to repress civil society organizations and

silence dissent. Our analysis shows that after countries pass their production peak they immediately experience a sharp decline in government revenues, along with a rise in the incidence of pro-democracy protests and increasingly competitive elections.

Finally, even after passing their peaks, oil-producing countries remained much less democratic than non-oil producers. Still, our analysis provides a basis for optimism: the oil producers that peaked after 1980—although highly undemocratic—still converged toward the rest of the world.

Our main results are robust to the exclusion of statistical outliers, potentially confounding trends, data characteristics, and alternative estimation procedures that account for treatment effect heterogeneity.

A remaining concern is that the shift toward democracy is driven by unobserved events that coincide with the peak years of oil production. We evaluate this possibility and conclude it is unlikely. The mechanisms of the resource curse are well documented and we consider it a more plausible explanation.

Our paper contributes most directly to the literature on the relationship between oil and democracy. Over two decades of research finds consistent evidence that a sustained increase in oil revenues tends to make governments less democratic (Andersen and Aslaksen, 2013; Robinson et al., 2006; Ross, 2001; Tsui, 2011), more conflict-prone (Blair et al., 2021; Dube and Vargas, 2013; Lei and Michaels, 2014; Paine, 2016), and more corrupt (Caselli and Michaels, 2013; Gillies, 2019). Since oil production has steadily risen at a global level over time, most studies focus on the effects of either increases in, or high levels of, oil production. To our knowledge this is the first study to ask what happens to autocratic governments when oil production declines.

Our study also speaks to research on the energy transition and its effects on oil-exporting countries. Many recent studies focus on the economic hazards posed by declining demand for fossil fuels and the resulting problem of stranded assets (Mercure et al., 2018; Van der Ploeg and Rezai, 2020; Welsby et al., 2021). Our analysis of the political consequences of declining oil wealth is more hopeful. In an era when democratic forces are in retreat in most parts of the world (Alizada et al., 2022), it implies that for a key set of countries, the energy transition may open the door toward greater political freedom.

Data

Oil production per capita. We rely on proprietary oil and gas (henceforth just oil) data with global coverage from Rystad Energy, an international oil consultancy firm. Their micro-to-macro approach allows us to aggregate oil production data up to a complete country-year panel that can be used to precisely identify the historical shapes of different countries' oil lifecycles. We normalize a country's annual oil production by population to get our preferred measure of oil production per capita. Our sample is comprised of countries that between 1960 and 2019 (i) produced at least two barrels of oil equivalent per capita, averaged over the sample period, (ii) experienced a discrete peak in oil production per capita, characterized by at least five year of growing production up to the peak year and at least ten years of decline after the peak, and (iii) had sovereign governments at peak-year. This provides us with a sample of 36 countries (see SI).

Democracy. We measure countries' democracy levels using the Polyarchy index from the Varieties of Democracy (V-Dem) project (Coppedge et al., 2020). The Polyarchy index measures the extent to which "the ideal of electoral democracy in its fullest sense is achieved", and

aggregates separate measures of electoral fairness, suffrage, and freedom of expression and association. It ranges from 0 (worst) to 1 (best). The mean Polyarchy score for our 36 countries over the sample period is 0.371. The maximum score is 0.92 (Denmark, in 1991-1993), and the minimum is 0.013 (Saudi Arabia in 1975-1978) (Fig. S3)

Additional data. We use information on total government revenue (including natural resource revenues) for 30 of our main sample countries during 1980 to 2019, from the UNU-WIDER Government Revenue Dataset (McNabb et al., 2021).

Empirical specification

We analyze the relationship between oil production peaks and democracy paths using an event-study approach. Our study period covers ten years before and twenty years after the peak. Our baseline empirical specification is given by

$$Y_{c,t} = \alpha_c + \gamma_t + \sum_{R=-10}^{20} \beta_R 1\{R_{c,t} = R\} 1\{R \neq -1\} + \epsilon_{c,t}, \tag{1}$$

where $Y_{c,t}$ is country c's democracy (Polyarchy) score in year t, α_c is a full set of country fixed effects to capture observed or unobserved country characteristics that might correlate with the country's average democracy level during the sample period, and γ_t is a set of calendar time (year) fixed effects to flexibly control for the average overall democracy trend in the sample. $R_{c,t}$ denotes the relative time to peak in country c in calendar year t, where $R = -1$, the year before the event, is the excluded reference year (unless otherwise stated).

Our estimates of interest are the β_R's which, for every relative year R, indicate the level of democracy relative to its level in the year before the peak ($R = -1$). More importantly, however, we are interested in the change in the *democracy trend* around the peak. In the following

event-study graphs, unless otherwise stated, the observed trend in the β_R's before and after the peak can be visually inspected relative to the general calendar time trend (estimated by the γ_t) by inspecting the difference between the horizontal axis and the β_R-trend line.

In heterogeneity analyses where our prime interest is in comparing the sizes of the changes in democracy trends around the peak (across different sample splits), we also exclude ($R = -10$) from the specification. This allows us to visually compare the size of the *break* across sub-samples more directly because any observed post-peak differences in trends can be interpreted relative to the pre-peak trends (that effectively have been parallelized due to the exclusion of the two separate pre-event periods, rather than just one as in the baseline specification).

Results

Main result: Democracy trend around the peak

The results from estimating Eq. [1] on our main sample of 36 oil intensive countries can be seen in Fig. 2, where the vertical line at *t=-1* indicates the year of the oil peak, and the vertical axis measures the level of democracy (i.e., the Polyarchy score) relative to that in the peak year. The pre-trend (prior to the peak) is flat and not statistically different from the average democracy trend in the sample (normalized to the horizontal axis, at zero), while there is a clear trend break just at the peak (*t=-1*). Immediately after the peak democracy starts to trend upwards, relative to the trend among the other oil producers. After 15 years the democracy score shows a relative increase of about 9 percentage points.

While we are cautious about inferring causality, the flat pre-trend suggests that there are no anticipation effects — that is, there is no indication that democracy responds to actions taken by political leaders or other influential agents *before* the peak. Instead, democracy evolves

in parallel with the average democracy trend in this sample of oil-producing countries. The absence of a pre-trend, combined with the precise alignment of the oil peak and the break in the democracy trend, suggests that democracy is responding to this event or, alternatively, other events that incidentally happen to coincide with the peak. We return to the issue of potential coinciding events in the Discussion section.

In Fig. 3, we split the sample according to the timing of the peak. In line with previous research showing that oil mainly became a hindrance to democratic transitions after the 1970s (Andersen and Ross, 2014; Lall, 2017), we see that the trend-break after the oil peak is more pronounced among countries that peaked after 1980. While the post-peak break toward democracy is still positive for countries that peaked before 1980, the shift is smaller and not significantly different from zero. This indicates our result in Fig. 2 is mainly, though not exclusively, driven by countries that peaked after 1980.

In Fig. 4, we split our post-1980 sample between countries producing above and below 20 barrels per capita annually over the sample. The results suggest that the post-peak trend is steeper for the larger oil producers, in line with the political resource curse hypothesis, although none of the differences are statistically significant due to small sub-sample sizes.

The political resource curse

We also ask if the oil peak is associated with factors believed to account for oil's anti-democratic effects: government revenues, political mobilization, electoral competitiveness and state repression. In Fig. 5 we show the results from regressing equation [1] on our measure of total government revenue as a percentage of GDP. While data on government revenues are only available for 27 of the 36 countries, they are consistent with the mechanism: one year after the oil peak, total

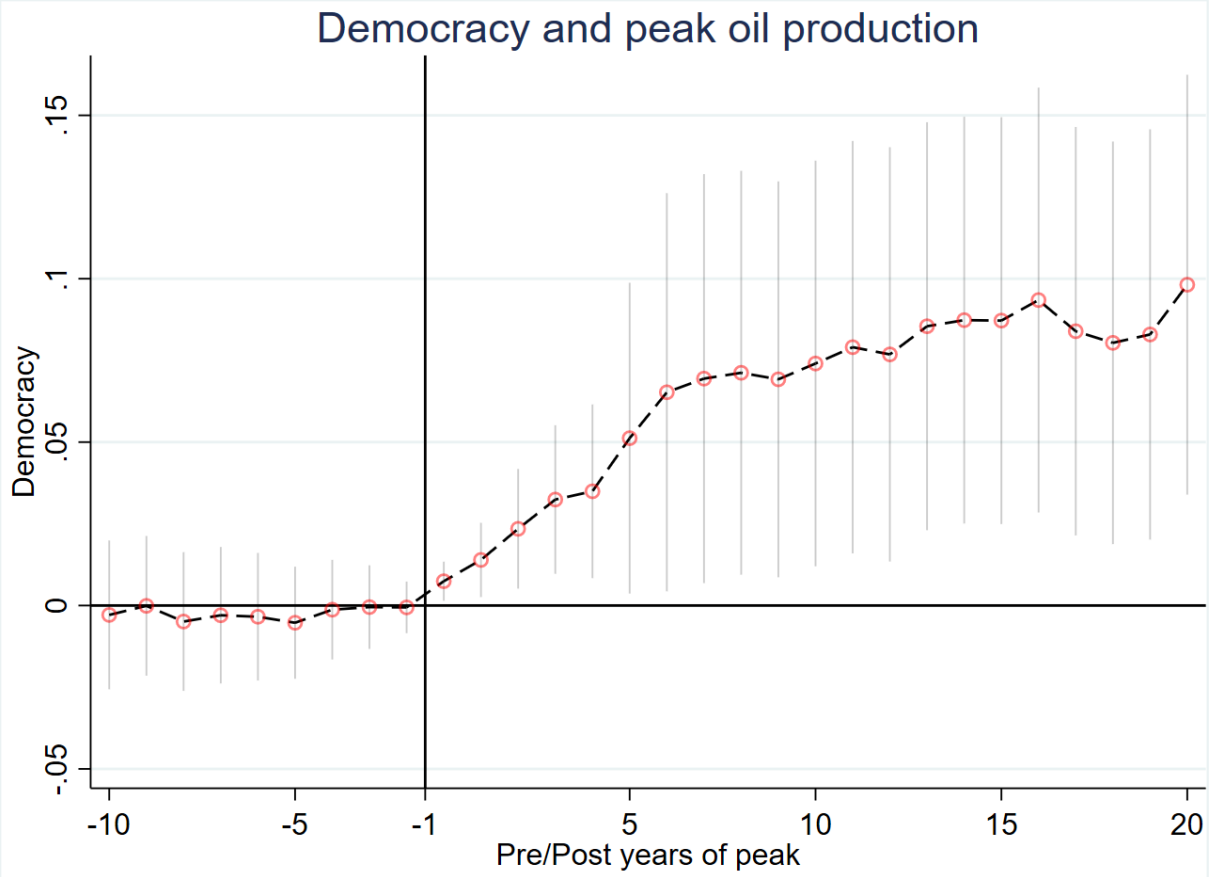

Figure 2: The graph shows the β-coefficients from estimating Eq. (1) on our main sample (36 countries, N = 1,026), with event window from -10 years before peak-year to 20 years after peak-year. The standard errors are clustered on country, and the confidence intervals are at the 95% level.

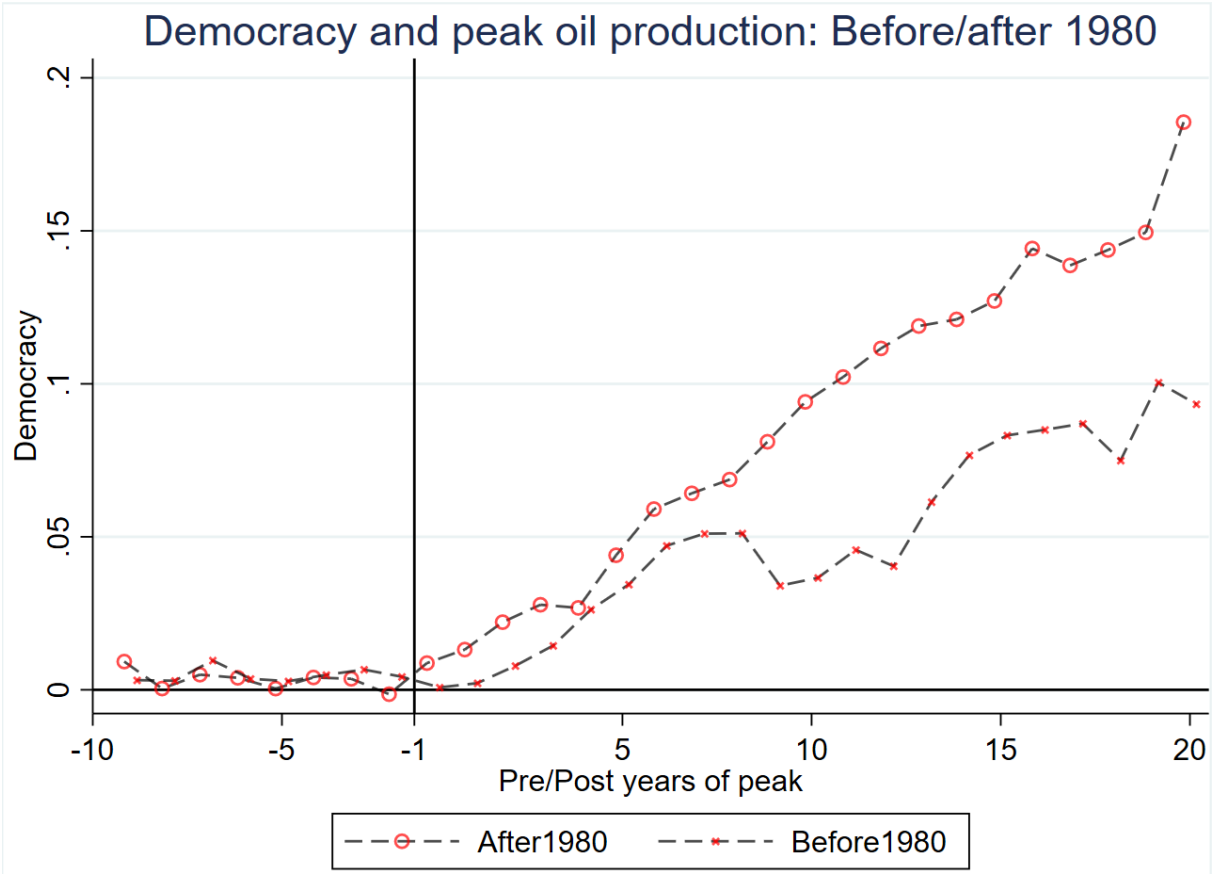

Figure 3: This graph reports the regression coefficients of eq. [1] (with added restriction: $\beta_{-10} = 0$) over two different subsamples: countries that peaked before 1980 (14 countries, N = 424), and countries that peaked after 1980 (22 countries, N = 602). The standard errors are clustered on country, and the confidence intervals are at the 95% level.

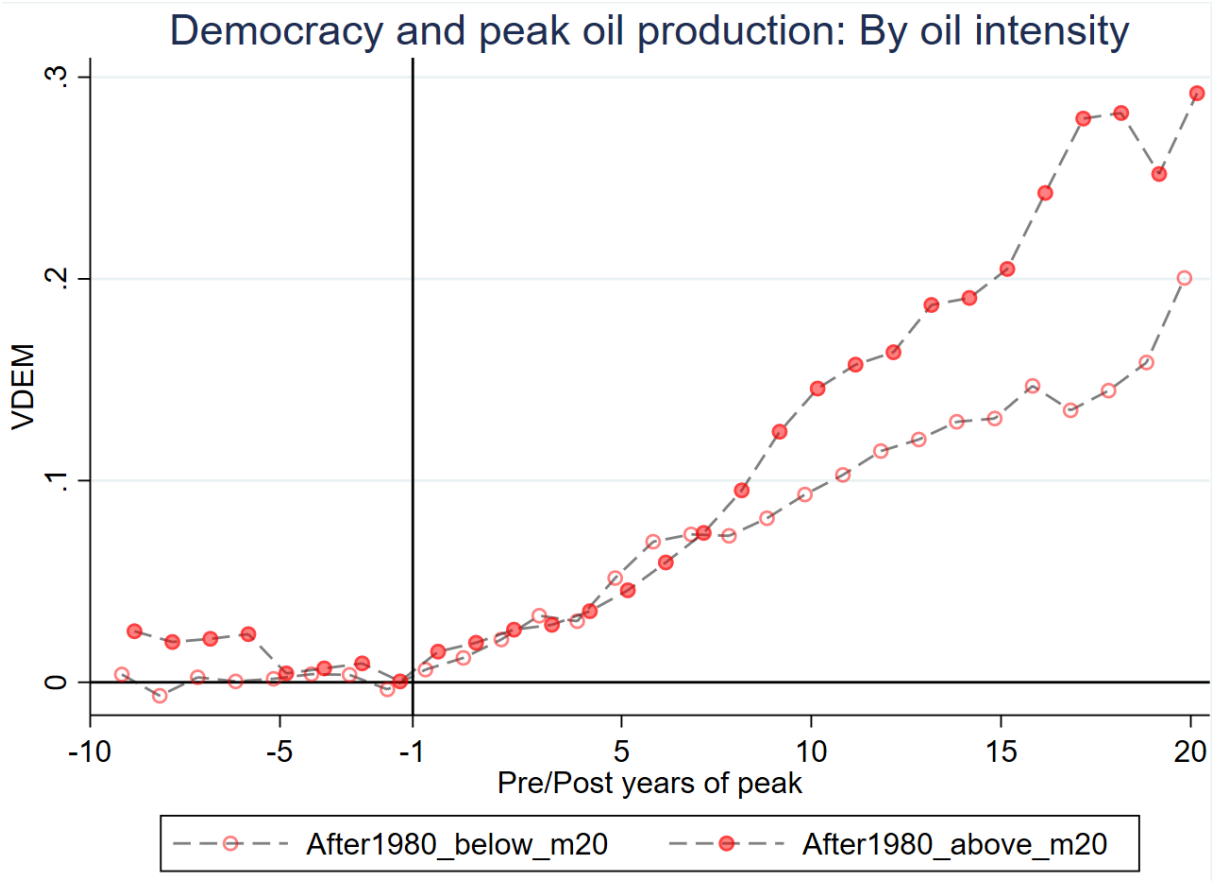

Figure 4: This graph reports the regression coefficients of eq. [1] (with added restriction: $\beta_{-10} = 0$) over two different subsamples: countries that had their peak oil year after 1980 and averaged more than 20 barrels/capita over the sample period (6 countries), and countries that had their peak oil year after 1980 and averaged less than 20 barrels/capita over the sample period (16 countries).

government revenues begin to decline, suggesting a one-year fiscal lag. After ten years, total government revenues are down by about 10 percentage points, which is borderline statistically significant at the 95% level.

In Fig. 6 we show trends in government repression, pro-democracy protests, and electoral competitiveness around the production peak. Both pro-democracy mobilization and electoral competitiveness begin to rise around the oil peak and grow significantly over the next six or seven years; this is consistent with a broad political turn toward democratic accountability. During the same post-peak interval there is no change in government repression, measured by the incidence of violence committed by government agents, including extralegal killings and torture. This implies that following the oil peak, regimes were either unable or unwilling to crack down on democratic protests. After 10 years post-peak, and a large rise in electoral competitiveness, repression declines sharply. These patterns are broadly consistent with the unwinding of a political resource curse, as we discuss below.

Finally, we compare the oil-producing countries to all *non* oil producing countries, where we start the comparison 10 years prior to the peak (by reinserting β_{-1} and removing $\beta_{-10} = 0$ in the empirical model, eq. [1]). The results are displayed in Fig. S1, where the red circles shows the democracy score relative to the starting point at event time $R = -10$ and throughout the event window for those oil countries that peaked after 1980, while the blue circles refer to those that peaked before 1980.

We observe two main differences across the two groups. First, while the pre-1980 sample (blue circles) shows no divergence from the non-oil countries until about 9-10 years after the peak, the post-1980 sample displays a steady and statistically significant decline in the average democracy score all the way up to the peak year. Hence, while there is no evidence of an

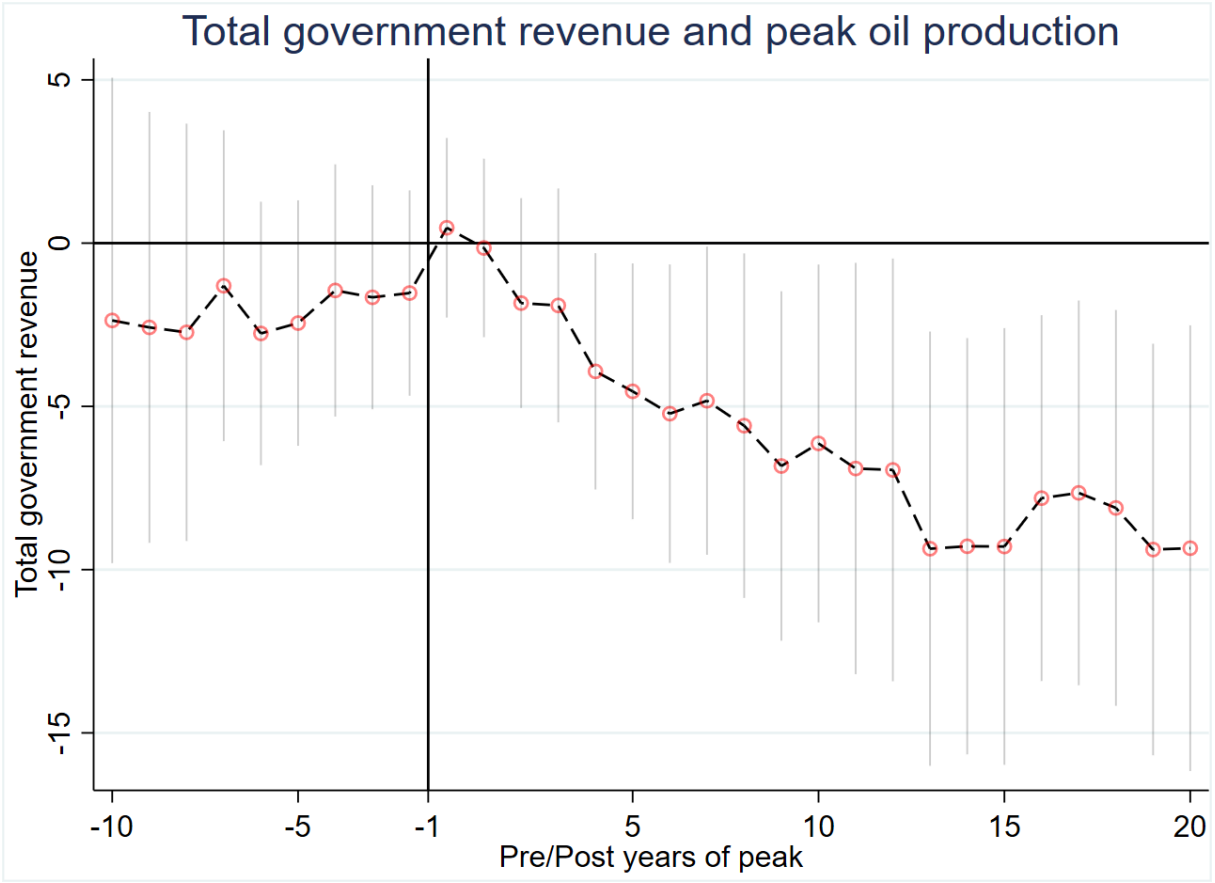

Figure 5: This figure shows the result from regressing eq. [1]. on the outcome of Total Government Revenue. The number of countries observed is 27 (N = 503). The standard errors are clustered on country, and the confidence intervals are at the 95% level.

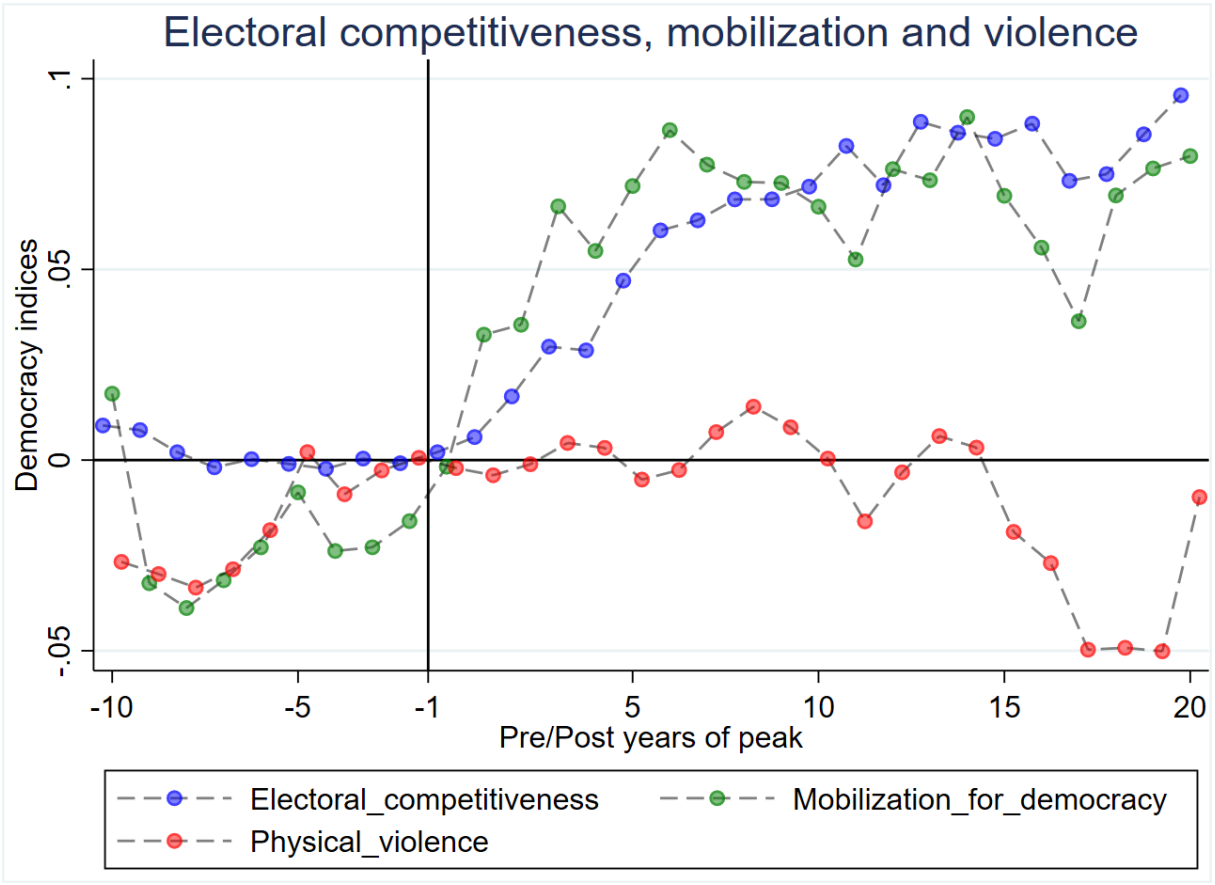

Figure 6: This figure displays the results from regressing eq. [1] on three outcomes from the VDEM data set: the Electoral component index, the Physical violence index, and the Mobilization for democracy indicator. The Mobilization for democracy variable is normalized to go from 0 to 1. There are 36 countries in the regression on Electoral component index, 28 countries in the regression on Mobilization for democracy, and 33 countries in the regression on Physical violence index. If we only include the 26 countries with data for all three indicators the results are largely unchanged; see See Fig. S11

oil curse among the pre-1980 countries, there is clear evidence of an oil curse in the post-1980 group, consistent with the results shown in Fig. 3 and our discussion of those patterns. Moreover, while there is no break in the democracy trend around the peak year ($R = -1$) among the former, there is a clear break from a downward-sloping to a flat democracy trend among the latter, again consistent with Fig. 3. Finally, note that the only signals of a resource curse in the pre-1980 group, albeit not statistically significant, do not start until about 10 years after the peak. As the first peak in this group, in our sample, is in 1969, this implies that 10 years and beyond the peak is from about 1980 and onward—precisely when we would expect to see a resource curse.

Robustness

A key concern in cross-country settings is the potential leverage of statistical outliers. We address this concern by re-estimating our model after removing each country, one at a time. The results are displayed in Fig. S4. There is little change in the results.

Since we normalize each country's oil production by population, our peak might reflect changes in population (the denominator) rather than oil production (the numerator). However, SI Appendix Fig. S5 shows that population trends are statistically unrelated to the timing of the oil peaks.

A common concern with democracy indexes is that they are typically bounded at each end. This is less of a concern with V-Dem's Polyarchy index than other indices due to its construction: there are no observations at either bound (0,1) (Table A1). The minimum country score in our sample is 0.013 while the maximum score is 0.92. Still, the index itself might imply less flexibility for democracy when approaching the (0,1) bounds, hence we re-estimate our

model after removing all countries whose mean democracy scores are below the 10th percentile (Angola, Oman, Qatar, and Saudi Arabia) or above the 90th percentile (Denmark, Ireland, New Zealand, Norway, and United Kingdom). While this leaves us with only 27 countries (N=768), the results are virtually unchanged (Fig. S6).

Finally, two-way fixed effects models with staggered treatment timing are vulnerable to estimation bias due to heterogeneous treatment effects. To address this concern we use the imputation method proposed by Borusyak, Jaravel, and Spiess (Borusyak et al., 2021). The main result is almost unchanged when we use this alternative specification (See Fig. S7).

Discussion and conclusion

Our results suggest a new set of facts about the empirical relationship between countries' oil life-cycles and the accountability of their governments: When oil production starts to decline, democracy tends to improve relative to other oil producing countries. The greater the oil production, the larger the pivot toward democracy, especially when the peak occurs after the 1970s.

The political resource curse is a natural interpretation. It is well-established that oil revenues help keep authoritarian leaders in power (Andersen and Aslaksen, 2013; Robinson et al., 2006; Ross, 2001; Tsui, 2011), that a deterioration in economic prospects can lead to political protests (Della Porta, 2015; Kurer et al., 2019), and that protests in authoritarian states tend to weaken popular support for the ruling regime (Aytaç et al., 2018; Hale and Colton, 2017; Hollyer et al., 2015). Moreover, when oil-funded governments see their revenues decline they may be forced to raise taxes. Prior studies show that tax increases tend to trigger popular demands for greater accountability (Paler, 2013; Prichard et al., 2018; Ross, 2004; Weigel, 2020).

Consistent with these mechanisms, our analysis shows that shortly after the production peak

there is a sharp decline in government revenues and a rise in both the number of pro-democracy protests and the competitiveness of elections. Importantly, these rising democratic pressures are not met with heightened repression. In fact, there is no change in repression for the first decade after the peak; after that, repression declines sharply.

The size of the post-peak shift toward democracy is large, although the small samples produce wide confidence intervals. In our baseline specification including all 36 countries, the democracy score rises about 9 percentage points after 15 years. Among countries that peaked after 1980, the increase was about 13 percentage points. For the countries with more oil production, the post-1980 rise was about 20 percentage points after 15 years and 30 percentage points after 20 years, although the confidence intervals are large.

These changes are substantial. On the 2019 V-DEM Polyarchy index, which covers 179 countries, 13 percentage points represents the distance between the country with the highest score, Denmark (=.9), and the country with the 43rd highest score (Chile=.773); 20 percentage points is the distance between Denmark and the 54th highest score (Namibia=.7), and 30 percentage points is the distance between Denmark and the 77th highest score (Paraguay=.601).

In Figure S8 we show the democracy paths of all 36 countries before and after their oil peaks, clearing for both country and year fixed effects. While there is substantial heterogeneity, 33 of the 36 countries experienced a net gain in democracy 10 years after their peak and just three countries experienced a decline. Some of the largest gains were in Angola, Congo Republic, Hungary, Mexico, Malaysia, Oman, and the United States.

An important threat to causal identification is the possibility that unobserved political events—such as coups, popular unrest, or civil wars—were causing countries in our sample to simultaneously (i) became more democratic and (ii) curtail oil production for the subsequent 10 years.

We believe this is unlikely for two reasons. First, none of these events are likely to cause both more political freedom and less oil production. Events that are violent or disruptive—like civil wars or state failures—might reduce oil production but should not simultaneously improve government accountability. Conversely, peaceful events—like non-violent political mobilization—might improve government accountability but should not lead to declining oil production: gains in democratic governance tend to boost oil sector investment and production (Bohn and Deacon, 2000; Cust and Harding, 2020). Second, we use historical data to assess the political circumstances around the peak years for each country in our sample. We identify 13 potential cases and show that our main results are robust to the simultaneous exclusion of all 13 cases (A3, S10). We conclude it is more likely that post-peak changes in oil production are causing improvements in democratic accountability.

Descriptive Statistics (Main sample)

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	1026	1992.591	14.978	1960	2019
Peak oil production year	1026	1988.37	13.666	1969	2009
Polyarchy-index	1026	.375	.312	.013	.919
Oil production per capita	1026	88.085	197.565	0	1447.984
Mean oil per capita per country	36	62.478	123.063	2.247	661.327

Descriptive Statistics (After 1980)

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	602	2001.729	10.869	1972	2019
Peak oil production year	602	1998.248	8.625	1982	2009
Polyarchy-index	602	.476	.304	.017	.919
Oil production per capita	602	38.019	70.092	0	363.395
Mean oil per capita per country	22	30.243	51.754	2.247	214.473

Descriptive Statistics (Before 1980)

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	424	1979.616	9.389	1960	1999
Peak oil production year	424	1974.347	3.298	1969	1979
Polyarchy-index	424	.231	.263	.013	.881
Oil production per capita	424	159.169	281.013	0	1447.984
Mean oil per capita per country	14	108.245	171.213	3.715	661.327

Table A1: TBA

Supporting Information Appendix (SI)

S1 Country sample Our main sample includes the following countries: Albania, Algeria, Angola, Argentina, Azerbaijan, Bahrain, Cameroon, Congo, Denmark, Ecuador, Egypt, Equatorial Guinea, Gabon, Hungary, Indonesia, Iran, Iraq, Ireland, Libya, Malaysia, Mexico, Netherlands, New Zealand, Nigeria, Norway, Oman, Qatar, Romania, Saudi Arabia, Suriname, Syria, Tunisia, UAE, United Kingdom, United States, and Yemen.

S2 Locally random peaks A production peak is the result of a combination of historic economic and policy decisions, reservoir-specific characteristics and, potentially, major political events. The exact timing of a single field's peak depends on a series of government decisions to sanction exploration, attract investment, distribute licenses, and negotiate contracts; a pro-

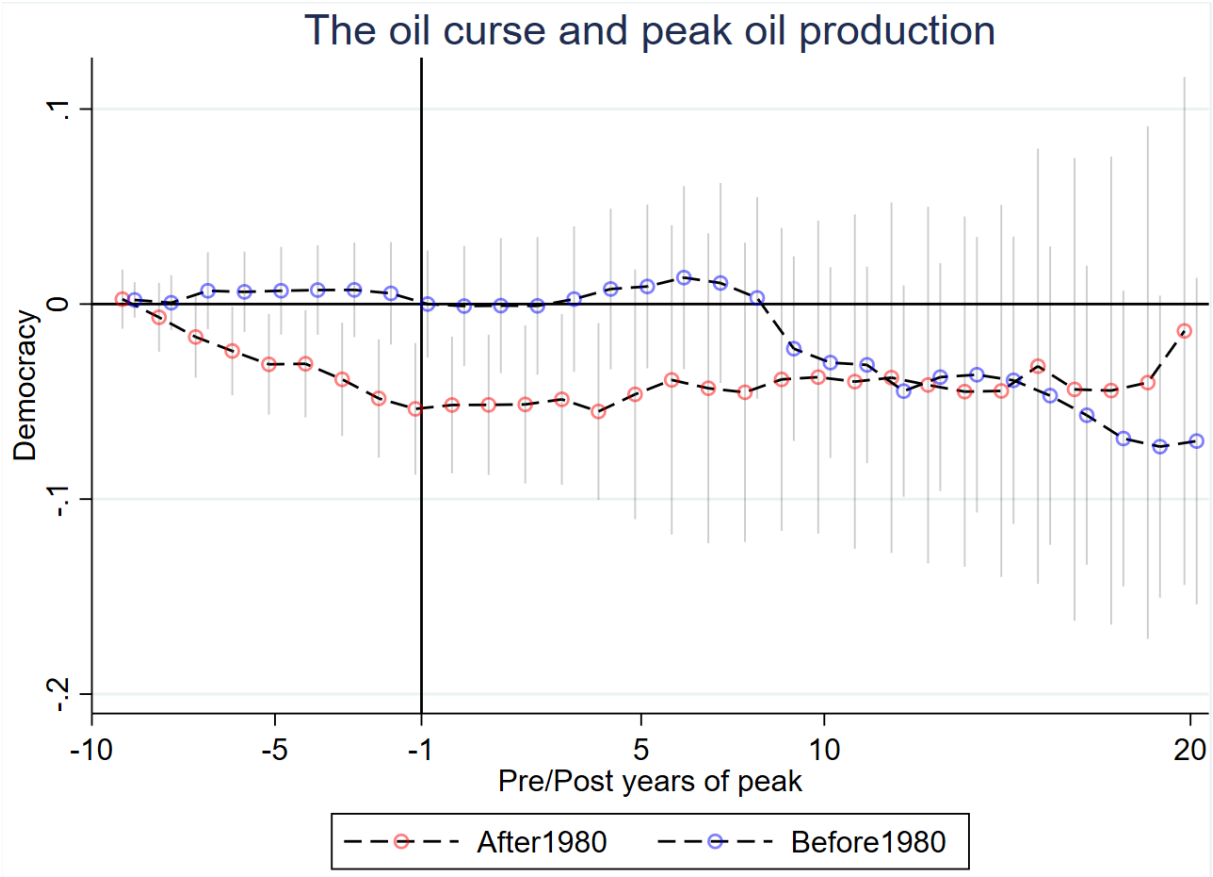

Figure S1: This graph depicts the estimated coefficients of eq. [1], with the addition of β_{-1} and removal of β_{-10}, over two different subsamples: Countries that have peak before 1980 (14 countries), and countries that peak after 1980 (22 countries). The control group consist of all *non* oil producing countries, in total 106 countries. The standard errors are clustered on country, and the confidence intervals are at the 95% level.

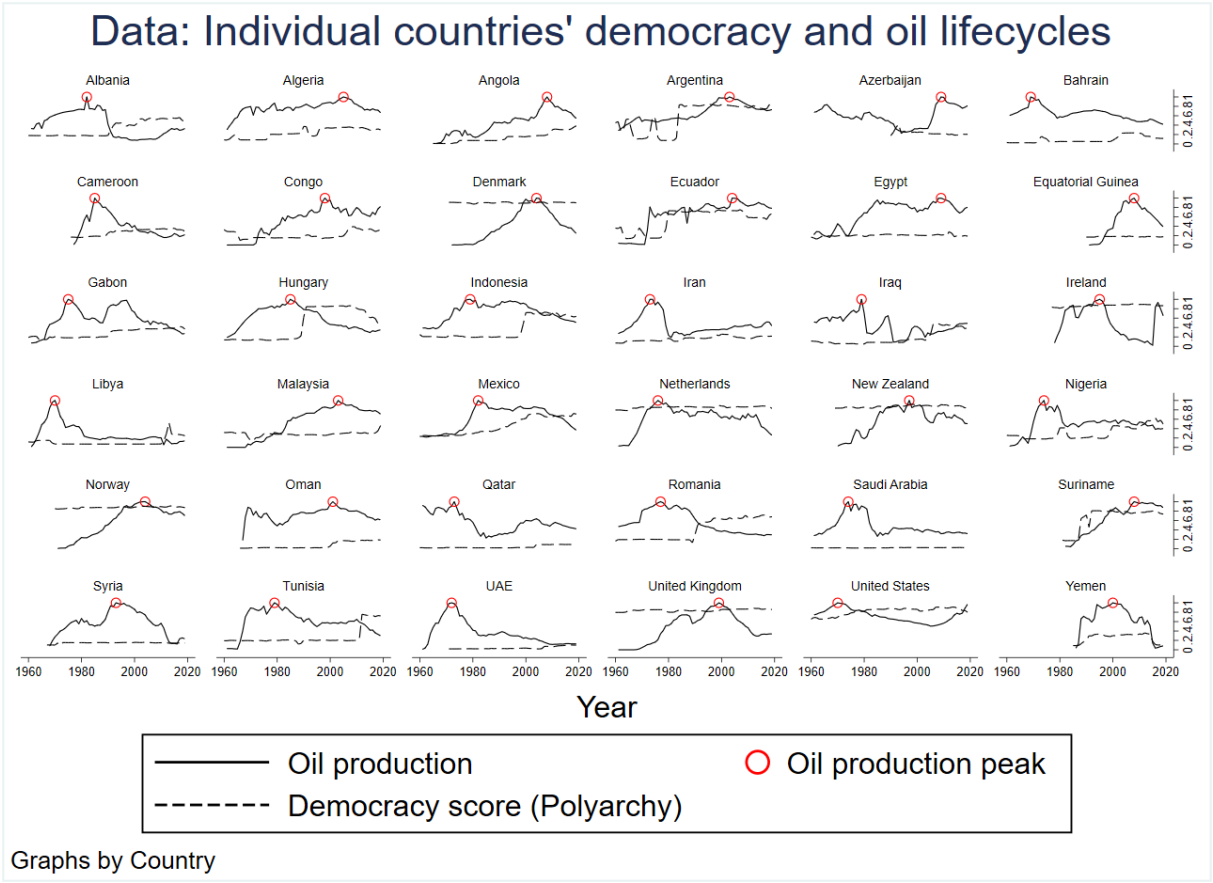

Figure S2: In this figure we report the Democracy (Polyarchy index) and oil production series all 36 countries included in our main sample. The y-axis is the Democracy score. The red circles show the year of the production peak for each country.

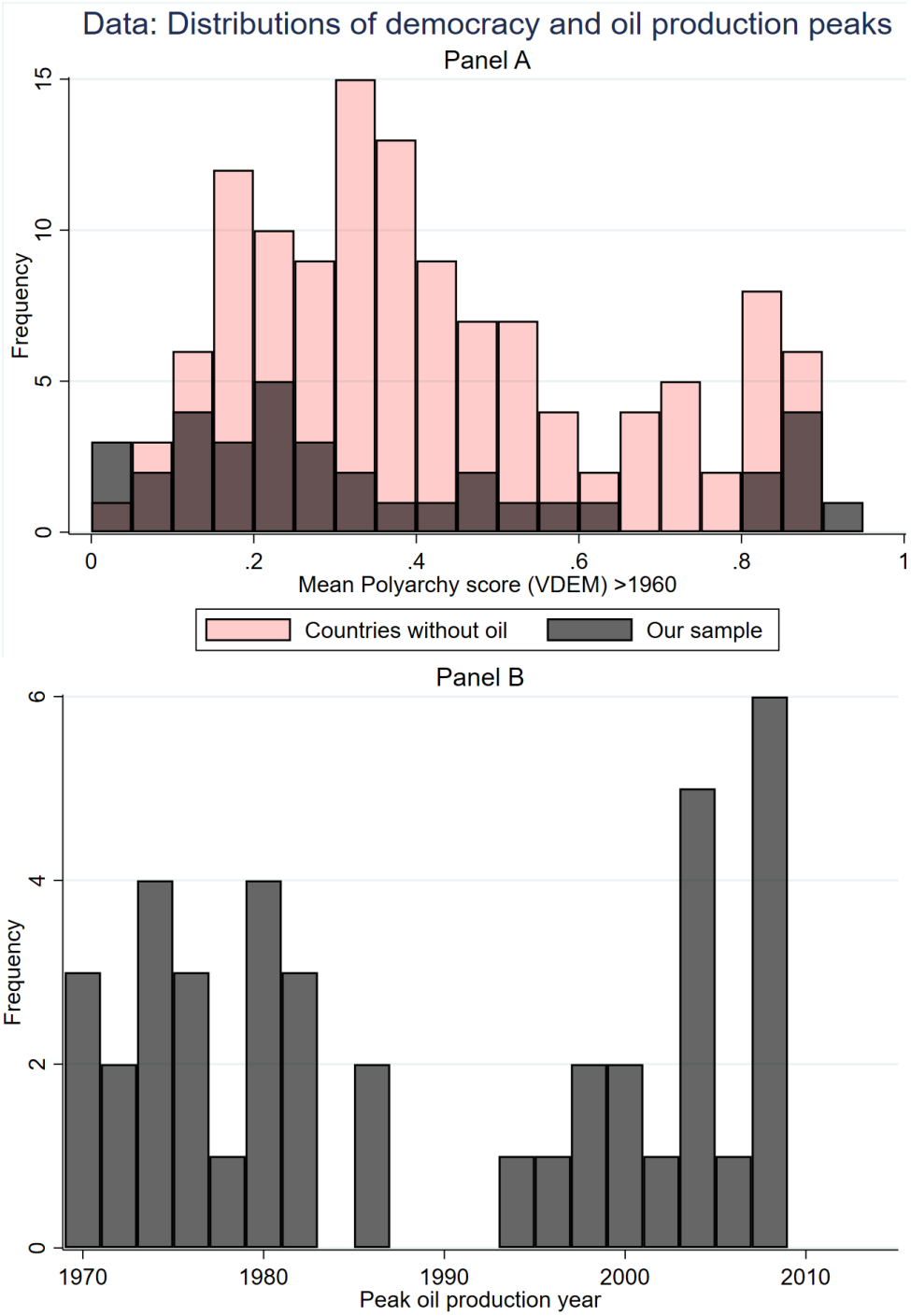

Figure S3: Panel A shows the distribution of mean democracy score (Polyarchy index) by country, over our sample period. The pink distribution includes all country not included in our main sample (110 countries). The grey distribution includes countries in our main sample (the 36 countries used in estimation, which produce the result reported in Fig. 2. Panel B reports the distribution of peak oil production year over our main sample.

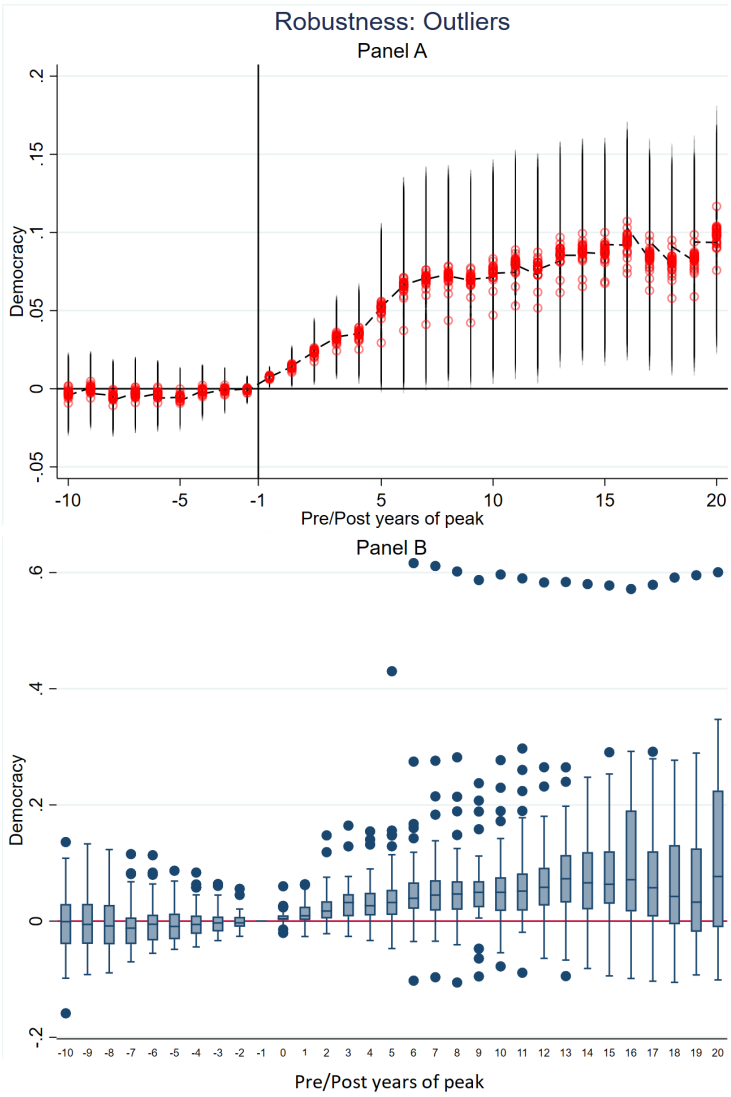

Figure S4: Panel A reports how our results react to removing one country out of the sample used for estimation. In total we estimate eq. [1] 36 times, each with a different country left out of the sample, with all estimates reported. Confidence interval reported at 95% level. Standard errors calculated by clustering on country.Panel B shows the within-country and - year variation used to estimate the β's in eq. [1]. To create the graph we start by estimating eq. [1]. Next, we add the estimated β-values together with the residual variation for each country. This leaves us with a series for each country cleared for year-FE and country-FE. We have also normalized the democracy score to $t = -1$. Except for the normalization, this graph corresponds to Fig. S8, where we have split the series by country. Each box at a given reference year include values between 25th and 75th percentiles. The median value is indicated by the line within the box. The whiskers and points are adjacent and outside values according to definition used by (Tukey et al., 1977)

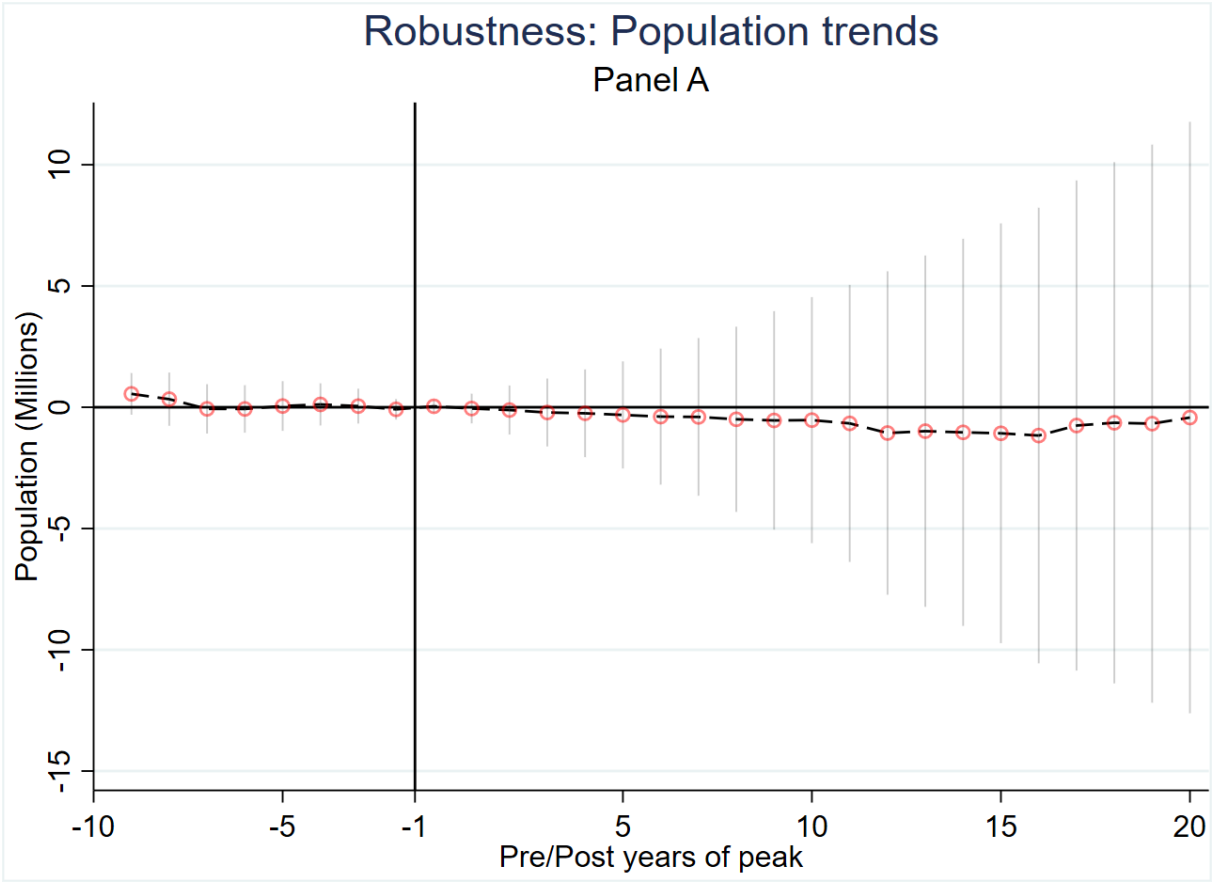

Figure S5: This figure reports the result of eq. [1] with added the restriction $\beta_{10} = 0$ on population (in millions) as the outcome variable. The standard errors are clustered on country, and the confidence intervals are at the 95% level.

Main result (Fig. 2): Estimates							
t = -10	-0.003	t = 1	0.014	t = 11	0.079	constant	0.314
	(0.011)		(0.006)		(0.031)		(0.034)
t = -9	-0.000	t = 2	0.023	t = 12	0.077	**#obs**	1,026
	(0.011)		(0.009)		(0.031)		
t = -8	-0.005	t = 3	0.032	t = 13	0.085	**#groups**	36
	(0.010)		(0.011)		(0.031)		
t = -7	-0.003	t = 4	0.035	t = 14	0.087	**year-FE**	Yes
	(0.010)		(0.013)		(0.031)		
t = -6	-0.003	t = 5	0.051	t = 15	0.087	**country-FE**	Yes
	(0.010)		(0.023)		(0.031)		
t = -5	-0.005	t = 6	0.065	t = 16	0.093		
	(0.008)		(0.030)		(0.032)		
t = -4	-0.001	t = 7	0.069	t = 17	0.084		
	(0.008)		(0.031)		(0.031)		
t = -3	-0.000	t = 8	0.071	t = 18	0.080		
	(0.006)		(0.030)		(0.030)		
t = -2	-0.001	t = 9	0.069	t = 19	0.083		
	(0.004)		(0.030)		(0.031)		
t = 0	0.007	t = 10	0.074	t = 20	0.098		
	(0.003)		(0.031)		(0.032)		

Table A2: This table shows the estimated coefficients corresponding to Fig. 2. The standard errors are clustered on country, and the confidence intervals are at the 95% level.

duction cycle that depends on reservoir size, well pressure, and other geological characteristics; and decisions by investors, well operators, and government officials about the pace of extraction and subsequent investments that could, for example, expand the reservoir or increase the well pressure.

While oil and gas exploration and discoveries are sensitive to policy (Ahlvik et al., 2022), subsequent production profiles are less so (Anderson et al., 2018), suggesting that a country's aggregate production profile is determined by a complex combination of random and deterministic factors. For every field, each of these events is subject to delays and disruptions produced by changes in local, national, and international conditions. As a result, the peak of a country's aggregate production profile—which is the sum of each field's production profile—is dynamic and difficult to predict with any precision. In our analyses, we therefore treat the exact year of a country's production peak as locally random (relative to our 30 year event window). As an

illustrative example we have in Fig. S9 plotted the production profiles of 201 separate fields in Nigeria, along with the aggregate production profile.

S3 Staggered Difference-in-Difference: Recent econometric research shows that a restricted Two-Way-Fixed-Effect (TWFE) model with staggered treatment can produce biased results if there are heterogenous treatment effects (Callaway and Sant'Anna, 2021; Sun and Abraham, 2021; Wooldridge, 2021). We address this concern by using the imputation method proposed by Borusyak, Jaravel, and Spiess (Borusyak et al., 2021).

Alternative solutions rely on increasing the flexibility of the model (Callaway and Sant'Anna, 2021; Sun and Abraham, 2021; Wooldridge, 2021). Since we have a setting with small treatment-time-cohorts and many treatment times (36 countries with 23 different treatment years), increased flexibility puts too much strain on our data.

The imputation method follows a two-stage procedure. In the first stage we use not-treated observations to impute the unit- and year-fixed effects using a TWFE-regression without the treatment dummy. In the second stage we subtract the imputed values on the outcome series and use a weighting scheme to produce a single coefficient for each treatment period. We have used OLS-weights in the second stage. The result of this exercise is shown in Fig. S7. The point estimates are highly similar to those in Fig. 2. Since the imputation method requires non-treated observations we end the sample period in 2008 (in 2009 are all countries treated).

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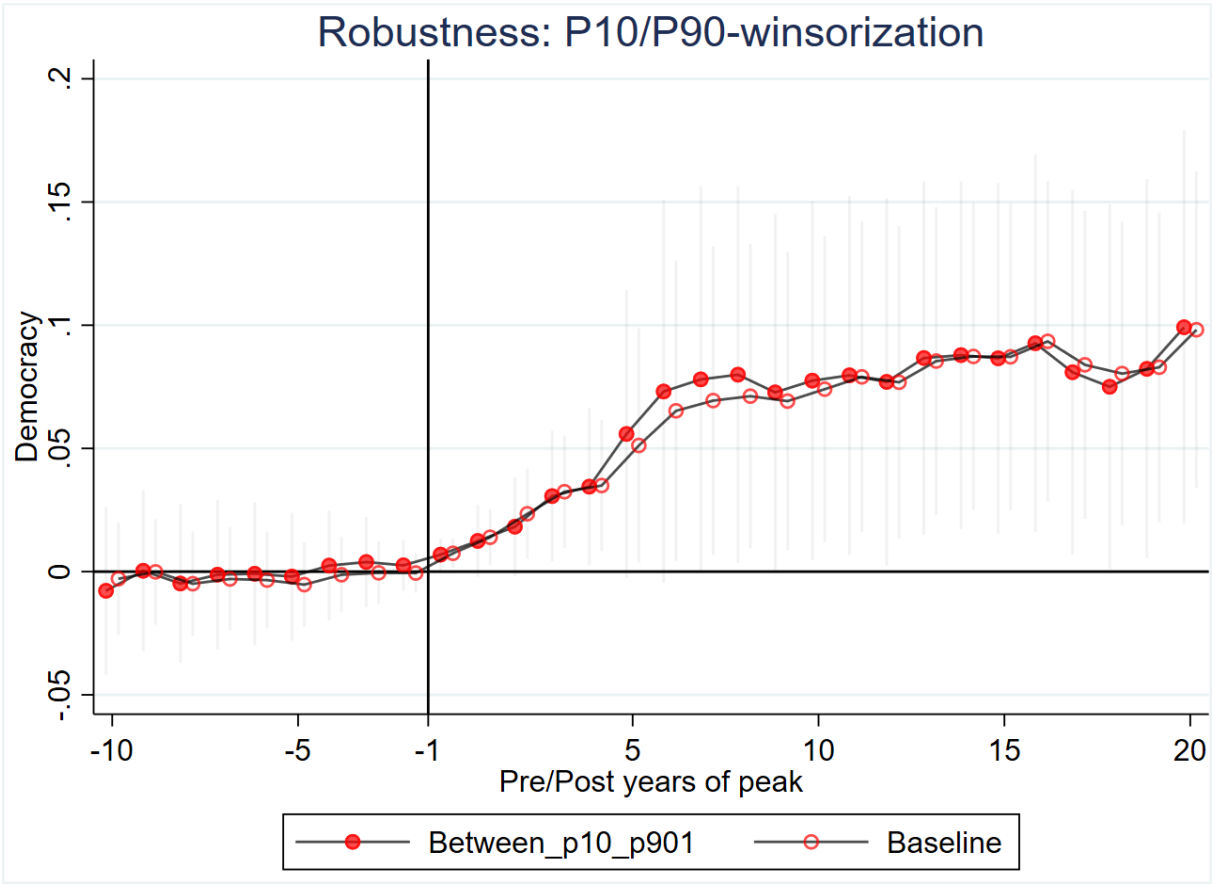

Figure S6: The red circles shows the point estimates when exclude countries whose democracy scores are below the 10th or above the 90th percentile in our main sample. The countries excluded are: Angola, Denmark, Ireland, New Zealand, Norway, Oman, Qatar, Saudi Arabia and United Kingdom. This leaves us with 27 countries (N = 768). The pink circles shows the point estimates from our main result, corresponding to fig. 2. The standard errors are clustered on country, and the confidence intervals are at the 95% level.

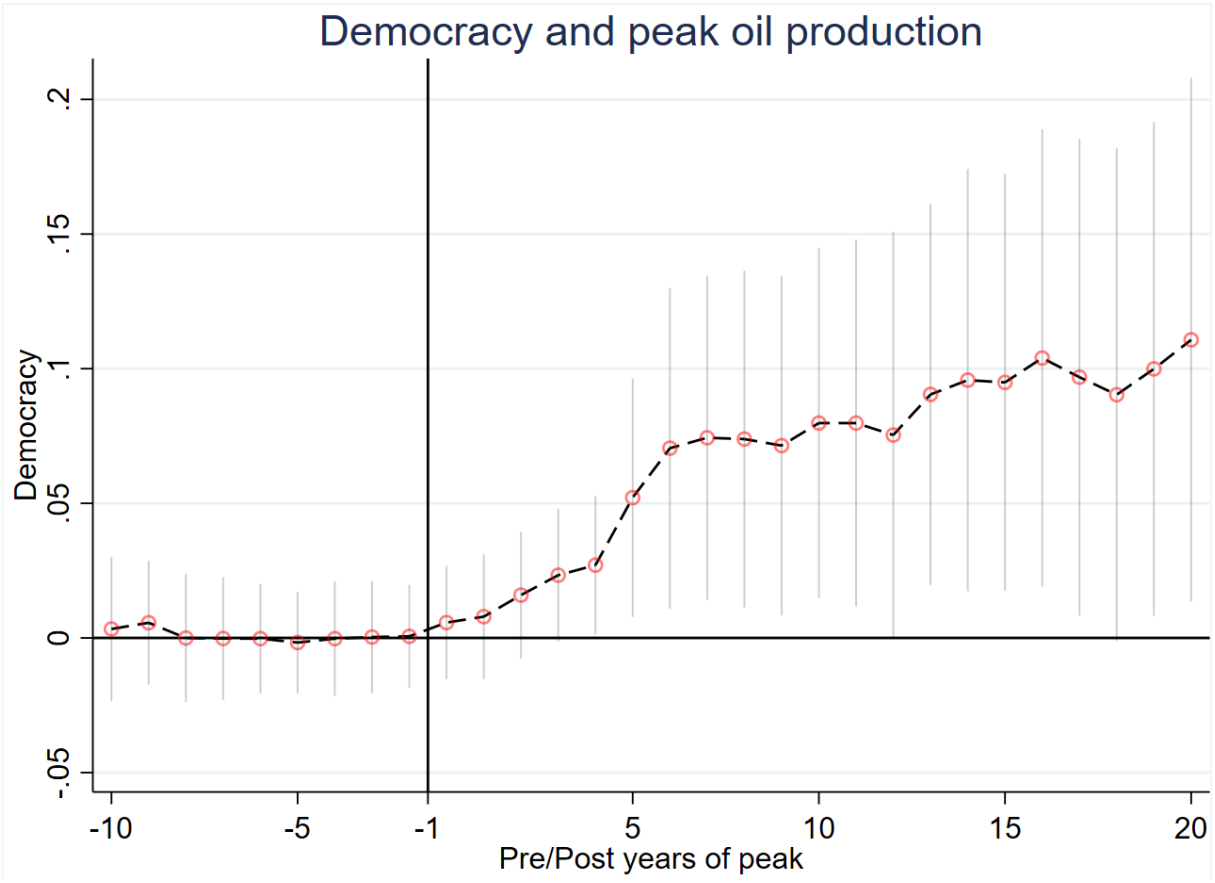

Figure S7: The graphs shows the β-coefficients using the imputation method proposed by (Borusyak et al., 2021). The method is robust to staggered treatment timing and heterogeneous treatment effect across units and time. The sample includes all 36 countries, however, we have restricted the study period to 1960 - 2008. This is done to ensure that we have imputed values for all periods in the sample. The standard errors are calculated by 1000 bootstrap replications.

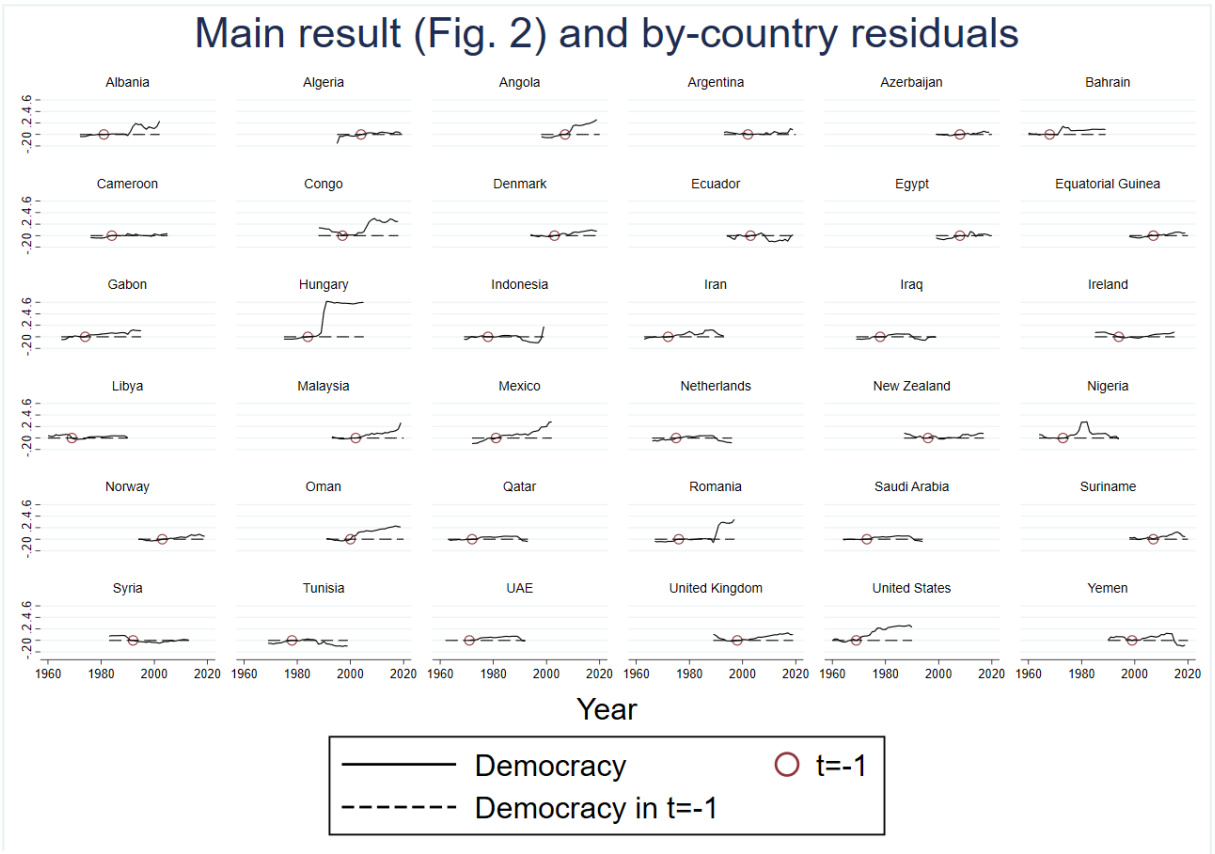

Figure S8: This figure is created by first estimating eq. [1], and then adding the estimated pre and post-peak coefficients (the β's) together with the residual variation for each country, creating separate series for each country. The series is therefore cleared for country- and year-FE, making it possible to visually inspect the within-country variation that makes up the estimated coefficients presented in our main result (fig. 2).

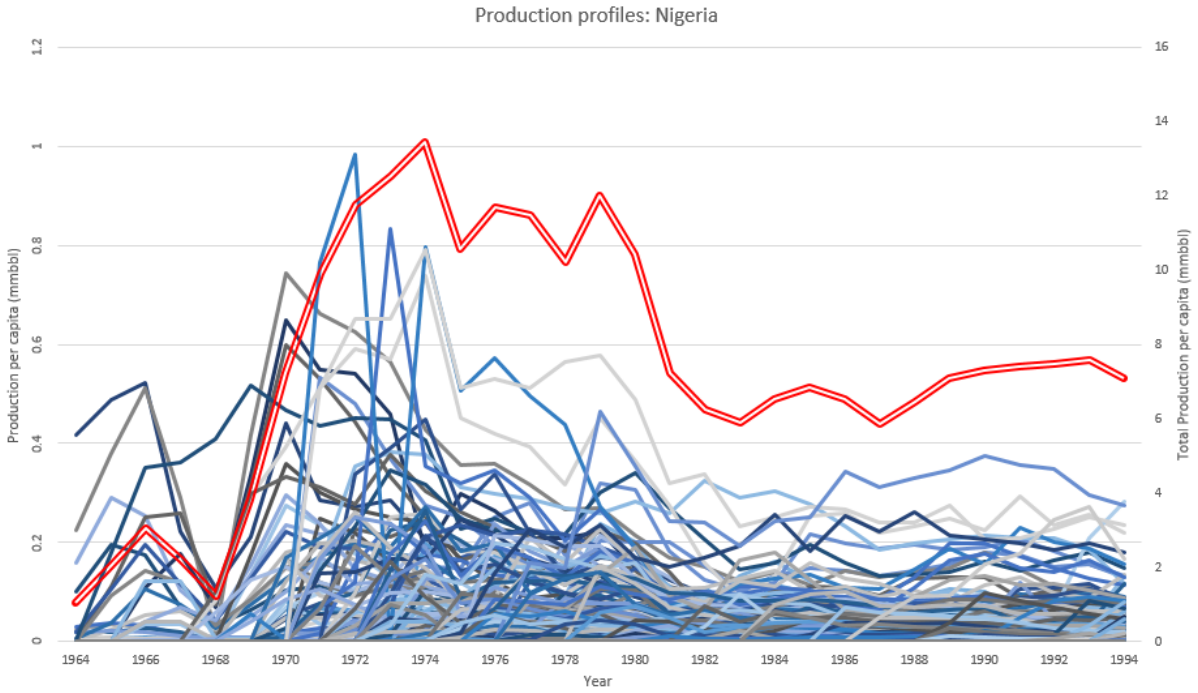

Figure S9: This figure depicts field specific production profiles per capita of Nigeria over our sample period, ten years before the peak and twenty years after the peak in 1974. The red thick line is total (aggregated) production per capita in a given year, corresponding to the values on the right y-axis. The number of fields are 201.

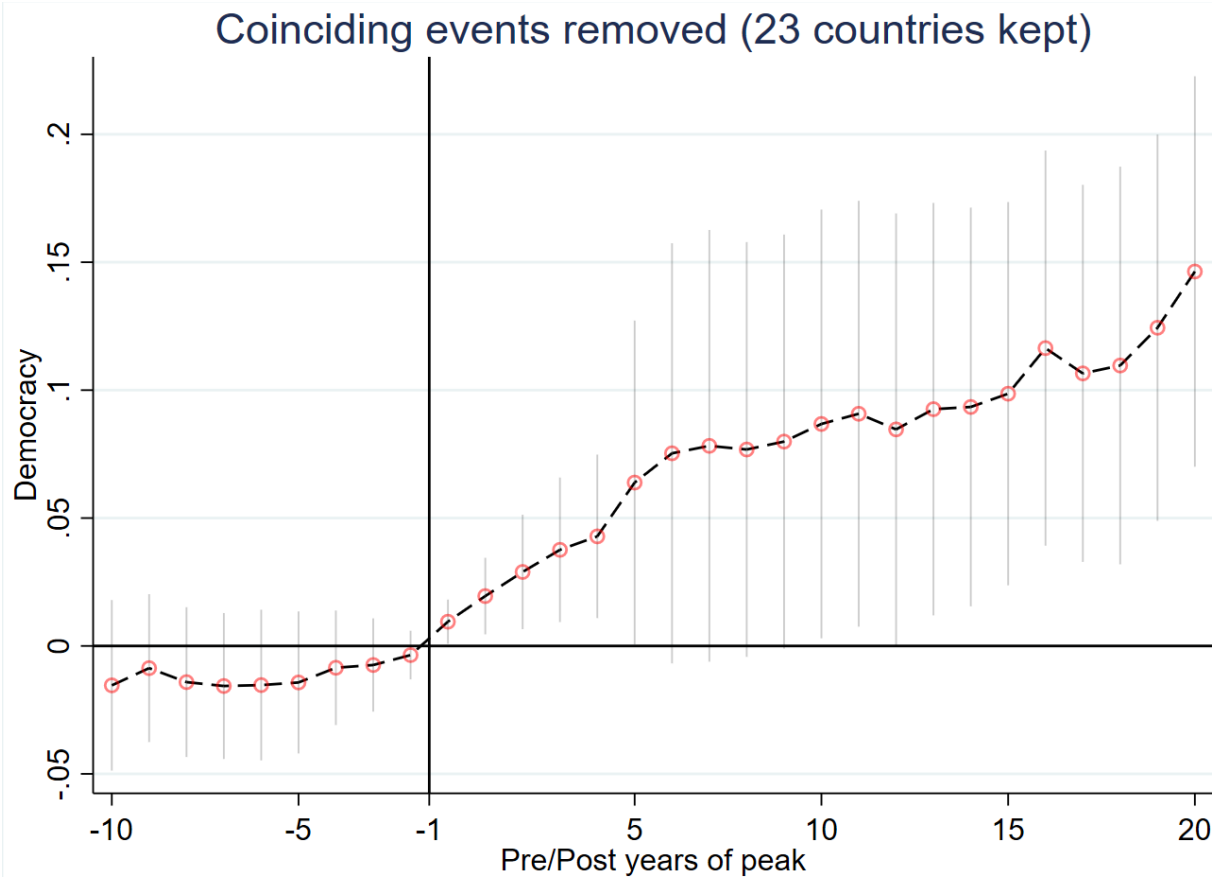

Figure S10: This graph depicts the estimated coefficients of eq. [1], when we remove countries with coinciding events that we asses to have the potential to influence democracy. In total we have 23 countries, meaning that removed 13 countries. In table A3 we have reported which countries we have removed, and why. The standard errors are clustered on country, and the confidence intervals are at the 95% level.

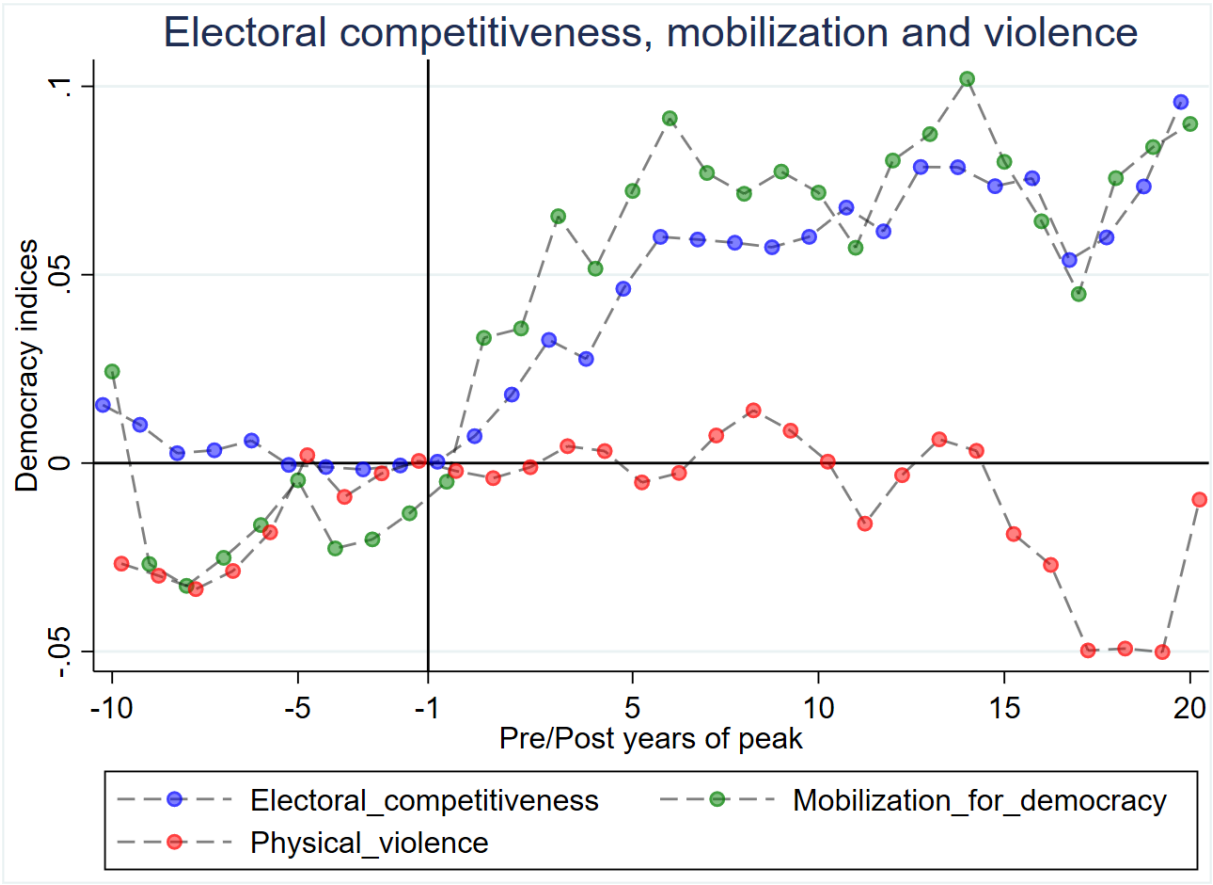

Figure S11: In this figure we report the results from regressing eq. [1] on three outcomes from the VDEM data set: Electoral compent index, Physical violence index and Mobilization for democracy. We have restricted the sample to only include the countries for which we have data on all three outcome variables. Twenty-six countries are included in the sample.

Countries removed	Peak production year	Event	Coinciding event year
Libya	1970	Military coup by Gaddafi	1969
UAE	1972	Full independence	1971
Iran	1973	Oil-crisis	1973
Qatar	1973	Oil-crisis	1973
Nigeria	1974	Coup	1975
Saudi Arabia	1974	Oil-crisis	1973
Iraq	1979	Iraq-Iran war	1980 - 1988
Mexico	1982	Economic crisis	1982
Ireland	1995	Ceasefire: IRA and Loyalist	1994
Congo	1998	Armed conflict	1998
Yemen	2000	Terrorist attack on US naval vessel, and 9/11	2000 and 2001
Oman	2001	9/11	2001
Egypt	2009	Arab spring	2010/2011

Table A3: This table shows the countries we have identified as having a coinciding event that have the potential to influence democracy.

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