Oil Bonanza and the Composition of Government Expenditure

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Abstract

Government behavior can be impacted by the benefits arising from natural resources. Benevolent government and political leaders may use them to improve the welfare of people, whereas non-benevolent ones may use them for their own interest. As an attempt to examine the effects of the oil bonanza on government behavior in a comprehensive manner, the current study investigates how giant oilfield discoveries affect the size and composition of government expenditure using the data of 148 countries between 1972 and 2008. We find that giant oilfield discoveries significantly increase total government expenditure in the medium and long term, although they do not have an impact in the short term. We also obtain evidence that democracy plays a mediating role in these effects; if the democracy level in a country is mature, the size of total government spending does not increase even when discovering giant oilfields. Considering each category of government expenditure, giant oilfield discoveries significantly increase expenditure on defense and general public services, whereas they decrease expenditure on public order and safety, and economic affairs. Furthermore, giant oilfield discoveries do not have a significant impact on social spending including health, education, and social protection. Finally, giant oilfield discoveries increase the net implicit gasoline subsidy in the long term. These findings enhance our understanding of the effects of oil bonanza on government behavior.

Keywords: Resource curse; Petroleum; Government expenditure
JEL Classification: H10; H50; O13

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1 Introduction

There have been debates in the "resource curse" literature about whether natural resources are a curse or a blessing for a country.[1] Proponents of the resource curse hypothesis have indicated that the endowment of natural resources can have negative consequences on the socio-economy and politics of a country. One notable negative consequence, the widely known "Dutch disease," is a phenomenon that explains possible negative effects of resource abundance on an economy. Resource revenue will induce currency appreciation, causing contraction of the manufacturing sector (Corden and Neary, 1982). As a seminal study in this regard, Sachs and Warner (1995) show that natural resource abundance lowers economic growth, and provide a supportive view of Dutch disease. Overestimating revenue from natural resources can lead to overconsumption for unproductive purposes (Weil, 2013). This temptation for increasing consumption may cause persistent budget deficits, and have an adverse effect on the economy of a country. In addition to its negative impacts on a country's economy, natural resource abundance can also have toxic effects on politics or institutional quality (e.g., Ross, 2001; Bulte et al., 2005).[2] Lucrative revenues from natural resources can lead to an increase in rent-seeking activity and corruption, or possibly armed conflicts, as experienced by countries such as Nigeria and Sierra Leone. However, other research argues that resource abundance does not necessarily lead to adverse consequences. Some recent studies such as Alexeev and Conrad (2009) and Smith (2015), argue that natural resources have a positive impact on economic development. These different streams of research in the literature indicate that the effects of natural resource abundance are not straightforward. Given the differing views, research on socioeconomic and political effects of resource abundance is important and worth being pursued.

Many studies have focused on examining the effects of natural resource endowments on economic development and the quality of institutions. In an attempt to provide new evidence, the current study provides an investigation on the impacts on government behavior (i.e., government expenditure), which has not been sufficiently addressed by previous studies. In general, the government of natural resource-rich countries depends heavily on revenues from natural resources. For example, in Nigeria, oil has accounted for 70–85 percent of all government revenues and 90–95 percent of all foreign exports since the 1970s (Amundsen, 2017). Because of this high dependency, natural resources can undoubtedly play an important role in shaping government behavior. Motivated by such a possibility, the current study comprehensively investigates how natural resources affect the size and composition of government expenditure.

The current study differs from previous ones and contributes to the literature in several aspects. First, we investigate the detailed effects of natural resources on the size and composition of government expenditure.[3] One may note that these effects are not necessarily clear, depending on a country's socio-economic and political environment. If natural resource companies are completely state-owned, government revenues as a share of gross domestic product (GDP) are likely to

[1] van der Ploeg (2011), Frankel (2012), and Venables (2016) provide a detailed survey on the resource curse.

[2] Ross (2015) reviews toxic effects of natural resources on politics and insists that the windfall of revenues from natural resources, specifically petroleum, negatively affects the quality of governance in a country.

[3] Shelton (2007) comprehensively investigates the determinants of government expenditure, although he does not consider the role of natural resource.

increase. Alternatively, if resource companies are completely private-owned, the natural resource windfalls do not necessarily increase government revenues to a large degree. Government revenues also depend on royalties and taxes imposed by the government. The impacts of natural resources on the composition of government expenditure are also ambiguous. Some studies examine their impacts on specific government expenditure, e.g., military expenditure (Cotet and Tsui, 2013; Ali and Abdellatif, 2015), health expenditure (Gylfason, 2001), and educational expenditure (Cockx and Francken, 2014, 2016). In an attempt to provide new evidence and a significant extension, our study uncovers government fiscal behavior in a more comprehensive manner and focuses on seven specific expenditures: defense, public order and safety, general public services, economic affairs, health, education, and social protection. This type of detailed investigation can provide more insights into the relationship between natural resources and government behavior. Various policy implications may arise from the results of our study.

Second, the current study focuses on the effect of giant oilfield discoveries. Since giant oilfield discoveries result in the variation of resource windfalls in an exogenous manner, as pointed out by Lei and Michaels (2014), a focus on it allows us to avoid the possibility of biased estimation results caused by endogeneity problems. As a proxy for resource dependence, previous studies have analyzed natural resource exports, natural resource rents, and natural capital wealth. When examining the impacts on government expenditure, using these measures can result in endogeneity problems such as simultaneity and reverse causality. These issues should be addressed since it can cause biased estimation results, and result in incorrect implications. Our identification approach addresses this by using giant oilfield discoveries as a proxy for resource windfalls, which are exogenous shocks.

Third, the current study considers a mediation role of democracy on the impacts of natural resource on the size and composition of government expenditure. Democratization generally extends franchise to poor citizens, and as a result, nurtures a redistribution policy (Meltzer and Richard, 1981). Furthermore, the consolidation of democracy emphasizes the checks and balances on government behavior. The government in a more democratic country generally gives itself less decision-making power. We investigate how the democracy level of a country holds its government accountable and maintains transparency for its people regarding expenditure. This examination can provide important implications regarding the role of democracy.

Our study is closely related to previous studies on the relationship between natural resources and overall government expenditure. Arezki et al. (2011) find that an increase in resource windfalls causes more government spending and its impact is larger in autocratic countries.[4] Caselli and Michaels (2013), using Brazilian municipalities' data, show that resource windfalls increase municipal revenues and spending on public goods and services, although household income does not necessarily increase. Furthermore, previous studies examine the relationship between natural resources and specific government expenditure such as military, education, and health. We note that the results are not simply comparable because they use different proxies for natural resources and different estimation methodologies. In previous literature, there has been discussion about the effect of natural resource abundance on military expenditure.[5] Cotet and Tsui (2013) show that

[4] Arezki et al. (2011) define government spending as government expenditures as a share of non-resource GDP.

[5] Another strand of literature looks at the relationship of the resource abundance and civil war. For instance,

whereas oil discoveries do not necessarily increase the likelihood of political violence, they increase military expenditure in non-democratic countries. Ali and Abdellatif (2015) investigate this relationship by using the data on the Middle East and North Africa countries and show that oil and forest rents increase military expenditure, but coal and natural gas rents decrease it. However, their study does not sufficiently address the causality issue; natural resource rents may not be an exogenous variable of military expenditure. In addition, several studies focus on the political determinants of military expenditure (Albalate et al., 2012; Nordhaus et al., 2012; Töngür et al., 2015). Some studies investigate the effects of natural resource abundance on government expenditure for education and health. Gylfason (2001) shows that natural resource abundance has negative impacts on educational inputs, outcomes, and participation. Cockx and Francken (2014, 2016) find evidence that natural resource abundance significantly decreases public health spending and public education expenditure. Finally, Bhattacharyya et al. (2017) find that resource discoveries do not have any impact on revenue decentralization and they lead to expenditure centralization.

The current study also contributes to the literature on the relationship between political regime and government expenditure. Easterly and Rebelo (1993) indicate that the political system does not influence fiscal variables except revenue used for aid. Furthermore, Mulligan et al. (2004) show that as democracy matures, military expenditure decreases but nonmilitary government consumption, education spending, and social spending remain the same. Kotera and Okada (2017) investigate how democratization affects the size and composition of government expenditure and present evidence of how democratization increases military expenditure and decreases health expenditure, while not having an impact on total government expenditure. Nelson (2007) shows that more expenditure on education and health is assured in a democratic regime, however, this increase does not necessarily guarantee better education and health outcomes without more institutional reforms in a democratic trend. Profeta et al. (2013) show that democracy does not necessarily have significant impact on tax revenue and tax composition when controlling for countries' fixed effects.

Using the data of 148 countries between 1972 and 2008 for the estimation, the main findings of our study are summarized as follows. While oilfield discoveries do not impact total government expenditure in the short run, they significantly increase it in the medium to long run. In addition, democracy has a mediating effect on this increasing impact. Specifically, if the democracy level in a country is mature, the government size does not increase even when giant oilfields are discovered. This finding may indicate that checks and balances in a democratic system are functioning as a factor that constrains a government's temptation to increase its expenditure. Considering each category of government expenditure, giant oilfield discoveries significantly increase expenditure on defense and general public services, whereas they decrease expenditure on public order and safety and economic affairs. Furthermore, giant oilfield discoveries do not have a significant impact on social spending including health, education, and social protection. Finally, giant oilfield discoveries increase net implicit gasoline subsidy in the long term.

Collier and Hoeffler (1998) find that natural resource abundance significantly increases the duration and occurrence probability of civil wars. Morelli and Rohner (2015) indicate that natural resource concentration plays a significant role in contributing to the incidence of civil wars. Berman et al. (2017) use geographical data on mining extraction in Africa and show that mining has a positive impact on conflict at the local level.

The remainder of this paper is structured as follows. In section 2, we explain estimation methodology and data. Section 3 presents the estimation results and the corresponding discussion. Section 4 presents our conclusion.

2 Estimation methodology and data

To examine the effects of giant oilfield discoveries on the size and composition of government expenditure, an unbalanced panel dataset is created, using annual data of 148 countries between 1972 and 2008. Table A1 in the Appendix indicates the countries included in our sample. The estimation equation is specified as follows.

$$\ln(y_{it+j}) = \beta_1 D_{it} + \beta_2 DY_{it} + \boldsymbol{\gamma}'\mathbf{X}_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

where subscripts i and t represent a country and year, respectively. μ is a country-specific effect; λ is a year-specific effect; and ε is an error term. To examine the effects of giant oil discoveries on future expenditure, year counter $j \in \{0, 2, 4, 6, 8, 10\}$ is considered. In corresponding estimations, y represents total government expenditure, various categories of government expenditure as shares of GDP, and net implicit gasoline subsidy. D is a dummy variable for giant oilfield discoveries in a given year. DY measures the number of years with giant oilfield discoveries from $t-10$ to $t-1$. The definitions and sources of data on total government expenditure, each category of government expenditure, and giant oilfield discoveries will be explained in more detail later. Vector $\mathbf{X}$ consists of various variables including a constant term, a dummy variable reflecting the accrual basis of accounting, and other necessary control variables. Following previous studies, the necessary control variables include real GDP per capita, trade openness proxied by share of the sum of exports and imports in GDP, total population, share of the population aged 0-14 in total population, and share of population aged 65 and above in total population. Natural logarithm is taken for all control variables except discovery, discovery-years, democracy, and a dummy for the accounting system. Based on Wagner's law (e.g., Easterly and Rebelo, 1993), the pattern of government expenditure (i.e., its size and its composition) changes depending on levels of economic development. Trade openness, as indicated by Rodrik (1998), can have a positive relationship with the government size (i.e., the government expenditure). As for population, whereas a larger size may result in the increase in people's variety of preference of public services, it also leads to the decrease in per capita investment cost on public goods due to non-rivalness characteristics of public goods (Alesina and Wacziarg, 1998). Such contrasts result in the ambiguous effect of the population size on public expenditure. Population structure can have impacts on public expenditure as well. A higher share of both younger and older people in a total population can increase welfare-related expenditure such as health, education, and social protection.

The current study uses an indicator for giant oilfield discoveries available in Lei and Michaels (2014) as the proxy for natural resource endowment. They construct the indicator until 2003, based on the data in Horn (2003, 2004). They define discovered oilfield as a giant oilfield when the stock of the ultimate recoverable reserves (URR) of the oilfield contains the equivalent of 500 million

barrels of oil or more. The choice of natural resource indicator is diverse in the literature. For instance, Sachs and Warner (1995) employ natural resource exports; Cotet and Tsui (2013) use oil wealth per capita; Ali and Abdellatif (2015) and Okada and Samreth (2017) consider various natural resource rents; Bhattacharyya and Hodler (2010) choose per capita rent from energy, minerals and forestry. However, using these measures can create endogeneity issues because natural resources are not randomly distributed among countries. Giant oilfield discoveries suggested by Lei and Michaels (2014) can be a better indicator. They state that "in a panel of countries, controlling for country and year fixed effects, the timing of giant oilfield discoveries is plausibly exogenous, at least in the short-medium run," because "prospecting for oil is highly uncertain, and the odds of finding a giant oilfield are usually low, so countries have little control over the timing of such finds."

The data for government expenditure are adopted from Kotera and Okada (2017). Following Acosta-Ormaechea and Morozumi (2017), we combine two databases to generate a longer panel dataset of government expenditure. One is the Historical Government Finance Statistics (GFS) provided by the International Monetary Fund (IMF, 2005) and another is the Government Finance Statistics, also taken from IMF (2013). The Historical GFS is generated from the Government Finance Statistics Manual (GFSM)1986. Its sample period is from 1972 to 1989. The GFS is based on GFSM 2001 and its available sample period is from 1990 onwards. Merging GFSM 1986 and GFSM 2001 into one dataset needs some adjustment, as explained by Kotera and Okada (2017), since the two databases apply different methodologies.[6] The first adjustment is the unification of the different classifications of the government expenditure categories in the Historical GFS and GFS. Adopting the approach in Wickens (2002), categories in the Historical GFS are adjusted to those in GFSM 2001. As a result, we have ten categories in our study, which include total government expenditure and other main subcategories. These subcategories include expenditures on defense, public order and safety, general public services, economic affairs, health, education, and social protection. The second adjustment relates to the different accounting bases of GFSM 1986, which adopts cash basis, and GFSM 2001, which adopts accrual basis for developed countries. Seiferling (2013) argues that merging these databases should not be problematic in practice. He also suggests the inclusion of a dummy variable to capture any possible systematic heterogeneity when combining such databases. Following this, a dummy for accounting with accrual basis is considered in our study. Moreover, accrual basis is used when both accounting bases are reported at a given year in the GFS. The third adjustment is to use consolidated central governments data for both databases for consistency. The last adjustment is to convert the government expenditures in the Historical GFS database into GDP shares, by using GDP data obtained from the World Economic Outlook Databases provided by the IMF (1999).

Regarding the other data, Ross et al. (2017) construct data for net implicit gasoline subsidy, as the difference between the local price and the benchmark price in constant 2015 US dollars per liter. World Development Indicators (World Bank, 2017) provide the data for real GDP per capita, trade openness (i.e., share of the sum of exports and imports in GDP), total population, population shares between the ages of 0 to 14, and 65 and over in the total population. The data for democracy

[6]More detailed explanation on the differences between GFSM 1986 and GFSM 2001 is provided in Wickens (2002).

level are available in Polity IV (Marshall et al., 2017). Specifically, its "polity2" measure is used. The polity2 measure reflects the democracy level in countries within a range of -10 and 10; the closer its value to -10 (10), the more dictatorial (democratic) the country is. Table A2 in the Appendix provides the definition of the variables and explains the data sources. Table A3 reports the descriptive statistics of the variables used for the estimation.

3 Empirical results

3.1 Results on total government expenditure

Table 1 presents estimation results of the effect of giant oilfield discoveries on total government expenditure. In columns (1)–(6), we consider their impact on future government expenditure in the periods $t+0, t+2, ..., t+10$, respectively. Although the coefficients of oilfield discoveries are not statistically significant in columns (1), (2), and (5), they are significant in columns (3), (4), and, (6). Therefore, whereas total government expenditure does not change just after giant oilfield discoveries, it increases in the medium and long run after the discoveries. Cumulative past discoveries, which means the number of years with giant oilfield discoveries from $t-10$ to $t-1$, significantly increase total government expenditure in columns (1)–(4). These results also suggest that total government expenditure increases in the medium and long run after giant oilfield discoveries. These time-lag effects seem to be natural since policy change for expenditure needs time to adjust regardless of political regime.

[Table 1 here]

Taking into account countries' political regime, generally, the government of a more democratic country is bound to be more transparent to its citizens (i.e., taxpayers) with regard to tax collection and expenditure. This duty might function as a constraint preventing discretionary behaviors taken by the government regarding its expenditure. We confirm that giant oilfield discoveries increase total government expenditure in Table 1. In order to examine how the democracy level influences these effects, we add two interaction terms between giant oilfield discoveries and democracy level in Table 2. In column (3), the coefficients of oilfield discoveries, past discoveries, democracy, and their interaction terms are significant. Based on the results in column (3), Figs. 1 and 2 illustrate the partial effect of giant oilfield discoveries and past discoveries conditional on democracy level, respectively. These figures illustrate that the increasing effects of giant oilfield discoveries on government expenditure decrease as democracy level matures. When a country is fully democratic, that is, the democracy score is 10, this increasing effect is almost null. These findings should not be surprising because checks and balances are imposed on the government in a more democratic country, thereby resulting in the null effects of giant oilfield discoveries on government expenditure.

[Table 2 here]

[Fig. 1 here]

[Fig. 2 here]

3.2 Results on public goods and infrastructure

In this section, we present the estimation results of expenditures on defense, public order and safety, general public services, and economic affairs. In Tables 3 through 6, we show the results without interaction terms between giant oilfield discoveries and democracy level in Panel A, and with them in Panel B, although estimation results of control variables in all tables are not reported. Table 3 illustrates the estimation results of government expenditure on defense. Results of Panel A indicate that giant oilfield discoveries significantly increase military expenditure, which is consistent with results of Cotet and Tsui (2013) and Ali and Abdellatif (2015), although their studies consider different samples and natural resource variables. In column (4) in Panel B, all coefficients of oilfield discoveries and their interaction with democracy are statistically significant. Like the results in Table 2, the increasing effect on military expenditure is mitigated by democracy level. This may be because law and order in more democratic countries are more established and military expenditure may not be necessary. Furthermore, in less democratic countries, oilfield discoveries are likely to increase the likelihood of wars and conflicts for grabbing the benefits from natural resources as widely argued in the literature of resource curse as toxic effects of natural resource endowment.[7]

[Table 3 here]

The results of government expenditure on public order and safety are presented in Table 4. The table indicates that giant oilfield discoveries decrease expenditure on public order and safety in the medium and long run. This finding seems to be in line with that in Table 3. When public order is established by strengthening the military sector, which benefits from receiving more budget allocation after giant oilfield discoveries as shown in Table 3, direct expenditure on public order and safety may be reduced.

[Table 4 here]

Table 5 presents the results of government expenditure on general public services. The table shows that this expenditure increases in the medium and long term after the discovery of giant oilfields. These results seem to be natural. Among others, foreign aid and research and development (R&D) in scientific knowledge are included in this expenditure. Prominent oil-producing countries are often major powers in regions such as the Middle East and Africa. Natural resource windfalls can act as diplomatic tools to increase the country's presence in the international community. They can provide foreign aid to increase the influence of their own country. For example, Saudi Arabia has provided foreign aid to not only pursue the development goals of developing countries, but also to promote Wahhabi expansion and development (Li, 2019). Furthermore, in a country where the expectation of finding new oilfields is high due to previous discoveries, its government may have a higher incentive to allocate more resources for R&D. Because technology advancement is undoubtedly an important factor for increasing the probability of discovering new oilfields, the

[7] War and conflicts can affect military expenditure. We include an additional control variable for war, which is equal to one if there are at least 1000 battle-related deaths and zero otherwise. This dummy variable is constructed using the UCDP/PRIO Armed Conflict Dataset version 17.1, which is provided by Gleditsch et al. (2002) and Allansson et al. (2017). The results are similar even if including this variable, confirming the robustness of results.

purpose for increasing expenditure for R&D would be to enhance scientific knowledge and technology level. In addition, an oil-producing country may have a strong incentive to invest in improved scientific knowledge and technology to increase the value added of oils through improved capacity of petroleum refineries.

[Table 5 here]

We indicate the results of government expenditure on economic affairs in Table 6, which shows slightly weak evidence that giant oilfield discoveries decrease this expenditure in the long term. This category means public investment in traditional infrastructure such as manufacturing, construction, and transport. Oil-rich countries are unlikely to have lower incentive to promote industrial development, partly because they are already receiving significant revenues from natural resource windfalls. The benefits from natural resources may also lead to the appreciation of currency in these countries. This can weaken the competitiveness of their exporting manufacturing sector, and lower the incentive to invest more resources in this sector from both the public and private sector. Therefore, giant oilfield discoveries decrease government expenditure on economic affairs. This phenomenon is in line with the widely known Dutch disease covered in the literature.

[Table 6 here]

3.3 Results on social spending

We classify expenditure on health, education, and social protection as social spending, and report the results in Tables 7, 8, and 9, respectively. Panel A in each table indicates that giant oilfield discoveries do not have a direct impact on these expenditures. Although this finding seems to be somewhat inconsistent with Cockx and Francken (2014, 2016), who find that natural resource abundance decreases government expenditure on health and education, it should not be surprising. This may be because while they use the share of natural capital in total national wealth and natural capital per capita as indicators for natural resource endowment, our study employs giant oilfield discoveries for that. The use of this indicator can allow us to avoid the possibility of endogeneity problems as explained earlier. In column (4) of Panel B in Table 7, the interaction term between discovery-years and democracy is statistically significant. Furthermore, the null hypothesis that the coefficient of discovery-years and its interaction term with democracy are jointly zero, are rejected at the conventional level. When the democracy level is less than -2.103, giant oilfield discoveries increase health expenditure, and when it is more than this threshold value, they decrease health expenditure. Our finding is in line with that in Cockx and Francken (2014, 2016) in more democratic countries. A possible explanation for this result is that health expenditure in more democratic countries is already substantial due to redistribution policy, whereas the government in less democratic countries increases this expenditure when there is an increase in their revenues from natural resources in order to appease the public. The results on health expenditure in Table 7 are similar to those on educational expenditure in Table 8. Finally, in the majority of cases, giant oilfield discoveries do not have a significant impact on expenditure on social protection. These results on health and social protection expenditure may also reflect the fact that these expenditures

are already higher in democratic countries, due to the redistribution policy.

[Table 7 here]

[Table 8 here]

[Table 9 here]

3.4 Results on gasoline subsidy

In this section, we show the effects of giant oilfield discoveries on the net implicit gasoline subsidy in Table 10. From Panel A in Table 10, the government increases the gasoline subsidy in the medium and long run after discovering giant oilfield. The finding is natural. The government in many oil-rich countries subsidizes gasoline prices partly because it gains the approval of the public. These countries tend to be less democratic and so their government should avoid frustrating the public, revolution, or even coup d'etat. For that purpose, the leaders in these countries have to appease the public. In reality, the gasoline subsidy in Venezuela, Libya, and Saudi Arabia is extremely high. The political system in these countries is dictatorial and political leaders should take measures to control political upheaval.

[Table 10 here]

4 Concluding remarks

Whether natural resources are good for socio-economic development has been discussed extensively for many years. In this study, in an attempt to provide new evidence, we examine how giant oilfield discoveries affect the size and composition of government expenditure. We find that they significantly increase the total government expenditure in the medium and long run. As the democracy level in a country becomes consolidated, the impact becomes smaller. This is likely because the checks and balances mechanism in more democratic countries function as a constraint, preventing their governments from increasing discretionary expenditure. We also consider the impact on each category of government expenditure and the gasoline subsidy. Giant oilfield discoveries increase expenditure on defense and general public services and net implicit gasoline subsidy. On the contrary, they do not have an impact on social spending such as health, education, and social protection. Finally, giant oilfield discoveries increase net implicit gasoline subsidy in the long term.

This study provides policy implications regarding government behavior. The government can obtain incremental revenue from natural resources. Benevolent government and political leaders use it to improve the welfare of the people. However, the government and political leaders pursing their own interests can dissipate and appropriate it, although they may partly employ it to appease the people. Checks and balances are important to monitor the government and political leaders, particularly in less democratic countries. Finally, it is noteworthy that although the current study focuses on government expenditure, it does not necessarily provide any findings on policy outcomes. Rajkumar and Swaroop (2008) find that government expenditure on education and health does not necessarily improve child mortality and educational attainment in case of severe corruption and low

bureaucratic quality. The investigation on the impacts of natural resources on such policy outcomes can be an important further research dimension.

Appendix

See Tables A1–A3.

[Table A1 here]

[Table A2 here]

[Table A3 here]

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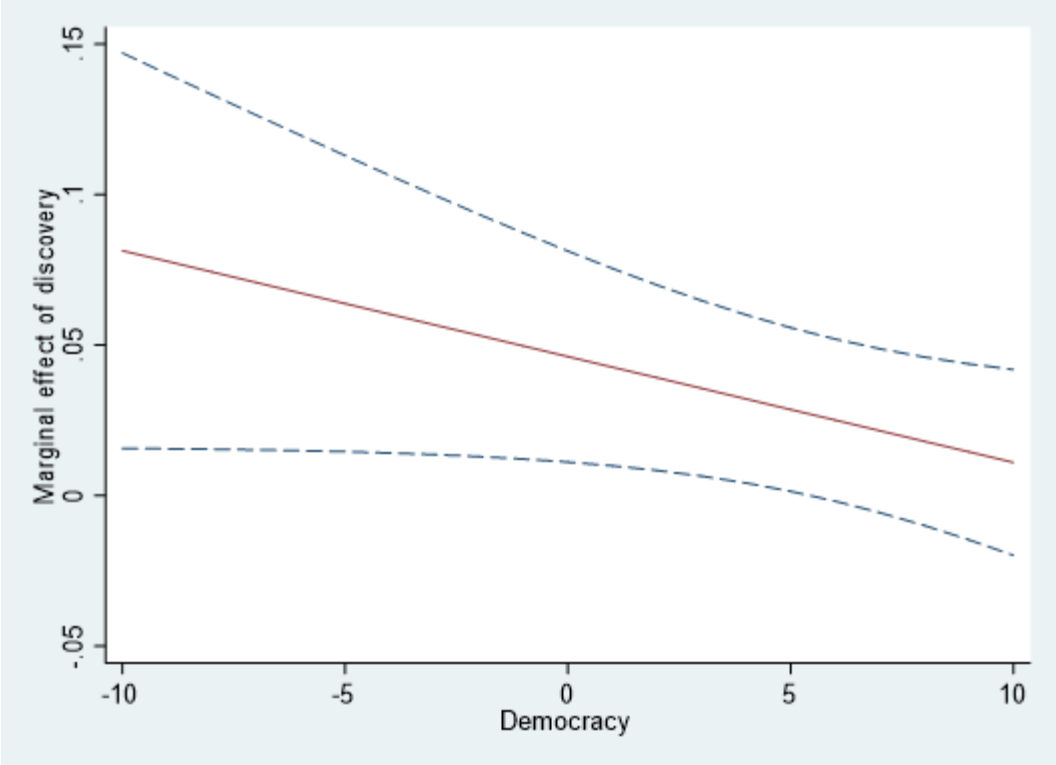

Fig. 1: Marginal effect of discovery

Notes: This figure illustrates the results of column (3) in Table 2. Dashed lines indicate 95% confidence interval.

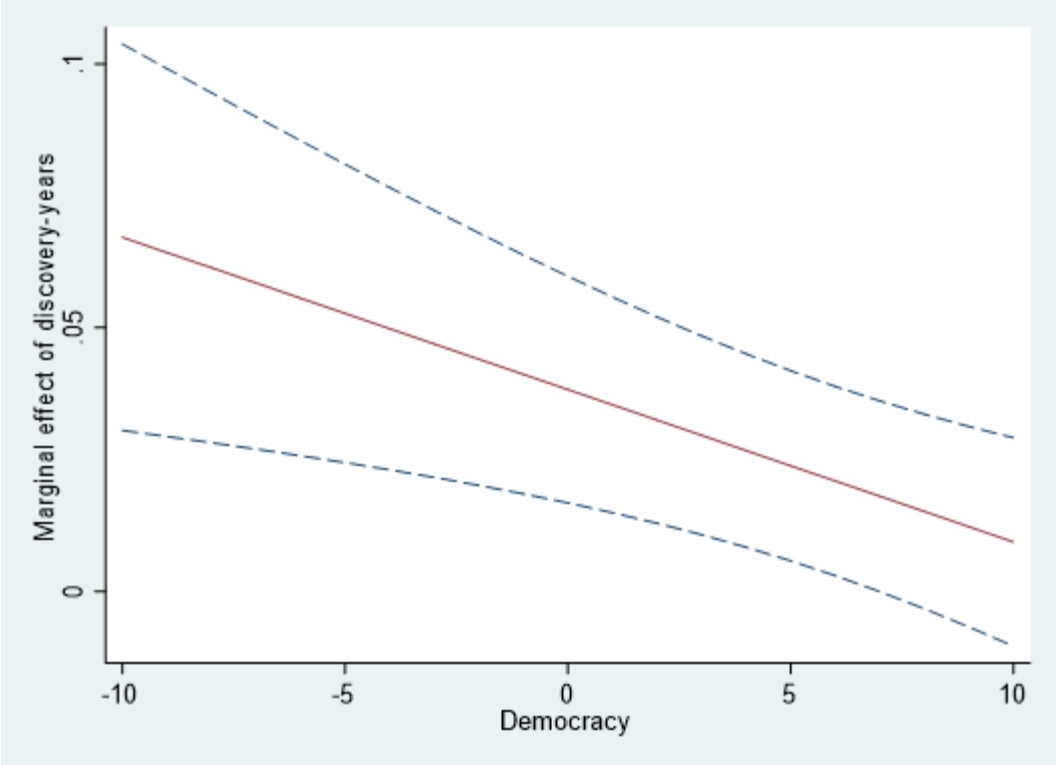

Fig. 2: Marginal effect of discovery-years

Notes: This figure illustrates the results of column (3) in Table 2. Dashed lines indicate 95% confidence interval.

Table 1: Effects of oil discoveries on total government expenditure

	(1) 0 years ahead	(2) 2 years ahead	(3) 4 years ahead	(4) 6 years ahead	(5) 8 years ahead	(6) 10 years ahead
Discovery	0.004	0.023	0.030*	0.044*	0.035	0.045*
	(0.016)	(0.019)	(0.016)	(0.022)	(0.023)	(0.027)
Discovery-years	0.033**	0.032**	0.027**	0.023*	0.016	0.008
	(0.014)	(0.014)	(0.014)	(0.013)	(0.011)	(0.008)
Democracy	-0.007*	-0.000	0.002	0.004	0.005*	0.007**
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
GDP per capita	-0.079	-0.004	-0.008	-0.008	-0.031	-0.047
	(0.075)	(0.059)	(0.051)	(0.047)	(0.048)	(0.052)
Trade openness	0.104*	0.080	0.085	0.074	0.070	0.039
	(0.061)	(0.058)	(0.052)	(0.048)	(0.047)	(0.044)
Population	-0.347**	-0.218*	-0.161	-0.121	-0.108	-0.109
	(0.135)	(0.123)	(0.118)	(0.117)	(0.116)	(0.111)
Fraction 14-	0.256	0.279	0.133	0.058	0.033	0.025
	(0.206)	(0.183)	(0.173)	(0.183)	(0.200)	(0.223)
Fraction 65+	0.263	0.230	0.131	0.073	0.074	0.090
	(0.195)	(0.177)	(0.177)	(0.188)	(0.213)	(0.237)
Countries	107	111	110	110	109	110
Observations	1994	2105	2200	2226	2168	2106

Notes: The dependent variable is the natural logarithm of total government expenditure as a share of GDP. Discovery is a dummy variable for giant oilfield discoveries. Discovery-years is years with giant oilfield discoveries during the last decade. GDP per capita, trade openness, and three demographic variables are in the natural logarithm. All estimations include country fixed effects, year dummies, a dummy for the accrual basis of accounting, and a constant term, although we do not report the results here. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are robust standard errors clustered at the country level.

Table 2: Interaction effects of oil discoveries and democracy on total government expenditure

	(1) 0 years ahead	(2) 2 years ahead	(3) 4 years ahead	(4) 6 years ahead	(5) 8 years ahead	(6) 10 years ahead
Discovery	0.007	0.041	0.046**	0.062***	0.061***	0.072***
	(0.021)	(0.027)	(0.018)	(0.023)	(0.019)	(0.026)
Discovery-years	0.045***	0.045***	0.038***	0.032***	0.022**	0.009
	(0.015)	(0.011)	(0.011)	(0.011)	(0.010)	(0.008)
Democracy	-0.005	0.002	0.004	0.005*	0.006**	0.007***
	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Discovery × Democracy	-0.001	-0.004	-0.004*	-0.004*	-0.008***	-0.008***
	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)
Discovery-years × Democracy	-0.003*	-0.003***	-0.003***	-0.003***	-0.002	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
GDP per capita	-0.095	-0.024	-0.028	-0.026	-0.038	-0.046
	(0.063)	(0.048)	(0.045)	(0.048)	(0.051)	(0.054)
Trade openness	0.094*	0.068	0.070	0.056	0.053	0.030
	(0.055)	(0.051)	(0.045)	(0.043)	(0.047)	(0.047)
Population	-0.282**	-0.147	-0.100	-0.072	-0.077	-0.094
	(0.125)	(0.116)	(0.111)	(0.109)	(0.109)	(0.107)
Fraction 14-	0.224	0.245	0.103	0.041	0.036	0.036
	(0.202)	(0.177)	(0.165)	(0.176)	(0.198)	(0.222)
Fraction 65+	0.268	0.227	0.126	0.068	0.069	0.084
	(0.195)	(0.174)	(0.169)	(0.178)	(0.204)	(0.229)
Countries	107	111	110	110	109	110
Observations	1994	2105	2200	2226	2168	2106

Notes: The dependent variable is the natural logarithm of total government expenditure as a share of GDP. Discovery is a dummy variable for giant oilfield discoveries. Discovery-years is years with giant oilfield discoveries during the last decade. GDP per capita, trade openness, and three demographic variables are in the natural logarithm. All estimations include country fixed effects, year dummies, a dummy for the accrual basis of accounting, and a constant term, although we do not report the results here. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are robust standard errors clustered at the country level.

Table 3: Effects of oilfield discoveries on government expenditure on defense

	(1) 0 years ahead	(2) 2 years ahead	(3) 4 years ahead	(4) 6 years ahead	(5) 8 years ahead	(6) 10 years ahead
Panel A: Without interaction terms						
Discovery	0.028	0.014	0.056**	0.084*	0.069*	0.093**
	(0.044)	(0.034)	(0.028)	(0.044)	(0.041)	(0.042)
Discovery-years	0.046*	0.051**	0.045*	0.034	0.018	-0.002
	(0.027)	(0.024)	(0.025)	(0.021)	(0.016)	(0.015)
Democracy	-0.015**	-0.011**	-0.009*	-0.006	-0.003	-0.001
	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
Panel B: With interaction terms						
Discovery	0.026	0.019	0.064*	0.118**	0.088*	0.123***
	(0.058)	(0.056)	(0.038)	(0.049)	(0.048)	(0.045)
Discovery-years	0.072**	0.071***	0.062**	0.046**	0.026	0.001
	(0.034)	(0.026)	(0.026)	(0.021)	(0.019)	(0.018)
Democracy	-0.011*	-0.007	-0.006	-0.004	-0.002	-0.000
	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Discovery × Democracy	0.000	-0.001	-0.001	-0.009**	-0.006	-0.011*
	(0.005)	(0.006)	(0.003)	(0.004)	(0.005)	(0.006)
Discovery-years × Democracy	-0.006**	-0.005***	-0.005**	-0.004**	-0.002	-0.001
	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Countries	96	99	98	98	95	94
Observations	1526	1603	1663	1672	1629	1583

Notes: The dependent variable is the natural logarithm of government expenditure on defense as a share of GDP. Panels A and B include the same control variables as those in Tables 1 and 2, respectively. See the notes to Tables 1 and 2 for additional details. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are robust standard errors clustered at the country level.

Table 4: Effects of oilfield discoveries on government expenditure on public order and safety

	(1) 0 years ahead	(2) 2 years ahead	(3) 4 years ahead	(4) 6 years ahead	(5) 8 years ahead	(6) 10 years ahead
Panel A: Without interaction terms						
Discovery	0.028	-0.008	-0.002	-0.036	-0.095	-0.093**
	(0.046)	(0.035)	(0.039)	(0.040)	(0.060)	(0.045)
Discovery-years	-0.041	-0.056**	-0.050*	-0.048**	-0.030**	-0.011
	(0.025)	(0.025)	(0.025)	(0.020)	(0.014)	(0.011)
Democracy	-0.008	0.016*	0.008	0.006	0.004	-0.000
	(0.016)	(0.009)	(0.006)	(0.006)	(0.005)	(0.005)
Panel B: With interaction terms						
Discovery	0.043	-0.014	0.013	-0.045	-0.080	-0.063
	(0.063)	(0.076)	(0.077)	(0.049)	(0.098)	(0.043)
Discovery-years	-0.034	-0.034	-0.037	-0.053	-0.029	-0.009
	(0.030)	(0.031)	(0.037)	(0.034)	(0.021)	(0.014)
Democracy	-0.007	0.018**	0.009	0.006	0.004	0.000
	(0.017)	(0.007)	(0.006)	(0.006)	(0.005)	(0.005)
Discovery × Democracy	-0.003	0.001	-0.003	0.002	-0.003	-0.008
	(0.009)	(0.010)	(0.011)	(0.005)	(0.011)	(0.005)
Discovery-years × Democracy	-0.001	-0.003	-0.002	0.001	0.000	-0.000
	(0.004)	(0.003)	(0.003)	(0.003)	(0.002)	(0.001)
Countries	84	88	88	89	87	86
Observations	918	1003	1075	1096	1065	1033

Notes: The dependent variable is the natural logarithm of government expenditure on public order and safety as a share of GDP. Panels A and B include the same control variables as those in Tables 1 and 2, respectively. See the notes to Tables 1 and 2 for additional details. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are robust standard errors clustered at the country level.

Table 5: Effects of oilfield discoveries on government expenditure on general public services

	(1) 0 years ahead	(2) 2 years ahead	(3) 4 years ahead	(4) 6 years ahead	(5) 8 years ahead	(6) 10 years ahead
Panel A: Without interaction terms						
Discovery	-0.050	0.002	0.038	0.099**	0.164***	0.136**
	(0.056)	(0.040)	(0.042)	(0.042)	(0.047)	(0.061)
Discovery-years	0.078***	0.087***	0.084***	0.073***	0.047**	0.022
	(0.022)	(0.024)	(0.027)	(0.027)	(0.024)	(0.019)
Democracy	-0.020**	-0.004	0.003	0.007	0.011*	0.014*
	(0.009)	(0.007)	(0.005)	(0.005)	(0.006)	(0.008)
Panel B: With interaction terms						
Discovery	-0.106**	-0.013	0.047	0.123**	0.206***	0.184***
	(0.052)	(0.044)	(0.055)	(0.049)	(0.046)	(0.065)
Discovery-years	0.089***	0.100***	0.098***	0.088***	0.057**	0.029
	(0.029)	(0.029)	(0.029)	(0.027)	(0.023)	(0.019)
Democracy	-0.019**	-0.002	0.005	0.010*	0.013*	0.015*
	(0.009)	(0.008)	(0.006)	(0.006)	(0.007)	(0.008)
Discovery × Democracy	0.014***	0.004	-0.002	-0.007	-0.014**	-0.017**
	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)	(0.007)
Discovery-years × Democracy	-0.003	-0.003	-0.004	-0.005*	-0.003	-0.002
	(0.004)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
Countries	98	100	99	99	96	95
Observations	1575	1650	1710	1718	1672	1622

Notes: The dependent variable is the natural logarithm of government expenditure on general public services as a share of GDP. Panels A and B include the same control variables as those in Tables 1 and 2, respectively. See the notes to Tables 1 and 2 for additional details. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are robust standard errors clustered at the country level.

Table 6: Effects of oilfield discoveries on government expenditure on economic affairs

	(1) 0 years ahead	(2) 2 years ahead	(3) 4 years ahead	(4) 6 years ahead	(5) 8 years ahead	(6) 10 years ahead
Panel A: Without interaction terms						
Discovery	0.043	0.067	0.055	0.008	-0.010	-0.011
	(0.031)	(0.044)	(0.052)	(0.040)	(0.028)	(0.032)
Discovery-years	0.027	0.000	-0.017	-0.023*	-0.025*	-0.026*
	(0.017)	(0.014)	(0.012)	(0.012)	(0.013)	(0.013)
Democracy	-0.012*	-0.004	0.000	0.006	0.010	0.015***
	(0.007)	(0.007)	(0.006)	(0.006)	(0.007)	(0.005)
Panel B: With interaction terms						
Discovery	0.044	0.079	0.053	-0.003	-0.004	-0.005
	(0.030)	(0.055)	(0.065)	(0.047)	(0.032)	(0.032)
Discovery-years	0.033*	0.005	-0.014	-0.018	-0.020	-0.021
	(0.017)	(0.017)	(0.016)	(0.016)	(0.017)	(0.016)
Democracy	-0.012	-0.003	0.001	0.007	0.011*	0.016***
	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.005)
Discovery × Democracy	-0.000	-0.003	0.001	0.004	-0.002	-0.002
	(0.004)	(0.005)	(0.006)	(0.005)	(0.004)	(0.004)
Discovery-years × Democracy	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001
	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)
Countries	97	99	98	98	95	94
Observations	1538	1611	1667	1675	1629	1579

Notes: The dependent variable is the natural logarithm of government expenditure on economic affairs as a share of GDP. Panels A and B include the same control variables as those in Tables 1 and 2, respectively. See the notes to Tables 1 and 2 for additional details. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are robust standard errors clustered at the country level.

Table 7: Effects of oilfield discoveries on government expenditure on health

	(1) 0 years ahead	(2) 2 years ahead	(3) 4 years ahead	(4) 6 years ahead	(5) 8 years ahead	(6) 10 years ahead
Panel A: Without interaction terms						
Discovery	-0.018	-0.004	-0.027	0.047	-0.003	-0.023
	(0.044)	(0.045)	(0.041)	(0.055)	(0.055)	(0.039)
Discovery-years	-0.014	-0.018	-0.017	-0.024	-0.023	-0.020
	(0.023)	(0.024)	(0.025)	(0.023)	(0.023)	(0.024)
Democracy	0.006	0.018*	0.022**	0.024*	0.025*	0.027**
	(0.008)	(0.009)	(0.011)	(0.013)	(0.014)	(0.013)
Panel B: With interaction terms						
Discovery	0.004	0.022	-0.005	0.059	0.008	0.000
	(0.049)	(0.046)	(0.039)	(0.056)	(0.054)	(0.040)
Discovery-years	0.003	0.000	-0.002	-0.009	-0.009	-0.009
	(0.023)	(0.024)	(0.025)	(0.022)	(0.021)	(0.021)
Democracy	0.008	0.020**	0.025**	0.026**	0.026*	0.029**
	(0.008)	(0.009)	(0.011)	(0.013)	(0.014)	(0.013)
Discovery × Democracy	-0.006	-0.006	-0.005	-0.003	-0.003	-0.007*
	(0.006)	(0.005)	(0.006)	(0.005)	(0.005)	(0.004)
Discovery-years × Democracy	-0.004*	-0.005**	-0.004**	-0.004**	-0.004*	-0.003*
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Countries	98	100	99	99	96	95
Observations	1586	1663	1723	1732	1686	1636

Notes: The dependent variable is the natural logarithm of government expenditure on health as a share of GDP. Panels A and B include the same control variables as those in Tables 1 and 2, respectively. See the notes to Tables 1 and 2 for additional details. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are robust standard errors clustered at the country level.

Table 8: Effects of oilfield discoveries on government expenditure on education

	(1) 0 years ahead	(2) 2 years ahead	(3) 4 years ahead	(4) 6 years ahead	(5) 8 years ahead	(6) 10 years ahead
Panel A: Without interaction terms						
Discovery	-0.015	-0.043	-0.017	-0.070	-0.117*	-0.076
	(0.027)	(0.040)	(0.046)	(0.051)	(0.063)	(0.059)
Discovery-years	-0.044	-0.049	-0.050	-0.049	-0.028	-0.010
	(0.026)	(0.030)	(0.034)	(0.036)	(0.036)	(0.033)
Democracy	0.000	0.004	0.003	0.005	0.003	0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)
Panel B: With interaction terms						
Discovery	-0.025	-0.025	0.006	-0.045	-0.097**	-0.051
	(0.036)	(0.038)	(0.041)	(0.044)	(0.044)	(0.044)
Discovery-years	-0.029	-0.028	-0.029	-0.028	-0.006	0.010
	(0.020)	(0.021)	(0.023)	(0.024)	(0.022)	(0.019)
Democracy	0.002	0.007*	0.007	0.008*	0.006	0.005
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)
Discovery × Democracy	0.002	-0.004	-0.005	-0.007	-0.006	-0.007
	(0.004)	(0.003)	(0.003)	(0.005)	(0.005)	(0.006)
Discovery-years × Democracy	-0.004**	-0.005***	-0.006***	-0.006***	-0.007***	-0.006***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Countries	98	100	99	99	96	95
Observations	1596	1673	1733	1742	1696	1646

Notes: The dependent variable is the natural logarithm of government expenditure on education as a share of GDP. Panels A and B include the same control variables as those in Tables 1 and 2, respectively. See the notes to Tables 1 and 2 for additional details. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are robust standard errors clustered at the country level.

Table 9: Effects of oilfield discoveries on government expenditure on social protection

	(1) 0 years ahead	(2) 2 years ahead	(3) 4 years ahead	(4) 6 years ahead	(5) 8 years ahead	(6) 10 years ahead
Panel A: Without interaction terms						
Discovery	-0.067	-0.038	-0.005	0.008	-0.011	0.033
	(0.049)	(0.028)	(0.030)	(0.036)	(0.057)	(0.049)
Discovery-years	-0.007	0.005	0.009	0.007	0.020	0.018
	(0.017)	(0.021)	(0.023)	(0.024)	(0.021)	(0.016)
Democracy	-0.002	0.006	0.006	0.004	-0.002	-0.008
	(0.006)	(0.006)	(0.006)	(0.006)	(0.005)	(0.006)
Panel B: With interaction terms						
Discovery	-0.092	-0.030	-0.013	0.024	-0.007	0.016
	(0.094)	(0.040)	(0.036)	(0.045)	(0.077)	(0.065)
Discovery-years	-0.021	-0.009	-0.007	-0.012	-0.000	-0.005
	(0.025)	(0.031)	(0.033)	(0.033)	(0.027)	(0.016)
Democracy	-0.003	0.005	0.003	0.002	-0.004	-0.010*
	(0.007)	(0.006)	(0.007)	(0.006)	(0.005)	(0.006)
Discovery × Democracy	0.006	-0.001	0.002	-0.004	-0.000	0.005
	(0.011)	(0.004)	(0.004)	(0.005)	(0.008)	(0.008)
Discovery-years × Democracy	0.003	0.003	0.004	0.005	0.005*	0.005***
	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.002)
Countries	97	99	98	97	95	93
Observations	1526	1598	1653	1660	1615	1566

Notes: The dependent variable is the natural logarithm of government expenditure on social protection as a share of GDP. Panels A and B include the same control variables as those in Tables 1 and 2, respectively. See the notes to Tables 1 and 2 for additional details. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are robust standard errors clustered at the country level.

Table 10: Effects of oilfield discoveries on net implicit gasoline subsidy

	(1) 0 years ahead	(2) 2 years ahead	(3) 4 years ahead	(4) 6 years ahead	(5) 8 years ahead	(6) 10 years ahead
Panel A: Without interaction terms						
Discovery	0.152	-0.006	-0.073**	0.041*	0.053**	0.073**
	(0.133)	(0.027)	(0.028)	(0.023)	(0.026)	(0.029)
Discovery-years	0.100***	-0.005	-0.009	0.041*	0.064**	0.040*
	(0.025)	(0.025)	(0.025)	(0.022)	(0.026)	(0.023)
Democracy	-0.002	0.001	-0.009*	-0.002	0.000	0.004
	(0.006)	(0.003)	(0.005)	(0.005)	(0.004)	(0.005)
Panel B: With interaction terms						
Discovery	0.116	-0.003	-0.086***	0.045**	0.051*	0.077**
	(0.117)	(0.028)	(0.027)	(0.021)	(0.029)	(0.030)
Discovery-years	0.117***	0.006	-0.029	0.038	0.068***	0.040*
	(0.023)	(0.033)	(0.034)	(0.027)	(0.026)	(0.022)
Democracy	0.003	0.001	-0.009**	-0.003	0.001	0.004
	(0.006)	(0.003)	(0.005)	(0.006)	(0.005)	(0.005)
Discovery × Democracy	-0.027	-0.000	0.003	-0.003	0.001	0.000
	(0.020)	(0.004)	(0.003)	(0.002)	(0.003)	(0.004)
Discovery-years × Democracy	-0.003	-0.002	0.004	0.001	-0.001	0.002
	(0.003)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)
Countries	125	133	137	141	140	139
Observations	125	389	658	792	785	768

Notes: The dependent variable is net implicit gasoline subsidy in constant 2015 US dollars per liter. Panels A and B include the same control variables as those in Tables 1 and 2, respectively. See the notes to Tables 1 and 2 for additional details. The asterisks ***, **, and * indicate the 1%, 5%, and 10% significance levels, respectively. The numbers in parentheses are robust standard errors clustered at the country level.

Table A1: List of countries

Albania	Denmark	Lao PDR	Qatar
Algeria	Dominican Republic	Latvia	Romania
Angola	Ecuador	Lesotho	Russian Federation
Argentina	Egypt, Arab Rep.	Liberia	Rwanda
Armenia	El Salvador	Libya	Saudi Arabia
Australia	Equatorial Guinea	Lithuania	Senegal
Austria	Estonia	Luxembourg	Sierra Leone
Azerbaijan	Finland	Macedonia, FYR	Singapore
Bahrain	France	Madagascar	Slovak Republic
Bangladesh	Gabon	Malawi	Slovenia
Belarus	Gambia, The	Malaysia	South Africa
Belgium	Georgia	Mali	Spain
Benin	Germany	Mauritania	Sri Lanka
Bhutan	Ghana	Mauritius	Sudan
Bolivia	Greece	Mexico	Suriname
Botswana	Guatemala	Moldova	Swaziland
Brazil	Guinea	Mongolia	Sweden
Bulgaria	Guinea-Bissau	Morocco	Switzerland
Burkina Faso	Guyana	Mozambique	Tajikistan
Burundi	Haiti	Myanmar	Tanzania
Cabo Verde	Honduras	Namibia	Thailand
Cambodia	Hungary	Nepal	Togo
Cameroon	India	Netherlands	Trinidad and Tobago
Canada	Indonesia	New Zealand	Tunisia
Central African Republic	Iran, Islamic Rep.	Nicaragua	Turkey
Chad	Iraq	Niger	Uganda
Chile	Ireland	Nigeria	Ukraine
China	Israel	Norway	United Arab Emirates
Colombia	Italy	Oman	United Kingdom
Comoros	Jamaica	Pakistan	United States
Congo, Dem. Rep.	Japan	Panama	Uruguay
Congo, Rep.	Jordan	Papua New Guinea	Uzbekistan
Costa Rica	Kazakhstan	Paraguay	Venezuela, RB
Cote d'Ivoire	Kenya	Peru	Vietnam
Croatia	Korea, Rep.	Philippines	Yemen, Rep.
Cyprus	Kuwait	Poland	Zambia
Czech Republic	Kyrgyz Republic	Portugal	Zimbabwe

Table A2: Data definitions and sources

Variable	Description	Source
Total	Total government expenditure as a share of GDP	IMF (1999, 2005, 2013)
Defense	Expenditure on defense as a share of GDP. Defense includes military defense, civil defense, and so on	IMF (1999, 2005, 2013)
Public order and safety	Expenditure on public order and safety as a share of GDP. Public order and safety include police services, fire protection services, law courts, prisons, and so on	IMF (1999, 2005, 2013)
General public services	Expenditure on general public services as a share of GDP. General public services include executive and legislative organs, financial and fiscal affairs, external affairs, foreign economic aid, and so on	IMF (1999, 2005, 2013)
Economic affairs	Expenditure on economic affairs as a share of GDP. Economic affairs include general economic, commercial, and labor affairs; affairs pertaining to agriculture, forestry, fishing, hunting, fuel and energy, mining, manufacturing, construction, transport, and communication, and so on	IMF (1999, 2005, 2013)
Health	Expenditure on health as a share of GDP. Health includes medical products, appliances and equipment, outpatient services, hospital services, public health services, and so on	IMF (1999, 2005, 2013)
Education	Expenditure on education as a share of GDP. Education includes pre-primary, primary, secondary, post-secondary, nontertiary, and tertiary education, and so on	IMF (1999, 2005, 2013)
Social protection	Expenditure on social protection as a share of GDP. Social protection includes protection against sickness and disability, old age, unemployment, and protection for survivors, family and children, housing, and so on	IMF (1999, 2005, 2013)
Net implicit gasoline subsidy	The difference between the local price and the benchmark price in constant 2015 US dollars per liter	Ross et al. (2017)

Table A2: Data definitions and sources (continued)

Variable	Description	Source
Discovery	Dummy variable for the discovery of at least one giant oilfield in a given year	Lei and Michaels (2013)
Discovery-years	The number of years with giant oilfield discovery between $t-1$ and $t-10$	Lei and Michaels (2013)
Democracy	The measure of democracy level reflecting the competitiveness of political participation, the openness and competitiveness of executive recruitment, and the constraints on the chief executive	Marshall et al. (2017)
GDP per capita	Real GDP per capita in constant 2005 U.S. dollars	World Bank (2017)
Trade openness	The sum of exports and imports divided by GDP	World Bank (2017)
Population	Total population	World Bank (2017)
Fraction 14-	Fraction of population between the ages 0 and 14 as a share of the total population	World Bank (2017)
Fraction 65+	Fraction of population aged 65 and above as a share of the total population	World Bank (2017)

Table A3: Descriptive statistics

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Total	2562	3.273	0.421	1.238	5.056
Defense	1928	0.634	0.784	-1.966	4.673
Public order and safety	1211	0.060	0.784	-2.526	1.975
General public services	1998	1.810	0.596	-0.942	4.137
Economic affairs	1958	1.333	0.629	-1.050	3.387
Health	2015	0.431	1.014	-4.227	2.294
Education	2025	0.925	0.791	-1.897	2.528
Social protection	1942	1.374	1.389	-4.497	3.257
Net implicit gasoline subsidy	810	-0.470	0.485	-2.053	0.797
Discovery	5902	0.058	0.234	0	1
Discovery-years	6642	0.558	1.367	0	10
Democracy	6290	0.704	7.507	-10	10
GDP per capita	5827	8.012	1.546	4.752	11.641
Trade openness	5729	4.041	0.680	-3.863	6.276
Population	7249	15.807	1.591	10.766	21.004
Fraction 14-	7252	3.529	0.328	2.584	3.949
Fraction 65+	7252	1.607	0.615	-0.267	3.056

Notes: These statistics are calculated based on 148 countries over the period 1972–2008. All variables except discovery, discovery-years, and democracy are in the natural logarithm.