Oil discoveries and innovation

Mercy Mhuru, Toby Daglish, and Griffin Geng

School of Economics and Finance, Victoria University of Wellington

November 9, 2020

Abstract

This paper explores the effects of giant oil discoveries on innovation for a sample of 159 countries for the period 1975-2005. Evidence indicates that approximately 2-5 years after oil discovery, innovation activity slows down. Using a difference-in-differences design, we show that on average patent citations decline by 3-4% per year and the number of actual patents slows down by approximately 2-3% per year. These results are consistent with the notion of natural resource curse, a phenomenon where resource-rich economies have inferior growth performance relative to resource-poor economies. Cross-sectional analyses indicate that changes in innovation activities are greater in civil law countries and less developed countries. We show that governance quality is a possible channel through which decline in innovative activity occurs after a resource windfall.

1 Introduction

Do resource booms affect innovation? This question is important given the role of innovation as a key driver of economic growth that solidifies competitive advantage (Solow, 1956; Porter, 1992). Despite a large literature investigating the relationship between natural resource booms and economic growth (Sachs and Warner, 1995; Papyrakis and Gerlagh, 2007), little is known as to how natural resource booms affect the innovation activities of a country.

In this paper, we investigate a natural experiment, examining the patent filing trends for both developed and emerging economies that have received giant oil discoveries in the period 1975-2005, and show that innovative activity, as measured by patents filed and their citations, slow down in the period after the discovery of oil. These results show that "easy riches lead to sloth" in line with Sachs and Warner (1995). This is a different empirical approach to the natural resource curse hypothesis and shows that giant oil discoveries have a negative effect on innovative activity.

The timing of the oil discoveries is usually random (Horn, 2007; Arezki et al., 2017). Arezki et al. (2017) claim that despite intense search effort involved, the odds of a giant discovery in a given year is less than one-in-twenty. The high uncertainty in the search process means that the precise timing and size of discovery is attributed more to chance than to planning. The randomness of the oil discovery data allows us to estimate the causal effect of oil discoveries on innovative activities.We use a staggered difference-in-difference model to examine the effects of giant oil discoveries on the quantity and quality of innovative activity at the industry level. We compare the patent count and patent citations between industries based in countries that have oil discoveries and those in countries with no oil discoveries. For each oil discovery event, we consider a twenty-year event window centered on oil discovery years. This window choice is important in that it captures the life-cycle of the natural resource reserve, which involves discovery, exploitation and finally depletion, in line with Arezki et al. (2017). Our results also hold in a longer event window (e.g. 15 years after oil discovery).

Giant oil discoveries constitute over 40% of the world's gas and oil natural reserves. Thus, the increment to a country's natural resources contributed by oil discoveries is of high economic significance in terms of revenue to the respective countries in which discoveries are made. High economic value of the oil discoveries relative to a country's economy ensures that there is enough power in our setting.

Oil discoveries capture the addition to the natural resources of a country. Prior studies usually measure a country's natural resource abundance by the ratio of a country's natural resource export to its GDP,

which is criticised for measuring resource dependence rather than resource abundance (Lederman and Maloney, 2008; Brunnschweiler and Bulte, 2008; Alexeev and Conrad, 2009; Allcott and Keniston, 2017). Measurement based on oil discoveries can overcome this criticism as it directly measures the increment to a country's natural resources.

Our results support the natural resource curse hypothesis. We observe that there is a significant gradual decline in innovative quantity and quality after the discovery of oil.[1] The quality of innovative activity declines by a geometric average of 2.99-3.85% per year in the ten-year window after oil discovery relative to the same period before oil discovery, while innovative quantity decreases by about 2.41-2.69% for the same event window. Accepting the natural resource curse hypothesis for innovation provides a potential vector for oil strikes to cause poor growth outcomes.

We extend our baseline findings to show channels through which natural resource booms negatively affect innovation. Our results show that governance quality is one such channel through which the natural resource curse occurs. To examine the relationship between institutional quality and resource abundance, we include governance estimates by the World Bank for the period 1996-2005 as proxies for institutional quality. Our results show significantly positive correlation between innovation and governance quality. We also find that governance quality and oil strikes are negatively correlated; governance quality worsens in the period after oil discovery, suggesting that governance quality is a plausible channel through which oil strikes have a negative effect on innovative activity. Our results are consistent with findings by Lane and Tornell (1996), Arezki and Van der Ploeg (2008) and Van der Ploeg (2011). [2]

The Dutch disease is one channel that has been identified for the natural resource curse, where resource booms induce exchange rate appreciation that in turn crowds out other non-resource sectors in the economy (Van der Ploeg and Poelhekke, 2010; Van der Ploeg, 2011). To rule out the Dutch disease as a possible mechanism through which we observe declining innovation activity, we control for real exchange rates in our model. Our results are persistent in showing residual decline in innovation while controlling for movements in real exchange rates.

We examine whether the effects of oil discoveries along the dimensions of legal origins and developmental levels for each country in our sample are homogeneous. Prior studies suggest that countries with civil

[1] The gradual decline in innovative activity after oil discovery is indicative of the effects of adjustment costs, that is, innovative projects do not immediately respond to the oil discovery. We are aware that when there is a significant oil find, the country may effect costly changes such as demand for and/or supply of different research programmes that will take time to yield outcome measures.

[2] Lane and Tornell (1996) find that public subsidies and other transfers grow more quickly than the increase in windfall income. Arezki and Van der Ploeg (2008) find that natural resources hurt institutional quality, ultimately impacting the economy negatively. Van der Ploeg (2011) surveys a variety of hypotheses and supporting evidence for why some countries benefit and others lose from the presence of natural resources, concluding that the negative effects of natural resource windfalls were of a conditional nature to the respective economies in which they occur.

law origins have less secure property rights, heavier regulation, less equitable distribution of resources, and corruption, whereas common law countries are found to have greater security of property rights and better contract enforcement.[3] We find that country differences through legal origins may account for crucial differences in social and economic outcomes among the countries reported in this study. Once we control for legal origins, both developed and emerging economies experience declining innovative activity after natural resource windfalls. The decline is lower in emerging-civil law economies and much higher in emerging-common law economies.

We also test whether countries that have not experienced civil war also exhibit the same slow down in innovation after oil discovery. Ross (2004) suggests that oil discoveries increase the likelihood of conflict and civil war. Hence, civil war becomes a probable channel through which oil discoveries hurt economic outcomes. We therefore exclude all countries that have experienced conflict and civil war in the period under consideration, as they would be the obvious culprits for a slow down in innovation. Our results remain robust: innovation activity slows down after an oil strike, even for countries with no civil war.

Finally, we test robustness of our results at the country level, as opposed to the industry level, and find that the same slow down effect persists.

Our study has a three-fold contribution to literature: firstly, we contribute to the natural resource curse literature using a different empirical approach. We show evidence for the natural resource curse at industry level. Our results suggest that governance quality and the wealth effect are plausible channels through which resource booms hurt innovation, while civil war is shown to be an unlikely channel through which innovative activity declines after the discovery of large oil fields. Prior studies also mostly focus on the macroeconomy, with empirical evidence shown by the interaction between natural resource intensity (various measures of resource intensity have been employed) and economic growth as measured by GDP/capita (e.g., Sachs and Warner, 1995; Gylfason, 2001; Papyrakis and Gerlagh, 2007; Bornhorst et al., 2008). Our paper provides granular microeconomic evidence on how natural resource affects the innovation activities using patent data. To our knowledge, our paper is the first to show evidence for the natural resource curse by investigating the relationship between giant oil discoveries and innovative activity as measured by patents and their citations.

Secondly, and closely tied to the natural resource curse, we show the economic consequences of legal origins. We show that common law origin countries, that are characterised by an equitable distribution of

[3]See Djankov et al. (2002). The country differences are further augmented by economic inequalities as established through the Gini index in section C.3 in Appendix.

wealth, experience the natural resource curse more than civil law origin countries. We find that the lower income inequality (as measured by the gini index) in an economy, the more the economy experiences declining innovative activity following a resource windfall.

Lastly, our paper adds to growing literature focusing on oil and gas field discoveries as a directly observable measure of future activity. Weber (2012) shows the effects of gas booms on employment and income, concluding that the impact has been moderate. Our study potentially conflicts with the findings by Guntner (2019) who shows that country-level production and domestic consumption increase following the discovery of large oil fields.

The remainder of our paper is organized as follows: Section 2 contains a literature review, Section 3 presents the data, Section 4 reviews the methodology employed and data analysis. We present the results and robustness analyses in Sections 5 and 6 respectively. Section 7 concludes the paper.

2 Relation to existing literature

Going as far back as Adam Smith, the abundance of natural resources has been associated with negative economic outcomes, with the term *natural resource curse* popularized by Gelb (1988) and Auty (2002) to explain this phenomenon. In their qualitative research, both Gelb (1988) and Auty (2002) observed that some resource-rich economies performed dismally as compared to their resource-poor counterparts after natural resource booms. In support of these findings, Sachs and Warner (1995) show empirical results of the curse, by studying the pattern of economic growth for a sample of 97 developing countries. They, however, suggest that the identification of high growth, resource-abundant economies may be exceptions to their general proposition. As a response to this suggestion, Papyrakis and Gerlagh (2007) demonstrate that resource-abundant states within the United States of America exhibit economic under-performance relative to resource-poor states, with under-investment in education and infrastructure as one of the channels through which this is likely to happen. Lane and Tornell (1996) in further support of the resource curse, extend the neoclassical growth model by introducing the voracity effect: public subsidies and other transfers grow more quickly than the increase in windfall income. One effect of this higher redistribution is to lower the effective rate of return on investment, and hence the aggregate growth rate of the economy deteriorates. Sachs and Warner (1999) show evidence of the curse from 7 Latin American countries and they conclude that, on average, resource booms have done little to generate long term growth.

Sachs and Warner (1995), Gylfason (2001) and Frankel (2010) make the case for the Dutch disease as a possible channel through which resource abundance impairs the economy.[4] However, Allcott and Keniston (2017) find evidence against the Dutch disease for local economies in the United States. They find that real wages, productivity and employment in the manufacturing sector increase following oil and gas booms. Gylfason (2001) adds rent seeking, neglect of education, and overconfidence as other culprits to stunted economic growth after resource windfalls. He argues that natural resource abundance leads to overconfidence and a false sense of security. As he puts it "rich parents sometimes spoil their kids. Mother Nature is no exception." Arezki and Van der Ploeg (2008) find that natural resources hurt institutional quality. For his part, Van der Ploeg (2011) surveys a variety of hypotheses and supporting evidence for why some countries benefit and others lose from the presence of natural resources, concluding that the negative effects of natural resource windfalls were of a conditional nature to the respective economies in which they occur. Countries that had civil wars and bad institutions were found to experience the natural resource curse more severely.

Some recent literature suggests a spurious nature of the resource curse, criticizing the regression designs that have been used to estimate the relationship between resource abundance and economic growth. Measurement error, omitted variable bias and reverse causality concerns have been raised with the models used in literature (See Brunnschweiler and Bulte (2008), Alexeev and Conrad (2009), James and Aadland (2011) and Van der Ploeg (2011)).

Lederman and Maloney (2008) examine econometric evidence for the resource curse and conclude that there is a lack of appropriate measures of abundance, and the existing measures, once instrumented, show no significant evidence for the natural resource curse. The resource dependence measure by Sachs and Warner (1995), expressed as resource earnings relative to income, implies that low income countries will have a higher resource dependence relative to their richer counterparts. However, high dependence on natural resources does not necessarily imply that the resource is in abundance. This measure therefore becomes a biased proxy through which causation is inferred.[5] For their part, Brunnschweiler and Bulte (2008) introduce a subsoil asset estimate, as proxy for resource abundance.[6] This measure is in turn criticized by Van der Ploeg and Poelhekke (2010) for endogeneity concerns as it is closely associated with resource rents.[7]

[4]Resource booms induce the appreciation of the real exchange rate thus making the non-resource sectors less competitive on the international market.

[5]Brunnschweiler and Bulte (2008), Alexeev and Conrad (2009) and Allcott and Keniston (2017), also criticize this measure as being an unsuitable proxy for abundance.

[6]Brunnschweiler and Bulte (2008) estimate natural resource abundance as the log of total natural capital and mineral resource assets in $US per capita.

[7]Natural resource wealth as estimated by Brunnschweiler and Bulte (2008) is an endogenous variable as it is calculated

Alexeev and Conrad (2009) demonstrate that oil and mineral resources have enhanced long term growth in the countries in which they are found. They argue that natural resources, particularly oil, are largely neutral with respect to the countries' institutions. Many other criticisms against the resource curse have shown that when natural resource abundance is proxied by a measure other than resource dependence, the resultant effect of natural resources on growth becomes positive (Lederman and Maloney, 2008; Boyce and Emery, 2011; Cavalcanti et al., 2011).

Boyce and Emery (2011) motivate the need for a better setting to investigate evidence for the natural resource curse, given that currently available evidence is shown through the interaction of resource abundance (and/or dependence) and economic growth. This is the gap that our paper intends to fill, by showing evidence for the natural resource curse using the interaction between giant oil discoveries and innovative activity.

The curse has only been diagnosed at the macroeconomic level, with empirical evidence shown by the interaction between natural resource intensity and economic growth as measured by GDP/capita (Sachs and Warner, 1995; Gylfason, 2001; Papyrakis and Gerlagh, 2007; Bornhorst et al., 2008). To our knowledge, our paper is the first to show evidence for the natural resource curse by investigating the relationship between giant oil discoveries and innovative activity as measured by patents and their citations.

3 Data and summary statistics

In this section we provide details on sample selection and variable construction. We construct our cross-country sample by merging oil discovery data with patent data. The intersection of our oil discovery and patent data sets is made up of 159 countries, of which 47 have both oil discoveries and registered patents.

3.1 Giant oil discoveries

We use the data set on giant oil discoveries by Horn (2007) as used by Arezki et al. (2017). The data set consists of 491 giant oil discoveries from 72 countries covering the period 1960-2012.[8] The period we consider, 1975-2005, contains 267 of these discoveries, spread across 53 countries. Six of the countries with discoveries do not have any patent activity.[9] Our final data set has 159 countries. Tables 1 and

as the present value of natural resource rents.

[8]Discoveries from fracking were not included in this dataset as they do not constitute shock discoveries.

[9]The countries with oil discoveries but no registered patents are Angola and Libya with 4 oil discoveries, Sudan and Turkmenistan with 2 each and Equatorial Guinea and Gabon with 1 oil discovery each for the period 1975-2005. Since these countries have no patenting activity, they are not included in Tables 1 and 2 although they are included in our analysis.

2 show the summary statistics for the 47 countries (out of the 159) that have both oil discoveries and patents. As shown in column 2 in Table 1, Russia, Saudi Arabia, Iran and China have the largest number of oil discoveries.

Giant oil discoveries contain an equivalent of 500 million barrels or more of ultimate recoverable reserves before extraction begins and account for over 40% of the world's oil and natural gas reserves. Arezki et al. (2017) detail three unique features about giant oil discoveries that make them ideal in representing an economic news shock that forms significant expectations about future prospects. Firstly, the discovery of a giant oil deposit is a rare, country-specific event, which represents a significant amount of oil revenue, constituting a median value of 9% of GDP for the respective countries. This makes oil discoveries a relevant macroeconomic shock, whose occurrence can be considered random, yet whose influence on the wealth of the specific countries is massive and widespread. The second unique feature of giant oil discoveries is that production is delayed by about 4-6 years after the initial discovery is made. This time lag between discovery and extraction ensures that news about future economic prospects proliferates through the economy, and forward-looking agents are able to update future expectations on the basis of available information. This makes giant oil discoveries an ideal news shock to influence future output. Lastly, the timing and the sheer size of the discovery is arguably exogenous and unexpected. While the process of exploration is not random, it is highly unpredictable with a very high probability of failure. The odds of a giant oil discovery in a given year is less than one-in-twenty, as noted by Lei and Michaels (2014), which makes their precise timing and the size of oil reserve more of a chance happening than a predictable occurrence. Given these unique characteristics of giant oil discoveries, we consider their occurrence as random and so we can interpret the events that follow them as being caused by the discoveries.

3.2 Patent data

Patent data has been recognized as a relevant proxy for innovation by Hall et al. (2001). Innovation, in turn, is considered a major source of long-run economic growth.[10] We collect patent and citation information from the data set by Lai et al. (2015).[11] This database contains granted USPTO patents data, including names of inventors, names of assignees, grant and application dates, technology classes and forward citations.

[10] See Hsu et al. (2014) and Cornaggia et al. (2015)

[11] This data set updates the work by Hall et al. (2001), which extends from January 1, 1963 through December 31, 1999. Lai et al. (2015) extend this data set to 2010 and they make a concerted effort to consolidate varied spellings of the same patent assignee.

Table 1:
Summary statistics for patents.
This table reports summary statistics for the country-year observations of oil discoveries and patent counts for 47 countries in the period 1975-2005. Column 2 shows the number of oil discoveries received by the countries in column 1. Columns 3-7 report the summary statistics for patent counts in the same period. The complete summary of 159 countries is shown in Table A.1 in Appendix A.

		PATENTS				
Country	Discoveries	Mean	Median	SD	Min	Max
Algeria	2	0.13	-	0.34	-	1
Argentina	3	29.65	25	15.92	10	74
Australia	12	532.87	439	260.38	227	1,143
Azerbaijan	3	0.29	-	0.64	-	2
Bangladesh	1	0.16	-	0.45	-	2
Bolivia	3	0.58	-	0.72	-	2
Brazil	11	57.84	55	36.64	20	141
Canada	5	2,138.45	1,967	970.09	1,074	3,975
China	14	154.00	50	253.51	-	944
Colombia	3	5.48	4	3.50	-	13
Congo, Rep	2	0.03	-	0.18	-	1
Cote d'Ivoire	1	0.13	-	0.34	-	1
Denmark	1	268.26	198	148.26	136	602
Egypt	5	2.71	2	2.28	-	7
India	4	132.84	29	204.35	5	638
Indonesia	8	3.61	2	2.89	-	10
Iran	15	2.39	2	2.82	-	11
Iraq	9	0.29	-	0.69	-	3
Italy	1	1,190.87	1,192	393.58	704	2,110
Kazakhstan	9	0.65	-	1.31	-	5
Kuwait	2	2.23	1	2.77	-	8
Malaysia	5	28.13	8	42.67	-	159
Mexico	5	51.00	43	20.21	25	112
Morocco	1	0.97	1	1.11	-	4
Myanmar	4	0.13	-	0.34	-	1
Nigeria	9	1.10	1	1.14	-	4
Norway	11	149.52	120	77.28	66	341
Oman	4	0.03	-	0.18	-	1
Pakistan	2	0.90	1	1.16	-	6
Papua New Guinea	1	0.10	-	0.30	-	1
Peru	3	2.26	2	1.69	-	6
Philippines	1	8.61	5	7.75	1	29
Qatar	2	0.10	-	0.40	-	2
Romania	1	5.65	4	4.85	-	19
Russia	19	207.19	182	108.92	77	465
Saudi Arabia	16	8.77	7	6.50	-	22
Spain	1	166.55	144	96.42	51	426
Thailand	2	9.52	4	12.06	-	55
Trinidad and Tobago	2	1.19	1	1.54	-	5
Tunisia	1	0.58	-	0.96	31 -	4
United Arab Emirates	4	1.81	1	2.34	-	9
United Kingdom	5	2,854.61	2,611	761.05	1,622	4,560
United States	13	57,527.03	52,904	21345.27	34,193	98,014
Uzbekistan	2	0.35	-	0.66	-	2
Venezuela	6	18.32	15	8.40	4	31
Vietnam	1	0.23	-	0.62	-	3
Yemen, Rep.	2	0.06	-	0.25	-	1

Table 2:
Summary statistics for citations.
This table reports summary statistics for the country-year observations of citations on the patents from the 47 countries in column 1. These are citations on the patents reported in Table 1. Columns 3-7 report summary statistics for patent citations for the period 1975-2005. The complete summary of citations for 159 countries is shown in Table A.2 in Appendix A.

		CITATIONS				
Country	Discoveries	Mean	Median	SD	Min	Max
Algeria	2	0.10	-	0.54	-	3
Argentina	3	273.00	181	238.47	1	800
Australia	12	3,980.71	3,919	1,969.71	208	8,042
Azerbaijan	3	1.42	-	4.15	-	20
Bangladesh	1	0.06	-	0.25	-	1
Bolivia	3	3.94	-	8.57	-	44
Brazil	11	296.29	261	159.05	10	667
Canada	5	19,275.39	17,034	10,552.95	680	38,193
China	14	475.03	446	460.92	-	1,626
Colombia	3	43.90	34	32.75	-	115
Congo, Rep	2	0.06	-	0.36	-	2
Cote d'Ivoire	1	2.16	-	6.92	-	30
Denmark	1	1,733.65	1,605	830.46	49	3,331
Egypt	5	24.45	5	42.18	-	183
India	4	322.26	192	316.40	13	1,198
Indonesia	8	19.26	17	17.96	-	60
Iran	15	21.90	7	42.06	-	197
Iraq	9	2.52	-	7.99	-	39
Italy	1	6,790.03	6,797	2,726.70	222	9,859
Kazakhstan	9	0.52	-	1.12	-	4
Kuwait	2	9.35	3	14.64	-	52
Malaysia	5	114.74	86	120.80	-	483
Mexico	5	301.68	325	122.96	12	480
Morocco	1	9.84	-	21.60	-	94
Myanmar	4	0.94	-	3.19	-	16
Nigeria	9	5.74	1	9.12	-	42
Norway	11	905.71	790	446.75	26	1,806
Oman	4	0.10	-	0.54	-	3
Pakistan	2	7.23	-	28.10	-	156
Papua New Guinea	1	0.39	-	1.58	-	8
Peru	3	14.32	9	16.92	-	77
Philippines	1	49.35	33	41.19	2	199
Qatar	2	0.03	-	0.18	-	1
Romania	1	28.52	20	30.55	-	110
Russia	19	1,192.07	1,221	667.38	60	2,623
Saudi Arabia	16	62.19	50	55.16	-	205
Spain	1	777.65	652	410.63	58	1,494
Thailand	2	52.00	36	51.65	-	182
Trinidad and Tobago	2	6.42	1	11.64	-	48
Tunisia	1	3.29	-	6.09	-	22
United Arab Emirates	4	10.90	2	23.63	-	123
United Kingdom	5	23,351.45	25,008	9,300.12	350	35,302
United States	13	657,297.50	564,403	340,700.80	23,690	1,279,368
Uzbekistan	2	1.06	-	3.07	-	15
Venezuela	6	119.58	130	77.61	-	314
Vietnam	1	0.35	-	1.80	-	10
Yemen, Rep.	2	0.06	-	0.36	-	2

Our final data set comprises a total of 3.3m patents granted for the period from 1975 through to 2005 and 31.3m citations received by these patents for the same period. We summarize the patent counts in Table 1 and patent citations in 2, which show statistics for 47 of the 159 countries in our study.[12] USA, UK, Canada, Italy, and Australia are the leaders in innovative activity.

Patent data suffers from truncation problems; i.e. our distributions of patent counts and citations lack proper estimates at the start and end of the sample period under consideration. For the earlier years, technological costs and accessibility make it difficult to fully capture patent activity in most countries. Hall et al. (2001) note that not all inventions are patented, and not all patented inventions were captured given the costs of technology in earlier years. From just scanning our data, it is clear that only major developed countries have registered patents in earlier years, which is reflective of the restrictive costs of technology in that period. To remedy this truncation issue, we restrict our data set to include patents from 1975 onward, to coincide with the year from which patent citation data is comprehensive, as noted by Lai et al. (2015).[13] Towards the end of our sample period, our data set (which is made up of only patents that are eventually granted), has a truncation bias emanating from the time to process a patent application. In the last 2-3 years of the available data set (2008-2010) the majority of patent applications were still not granted at the time the data set was compiled. To mitigate the truncation issue towards the end of our sample period, we make 2005 the closing year in our empirical analysis, in line with recommendations by Lerner et al. (2011) and Dass et al. (2017). This ensures we capture 94-97% of patent grants in the period until 2005. In addition we scale our patents using the fixed-effect adjustment by Hall et al. (2001) and Lerner and Seru (2017) to capture patent intensity. We drop design, reissue and plant patents because they are not involved with the invention or improvement of a product, process or machine. We are left with utility patents in our data set, which constitute the majority of all patents. We create an innovation measure $\log(1 + PAT)_{i,j,t}$, to capture the quantity of innovative activity for industry i that are invented by individuals and institutions from country j in year t. To match patents with industry, we use the two-digit standard industrialization classifications from the US Patent and Trademark Office (USPTO).[14]

Using patent counts as a proxy for innovation has received criticism, as noted by Hsu et al. (2014), that even though the intuition and implementation of patent counts is fairly straightforward, they do not

[12] Statistics for the full sample of 159 countries is given in Tables A.1 and A.2 in Appendix A.

[13] Hall et al. (2001) also state that prior to 1975, there are no data sets that completely capture all citations data. For this reason, our sample runs from 1975-2005. We attempted using a patent data sample from 1960-2005 but could not draw any meaningful conclusions given the significant amount of missing data.

[14] See `https://www.uspto.gov/web/offices/ac/ido/oeip/taf/naics/doc/naics_info.htm`

distinguish ground-breaking inventions from incremental technological discoveries. We therefore introduce a second innovation measure, $\log(1 + CITES)_{i,j,t}$, which measures patent influence by counting the number of citations that particular industry patents receive in subsequent years. This measure therefore captures the quality and importance of innovative activity as well as innovative knowledge flows. Our citation data set faces truncation problems in that patents will continue to receive citations over a long period of time, yet in our data set we observe citations up until 2010. We therefore adjust our sample data to exclude the last five years (as suggested by Dass et al. (2017)) and, in addition, we scale our citations using the patent class-year fixed-effects approach.[15]

4 Methodology and empirical analysis

We create a dummy variable, *strike*, which takes the value of 1 to indicate a year when oil discovery was made for each country and 0 otherwise. To study the impact of giant oil discoveries on innovation, we create 10 lead and lag dummy variables to enable us to analyze patent activity ten years before the strike and up to ten years post-strike. We choose a ten-year lead/lag period for each discovery in line with Arezki et al. (2017), whose findings show a ten-year cycle for each discovery; with production starting 4-6 years after discovery and continuing through to year 10 when the oil is depleted. The ten-year period before the strike, allows us to observe normal innovative trend before the discovery shock, while the ten-year period after the strike shows the changes to the pattern observed before strike. We interpret these changes to normal trend as the causal effects of the oil discovery on innovative activity.[16] When we create the strike dummy variable, we notice an overlap for some countries that have received discoveries in subsequent years. We allow the strike lead/lag dummies to jointly affect a given year's patent activity so that, for example, 5 years after strike 1 and 6 years before strike 2 is affected by the 5 year lag and 6 year lead dummies.

Patent and citations data are a count variable, with zero in the lower bound. The upper bound is unlimited, in some cases stretching to thousands/millions of count data for countries like the USA. To this end, a poisson regression model would be used to estimate correlation between oil discovery and innovation. However, once we employ the patent class-year fixed effects adjustments, our patents and

[15] Lerner et al. (2011) note that the Hall et al. (2001) approach of imputing a citation distribution over time may inflate the importance of some technologies and depress others. We therefore use a combined approach of excluding the last 5 years and the patent class-year fixed-effect adjustment in line with Dass et al. (2017) and Lerner and Seru (2017).

[16] We attempted to extend the event window after oil discovery to 15 years, to observe if there are any residual effects of oil discovery on innovative patterns. We found no significant difference to the pattern we observe with the 10 year window.

citations data cease to be count variables. We therefore use the ordinary least squares regression model.[17]

We run the following Ordinary Least Squares (OLS) regression model:

$$y_{i,j,t} = \beta_i + \sum_{\tau=-10}^{10} (\beta_\tau \delta_{\tau,j,t}) + \rho_1 \boldsymbol{X}_{j,t} + \gamma_j t + \mu_i + \epsilon_{i,j,t} \tag{1}$$

where $y_{i,j,t}$ represents either the log of patents $\log(1+PAT)_{i,j,t}$, or the log of citations $\log(1+CITES)_{i,j,t}$ adjusted for class-year fixed effects, for industry i in country j, in year t. β_τ represents the respective lag/lead coefficients of the strike variable ($\delta_{\tau,j,t}$) for the period ten years before the strike to ten years after the strike, $\rho_1 \boldsymbol{X}_{j,t}$ represents control variables, $\gamma_j t$ denotes country time trend that absorbs time-varying country characteristics, β_i are constants, μ_i is the industry fixed effect that absorbs the effects of industrial variation upon which our dependent variables are constructed and $\epsilon_{i,j,t}$ represents residuals. A standard approach for fixed effects ($\eta_{i,j,t}$) for industry, country and time would use $\eta_{i,j,t} = \beta_i + \mu_j + \gamma_t$. However, this forces a common time trend, adjusted in levels, across all countries, which is empirically inaccurate. Some countries' patent and citations counts are growing faster relative to others. The predominant time effect is a linear trend, so we use instead $\eta_{i,j,t} = \beta_0 + \mu_i + \gamma_{i,j} t$ to allow for industry and country-specific time trends. The last term in this fixed effects equation controls for the country-specific time trends.

Our focus when we interpret our results is on the event window ten years before and after the strike. Hence, we are interested in the coefficients and significance of the 21 dummy variables, represented by β_τ in (1). These results are shown in regression tables in Section 5 and in the Appendix.

To fully examine the effect of the oil strike in the pre-strike and post-strike periods, we use a cumulative effect measure of the strike's impact following Campbell et al. (1997). We present these results in graphical form. Next, we analyze activity in respective event windows. activity in event time is indexed by τ, implying that $\tau = 0$ becomes the event date for every strike. $\tau - 1$ to $\tau + 1$ represents event window from 1 year before strike to 1 year after strike; and so on until $\tau - 10$ to $\tau + 10$, which represents the event window from 10 years before the strike to ten years after the strike, respectively. Using these event windows, we create a $[10 \times 21]$ matrix χ_{ij} where:

$$\chi_{i,j} = \begin{cases} 1 & \text{if} \quad 12 \leq j \leq 11 + i, \\ -1 & \text{if} \quad 11 - i \leq j \leq 10, \\ 0 & \quad \text{otherwise.} \end{cases}$$

[17] We prioritized less truncation bias in this paper over model specification. Our results using poisson model specification in line with Lerner et al. (2011) are available upon request and these are consistent with results shown in this paper.

The indices i and j represent the row and column respectively. Using our coefficients from regression results (represented by β_τ), we create a variance covariance matrix, which we will call Σ. We then produce a $[10 \times 10]$ cumulant variance covariance matrix, $\Phi = \chi * \Sigma * \chi^T$; which has cumulant variances along the diagonal. Because we are focusing on time windows, we create our ten event window activity estimates as a $[10 \times 1]$ vector $\mathbf{A} = \chi\beta$.[18] We use these event window activity estimates in $\mathbf{A}$ and the standard deviations from matrix Φ to calculate t-statistics for each event window.

We interpret the activity difference between any given event window as the measure of the impact of the oil discovery on the industry innovative activity. A positive (negative) and significant activity difference suggests that innovative activity increases (decreases) after the oil discovery. If our results show a decrease in innovative activity after the strike, then this is consistent with the natural resource curse hypothesis. A positive activity difference in respective event windows supports the findings that natural resource endowment is positively correlated with economic outcomes, and hence evidence *against* the natural resource curse.

5 Baseline results

In this section, we present our main findings. We test whether natural resource shocks are correlated with innovation. Our results (see Table 3, Figure 1, and Table 4) show that in the period before the discovery, innovative activity is positive and increasing over time, while activity post-discovery shows significant decline. For all event window periods shown in Table 4, patent activity between time -t and 0 is higher than patent activity from time 0 to t. In other words, pre-strike patent activity is higher relative to post-strike patent activity.

Our baseline regression results are presented in Table 3. Models 1 and 2 show results from using $\log(1 + PAT)_{i,j,t}$ as the proxy for innovative quantity while models 3 and 4 use $\log(1 + CITES)_{i,j,t}$ as proxy for innovative quality. Regression models 1 and 3 shows results from regressing $\log(1 + PAT)_{i,j,t}$ and $\log(1 + CITES)_{i,j,t}$ on the giant oil discovery dummy variables, without any controls. In models 2 and 4 we control for differences in economic growth levels by introducing the variable GDP/capita, the log of real exchange rates and financial openness. We add real exchange rates as controls in our model as they are central to the Dutch disease.[19] Our macroeconomic variables are from IMF (2017) and

[18] The event window activity estimates are calculated as the sum of activity after strike less the sum of the activity before strike.

[19] Data are also available for education as measured by the rate of primary school completion, and employment. However, we exclude these controls as they have approximately 50% of observations missing. Financial openness is calculated as the sum of assets and liabilities relative to GDP. An average of this index for each country was calculated and if it is above the

Table 3: Oil discoveries and innovation activity.
This table shows the regression results of industry-level panel regressions of innovation activity on oil discoveries for the period 1975-2005. Columns 1 and 2 show results where the dependent variable is the logarithm of one plus the number of patents (adjusted for class-year fixed effects) granted by the USPTO, for industry i in country j, in year t. Columns 3 and 4 show results where the dependent variable is the logarithm of one plus the number of citations (adjusted for class-year fixed effects) of patents granted by the USPTO, for industry i in country j, in year t. The effect of oil discoveries on innovation activity is shown through the period ten years before and after oil discovery. Time $\tau = 0$ is the event date in calendar time. Interval $(\tau - 10) - (\tau - 1)$ is the pre-event period that shows the pattern of innovation before oil discovery. Interval $(\tau - 10) - (\tau + 10)$ is the 21-year event window and interval $(\tau + 1) - (\tau + 10)$ is the post-event window that shows pattern of innovation after oil discovery. The pre-event window provides the information needed to specify normal trend. The post-event window is used to investigate longer term patents and citations performance following oil discovery. Regression models 2 and 4 include control variables, GDP/capita, log of real exchange rate and financial openness (controls are unreported). The symbols ***,**, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable	PAT		CITES	
	(1)	(2)	(3)	(4)
Event window	No controls	With controls	No controls	With controls
-10	0.0174*	0.0024	0.0268***	0.0067
	(0.0089)	(0.0109)	(0.0098)	(0.0121)
-9	0.0258***	0.0131	0.0411***	0.0242**
	(0.0089)	(0.0109)	(0.0100)	(0.0122)
-8	0.0120	0.0108	0.0386***	0.0369***
	(0.0089)	(0.0106)	(0.0098)	(0.0119)
-7	0.0134	0.0164	0.0351***	0.0414***
	(0.0088)	(0.0106)	(0.0097)	(0.0119)
-6	0.0234***	0.0324***	0.0426***	0.0560***
	(0.0088)	(0.0104)	(0.0095)	(0.0114)
-5	0.0311***	0.0386***	0.0431***	0.0514***
	(0.0086)	(0.0103)	(0.0094)	(0.0112)
-4	0.0228***	0.0351***	0.0315***	0.0450***
	(0.0086)	(0.0103)	(0.0093)	(0.0113)
-3	0.0215**	0.0256**	0.0185**	0.0217*
	(0.0085)	(0.0102)	(0.0094)	(0.0114)
-2	0.0310***	0.0283***	0.0126	0.0067
	(0.0084)	(0.0103)	(0.0094)	(0.0116)
-1	0.0297***	0.0240**	0.0156*	0.0060
	(0.0084)	(0.0103)	(0.0094)	(0.0117)
$\tau = 0$	0.0294***	0.0318***	0.0261***	0.0231**
	(0.0082)	(0.0100)	(0.0091)	(0.0111)
1	0.0133	0.0104	0.0018	-0.0093
	(0.0082)	(0.0098)	(0.0091)	(0.0108)
2	0.0151*	0.0110	0.0122	-0.0037
	(0.0082)	(0.0099)	(0.0093)	(0.0113)
3	-0.0043	-0.0049	-0.0195**	-0.0296***
	(0.0083)	(0.0096)	(0.0091)	(0.0107)
4	-0.0180**	-0.0127	-0.0281***	-0.0324***
	(0.0083)	(0.0094)	(0.0095)	(0.0108)
5	-0.0096	-0.0096	-0.0055	-0.0178*
	(0.0083)	(0.0090)	(0.0093)	(0.0102)
6	-0.0103	-0.0068	-0.0070	-0.0160
	(0.0084)	(0.0091)	(0.0095)	(0.0103)
7	-0.0073	0.0032	0.0083	0.0041
	(0.0087)	(0.0093)	(0.0098)	(0.0106)
8	-0.0061	0.0035	0.0103	0.0054
	(0.0089)	(0.0095)	(0.0098)	(0.0105)
9	-0.0060	-0.0024	0.0205**	0.0119
	(0.0091)	(0.0097)	(0.0102)	(0.0109)
10	-0.0075	-0.0061	0.0133	-0.0017
	(0.0092)	(0.0099)	(0.0104)	(0.0114)
Observations	62,124	42,141	58,063	40,057
R-squared	0.8540	0.8581	0.8326	0.8320
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

World Bank (2018).

Our results in Table 3 show that, on average, innovative activity before oil discovery is positive and gradually increasing over time. After oil discovery, we observe a decline in patent and citations activity, in some cases, with amounts below observed trend in the pre-strike period for both innovative quantity and innovative quality. On average, patenting activity decreases by 1.80% and 1.27% four years after oil discovery in models 1 and 2 respectively. This is down from pre-strike activity that was 2.28% and 3.51% above trend in the four years before oil discovery. Similarly, the number of citations is 2.81% and 3.24% below trend, from amounts 3.15% and 4.50% above trend for the same period in models 3 and 4 respectively. These results show us the deviation from pre-strike innovative activity that is due to oil discovery.

Comparing regression models 1 and 3, in which we have no controls, we find that expected innovative quantity (as measured by $\log(1+PAT)_{i,j,t}$) gradually increases from 1.74% 10 years before strike, to peak at 3.10% two years before strike. Innovative activity above trend lingers in the year that oil is discovered until 3 years post-strike patent and citations activity is almost zero. In comparison, innovative quality (as measured by $\log(1+CITES)_{i,j,t}$ in model 3) registers positive and significant activity, with highs of 4.31% (no controls) and 5.14% (controlling for GDP, exchange rates and openness) 5 years before strike. This trend of positive expected activity continues until one year after oil discovery where expected activity is almost zero. We observe that three years after oil discovery, expected activity becomes negative at -1.95% and -2.96% in models 3 and 4 respectively.

To fully observe the trend of innovation activity before and after oil discovery, we construct graphs showing the cumulative effect of activity ten years before and after oil discovery. We show the results in Figure 1.

Figure 1 expresses the results from Table 3 in graphical form. Our cumulative estimates before the strike are positive and gradually increasing, showing that in the pre-strike period, innovative activity trends up over time relative to the post-strike period. Approximately two years after an oil strike, this upward trend is interrupted, and there is a slowdown in innovative quantity, as shown by the solid lines in graphs A and B. Innovative quality (citations) slows down at strike as shown by the broken lines in Figure 1. The pattern in the graphs shows that the sustained innovative activity we observe in the pre-strike period is disrupted when oil discoveries are made, after which a slowdown effect is evidenced.

median then the country is considered open (and given a dummy variable of 1). If the average is below the median then the country is considered financially closed (and given a dummy variable of zero).

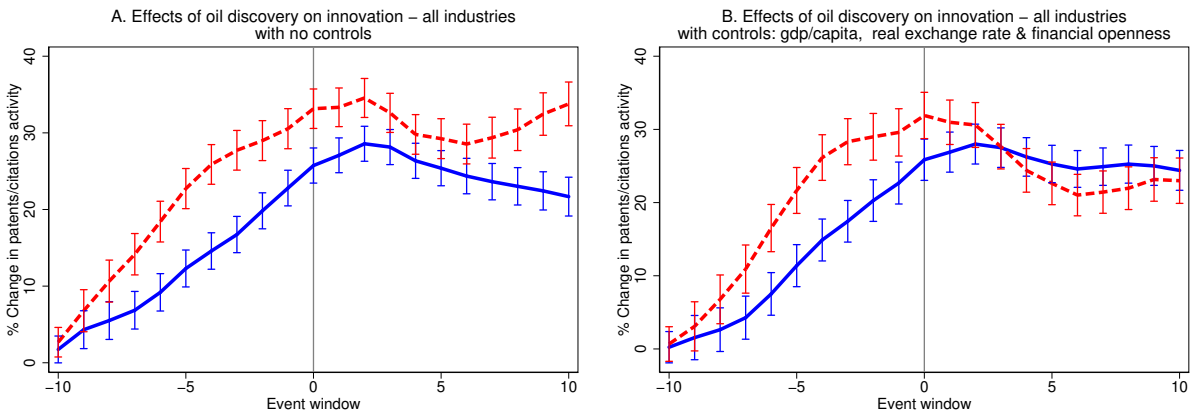

Figure 1: Graphical presentation of the effect of oil discovery on innovation activity.
The line graphs show the cumulative of estimates shown in regression results in Table 3. The solid lines in graphs A and B show results for innovative quantity, as measured by $\log(1+PAT)_{i,j,t}$, while the dashed lines show results for innovative quality as measured by $\log(1+CITES)_{i,j,t}$. The event window from -10 to -1 shows the period in years before oil discovery, time 0 is the time when each individual oil discovery is made. The event window from 1 to 10 years shows the period after oil discovery. Graph A shows the effect of oil discovery on innovation without controls. Graph B shows the same results while controlling for GDP/capital, the log of real exchange rates and financial openness. Both innovation quantity and quality measured by patents and their citations slow down after oil discovery.

These patterns provide indications of the impact of oil discovery on innovative activity. We observe a slowdown in the period after the discovery of oil, and this pattern is consistent with the natural resource curse hypothesis. When natural resources are in abundance, they impact economic outcomes negatively.

To ascertain whether the impact of oil discoveries on innovative quantity and quality is significant in the period after oil discovery, we construct ten event windows (as explained in Section 4). The results are shown in Table 4. We find that in all event windows, innovative activity differences (i.e. activity after the strike minus activity before the strike) are negative. This shows that innovative activity after the strike declines, relative to the period before the strike, whichever event window one looks at.

Our results in Table 4 show that innovative quantity declines by about 1.35%-1.63% (relative to trend) when comparing 1 year windows. As the event window widens to 10 years before and after the strike, the magnitude of the decline in innovative quantity increases to approximately 2.69% and 2.41% per year (in models 1 and 2 respectively), as shown in the top panel of Table 4. These results are significant at the 5% level.

Similarly, for innovative quality, we observe that activity (relative to trend) after oil discovery is less than activity before discovery. All event windows show innovative amounts below trend, in similar fashion to innovative quantity. The one-year window shows a decline of 1.38% and 1.53% in models 3 and 4 respectively. The magnitude of decline increases as the event windows widen, for example, the ten year window shows activity declines of 29.9% and 38.5% in models 3 and 4 respectively. These 10-year

window activity declines translate to annual geometric average declines of 2.99% and 3.85% respectively. The estimated activity declines shown in the event windows are significant at the 5% level. Hence, our baseline regression results support the natural resource curse hypothesis. After oil discovery, our results show that both innovative quantity and quality reduce significantly relative to trend.

We further extend our findings to explore possible channels through which the decline in innovative activity occurs in Section 6.

Table 4: Event windows showing the effect of oil discoveries on innovation activity.
This table shows the change in innovation activity for event windows 1-10. The change in activity is calculated as difference between the sum of innovation activity after oil discovery and the sum of innovation activity before oil discovery for ten event windows. A negative change in activity shows that innovation activity after oil discovery is lower than innovation activity before oil discovery. The change in activity estimates are from regression models 1-4 in Table 3. Models 1-2 represent results using $\log(1+PAT)_{i,j,t}$ and models 3-4 represent event window analysis using $\log(1+CITES)_{i,j,t}$ as dependent variables. Results are significant at the 5% level for the 3-10 year event windows.

	PAT			
	Model 1		Model 2	
Event window	% Change in innovation	t-stat	% Change in innovation	t-stat
(1,-1)	-1.63	-1.36	-1.35	-0.96
(2,-2)	-3.23	-2.07	-3.09	-1.66
(3,-3)	-5.80	-3.32	-6.13	-3.00
(4,-4)	-9.88	-5.09	-10.90	-4.82
(5,-5)	-14.00	-6.53	-15.70	-6.32
(6,-6)	-17.30	-7.43	-19.70	-7.22
(7,-7)	-19.40	-7.88	-21.00	-7.22
(8,-8)	-21.20	-8.08	-21.70	-6.91
(9,-9)	-24.40	-8.66	-23.30	-6.75
(10,-10)	-26.90	-8.76	-24.10	-6.30
	CITES			
	Model 3		Model 4	
Event window	% Change in innovation	t-stat	% Change in innovation	t-stat
(1,-1)	-1.38	-1.06	-1.53	-1.00
(2,-2)	-1.41	-0.80	-2.57	-1.21
(3,-3)	-5.21	-2.73	-7.70	-3.40
(4,-4)	-11.20	-5.32	-15.40	-6.18
(5,-5)	-16.00	-6.79	-22.40	-7.98
(6,-6)	-21.00	-8.02	-29.60	-9.48
(7,-7)	-23.70	-8.49	-33.30	-9.85
(8,-8)	-26.50	-8.90	-36.40	-9.89
(9,-9)	-28.60	-9.02	-37.70	-9.37
(10,-10)	-29.90	-8.76	-38.50	-8.63

6 Robustness and extensions

In this section, we check the robustness of our main findings. We examine whether the effects of giant oil discoveries are robust to alternative specifications of the main model. Specifically, we test whether

declining governance quality could be a plausible channel through which oil discoveries have a harmful effect on innovation. We also test whether our results remain the same when we split our country sample according to common and civil law origins, and developed vs emerging countries. Civil conflict has been considered as more likely after the discovery of natural resources and thus becomes a probable culprit in declining economic activity. Hence, we restrict our sample to those countries that have not experienced civil wars and re-estimate our model. Lastly, we test for the robustness of our results at the country level.[20]

For brevity, in this section we only show graphical presentations of our regression results and the 5-year window of our event window analyses.[21]

6.1 Governance

Our baseline results show evidence in support of the natural resource curse. Alexeev and Conrad (2009) and Frankel (2010) hypothesize that deterioration of governance and institutional is the channel through which natural resources can be a curse to long-run development. Lane and Tornell (1996) propose the voracity effect, that is, the increased re-distributive activity in the wake of resource windfalls, as a culprit for stunted economic growth, through the lowering of the effective rate of return to investment. In addition, they find that the voracity effect is more pronounced in countries with powerful groups and poorly managed institutions. These findings suggest that governance quality is a plausible channel through which natural resource windfalls might have a harmful effect on innovation. We therefore explore whether this holds for our sample. We begin by showing how legal origins (as suggested by LaPorta et al. (2008)) affect our results. Next, we show how oil discoveries affect governance quality.

6.1.1 Legal origins

We first determine whether our main results are robust to splitting our sample according to common and civil law origins. Legal origins, broadly interpreted by LaPorta et al. (2008) as highly persistent systems of social control of economic lives, play a vital role in influencing institutional, governance and economic outcomes in different countries. Glaeser and Shleifer (2002) find that legal structures in many countries are heavily influenced by either English common law or the French civil law.[22] In addition to

[20] We also consider expanding our sample period to 1960-2005, but our results are biased (and therefore not reported) due to lack of patent citations data for the period prior to 1975.

[21] Full event window analysis results are in the Appendix.

[22] As stated by Glaeser and Shleifer (2002) common law tradition originates in the laws of England, and has been transplanted through conquest and colonization to England's colonies, including the United States, Australia, Canada, and many countries in Africa and Asia. Civil law tradition has its roots in the Roman law, lost during the Dark Ages, but rediscovered by the Catholic Church in the eleventh century and adopted by several continental states, including France

these findings, Glaeser and Shleifer (2002) posit that common law origin countries exhibit better investor protection, lighter government ownership and regulation, and are in turn associated with less corruption, better functioning markets, and more independent judicial systems. At the same developmental level, they find that civil law countries exhibit heavier regulation, less secure property rights, more corruption, less efficient government and even less political freedom relative to common law countries.

Using data on respective countries' legal origins by Djankov et al. (2002), we identify the legal systems for all country observations in our data set. We then split our data into two data sets with countries with civil law and common law origins respectively. The common and civil law countries are shown in Appendix B.

Appendix C.1 shows regression results for split data sets comprising countries with civil law and common law origins. We show the graphical presentation of the regression results in Figure 2. The solid lines in the graphs depict innovative quantity as measured by $(\log(1 + PAT)_{i,j,t})$ while dashed lines show innovative quality $(\log(1 + CITES)_{i,j,t})$. The top panel, graphs A and B, show cumulative patent and citations activity for civil law countries, and the bottom panel (graphs C and D) show activity for common law countries.

Figure 2 shows that the decline in innovative quality and quantity in response to oil discovery is more pronounced in common law countries (graph D) relative to civil law countries (graph B). We observe diminutive slowdown for civil law countries, while common law countries experience significant decline contemporaneously with the oil discovery. The innovative pattern exhibited by civil and common law countries supports the findings of Glaeser and Shleifer (2002) that the former have less property rights and inefficient resource allocation relative to common law countries and hence non-benefiting groups in civil law countries find it necessary to keep inventing even in the midst of resource windfalls. Our results support the findings that legal differences influence economic outcomes as suggested by LaPorta et al. (2008).

We now show the estimated changes in the 5-year window for both civil law and common law countries. Our results are shown in Table 5. Complete event window results are shown in Appendix C.2. As suggested by Figure 2, the decline in innovation is larger for common law countries relative to civil law countries. The five-year window for common law origin countries shows declines in innovative quantity of 33.1% and 50.1% as shown in the top right panel. In comparison, civil law countries show a decline of 5.12% and an increase of 0.84% in the top left panel. This shows that civil law countries experience

through the Napoleonic Code.

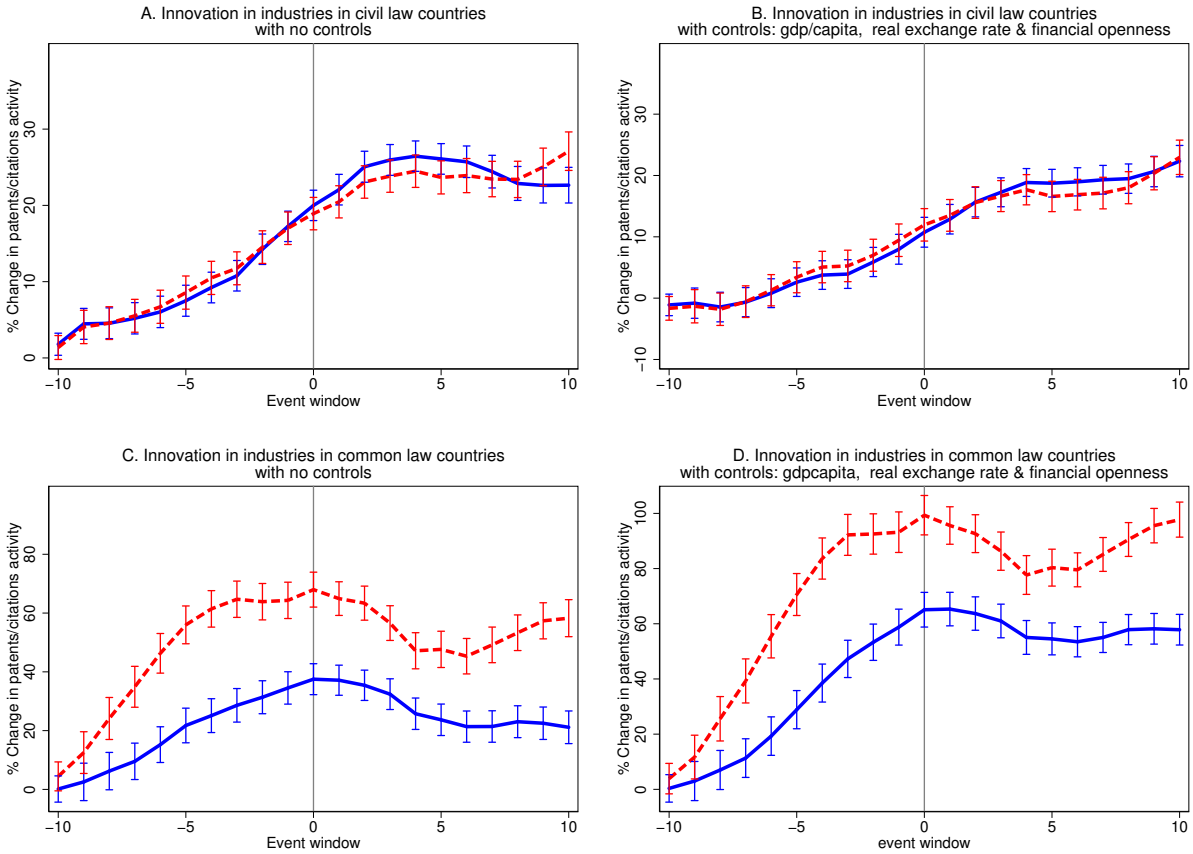

Figure 2: Graphical presentation of the effects of oil discoveries on innovation activity for industries in civil and common law origin countries.
The line graphs show the cumulative of estimates shown in regression results in Table C.1 in Appendix C. Graphs A and B in the top panel show the effect of oil on innovative activity for industries civil law countries, while graphs C and D in the bottom panel show activity for common law countries. The solid lines in graphs A and B show results for innovative quantity, as measured by $\log(1+PAT)_{i,j,t}$, while the dashed lines show results for innovative quality as measured by $\log(1+CITES)_{i,j,t}$. The event window from -10 to -1 shows the period in years before oil discovery, time 0 is the time when each individual oil discovery is made. The event window from 1 to 10 years shows the period after oil discovery.

slight decline in the five years after oil discovery relative to the same period before oil discovery.

Our results for innovative quality depict the same pattern of decline after oil discovery. We observe significantly higher magnitudes of decline in common law countries than in civil law countries as shown in Table 5. The 5-year window in the bottom right panel show innovation declines of 38.3% and 56.7% respectively, while models in the bottom left panel shows quantity declines of 5.54% and 3.52% respectively. As the event window widens, we observe higher magnitudes of decline, for example, the ten-year window for innovative quality (shown in Appendix C.2) shows innovation declines of 74.0% and 94.8%.[23]

Table 5: This table shows the change in innovation activity five years before and after oil discovery for industries in civil and common law countries. The left panel shows the change in innovative quantity (top) and innovative quality (bottom) for civil law countries. The right panel shows the change in innovative quantity (top) and innovative quality (bottom) for common law countries. Innovation quality declines significantly in the five years before and after oil discovery. Full event window results are shown in Table C.2 in Appendix.

	Civil Law		Common Law	
	No Controls	Controls	No Controls	Controls
Pat	-5.1% (-2.61)	0.8% (0.38)	-33.1% (-6.47)	-50.1% (-8.35)
Cit	-5.5% (-2.69)	-3.5% (-1.47)	-38.3% (-6.70)	-56.7% (-8.28)

To further explore the differences we noted for civil and common law origin countries, we consider the Gini index. According to the World Bank, the Gini index measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfect equal distribution. A Gini index close to one indicates that fewer people own the wealth and income of the economy. We consider splitting our sample into high and low Gini index measures, as a way as a measure to show whether inequalities are rampant in civil law relative to common law economies. Our data on the Gini index is from World Bank (2017a). We calculate average Gini index for each country in our dataset for the period 1975-2005. The Gini index for the countries in our sample ranges from 22.8% to 60.6%. We split the sample into two groups, the low Gini index group from 22.8-39% and the high Gini index group from 40-60.6%. A lower Gini coefficient indicates a more uniform income distribution, while higher values denote greater income inequality.Our country splits are shown in Appendix C.3.

We observe that the majority of countries with a high average Gini (above 40%) are emerging economies, with the exception of Trinidad and Tobago that is classified as a developed economy by World Bank (2018). This observation suggests that income inequality has an impact on innovation outcomes. High Gini countries, are more likely to experience the same outcomes as emerging economies

[23] A decline of 74% for the ten year window signifies a geometric average decline of 7.4% per year. Our results show the extent to which expected innovative activity is depressed as a result of oil discovery. This means that some well-performing countries (like Australia, Uk and US) may still have increasing innovative activity, but that is lower than the expected activity barring oil discovery.

following the discovery of oil. There is a fair mix between common and civil law origin countries in both the low-Gini and high-Gini country splits.[24] However, if we select only the 47 countries that received oil discoveries in our sample, we find that 35 of these are civil law countries, with the average Gini coefficient for these countries ranging from 25% to 48%. Compared with the common law countries that received oil discoveries, we find that the civil law countries exhibit more income inequality relative to common law countries. The Gini index for the 12 common law countries in the sample of countries that received oil discoveries lean more towards perfect equality than those of civil law countries. We can therefore argue that civil law countries have high a Gini index and hence inequality plays a big role in the pattern observed in innovative activity after the discovery of oil.

One might question whether the results we observe from common law countries are statistically different from civil law countries. To show that our results for civil law and common law origin countries are different, we use the seemingly unrelated regression method and show results for all event windows in Table 6. This method takes into account the cross equation correlation between civil law and common law regression models, and the resultant effect shows that there is a significant difference between the two. We find that the innovation activity differences between the two country groups are significant at the 5% level for all models.

6.1.2 The effects of giant oil discoveries on governance

Institutional quality has been noted by Van der Ploeg (2011) as one contributing factor through which natural resource abundance can have a harmful effect on economic activity. Closely tied to institutional quality is governance, which is defined by the World Bank as the traditions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced, the capacity of the government to effectively formulate and implement sound policies, and the respect of citizens and the state for the institutions that govern economic and social interactions among them. Frankel (2010) finds that natural resource wealth can inhibit the development of democracy, and hence lead to poor institutional quality. The decline in institutional quality in turn leads to the absence of rule of law and property rights, inequality, corruption, societal class divisions, and long-standing power struggles. Robinson et al. (2006) suggest that the important question is whether the country already has good institutions at the time that the oil is discovered, in which case the oil wealth is more likely to be put to good use for national welfare (instead of welfare for an elite group).

[24] See Maggio et al. (2014).

Table 6: The comparison of innovation activities in industries in civil law and common law countries. This table shows the percentage difference in estimates for common and civil law countries and the corresponding t-statistics at the 5% level. The differences in estimates for common law and civil law origin countries are calculated using the seemingly unrelated regression method. For each change in innovation activity, we show the difference between the common law regression estimate and the civil law regression estimate (and the respective t-statistic). For example, the top left column shows the difference in estimates from model 5 and model 1 in Table C.1 in Appendix C. Results show that the estimates observed for common law countries are significantly different from those observed for civil law countries.

	Common - Civil			
	PAT			
	Models (5)-(1)		Models (6)-(2)	
event window	% Difference	t-stat	% Difference	t-stat
(1,-1)	-2.58	-1.00	-5.30	-1.73
(2,-2)	-6.58	-2.19	-13.80	-3.74
(3,-3)	-12.50	-3.51	-26.70	-6.44
(4,-4)	-21.20	-4.97	-42.70	-8.69
(5,-5)	-28.00	-5.93	-50.90	-9.13
(6,-6)	-34.80	-6.65	-58.70	-9.55
(7,-7)	-36.10	-6.37	-61.00	-9.33
(8,-8)	-36.50	-5.93	-62.90	-9.05
(9,-9)	-36.50	-5.65	-66.20	-9.17
(10,-10)	-36.30	-5.41	-69.60	-9.30
	CITES			
	Models (7)-(3)		Models (8)-(4)	
event window	% Difference	t-stat	% Difference	t-stat
(1,-1)	-2.58	-0.93	-3.47	-1.03
(2,-2)	-3.12	-0.88	-7.11	-1.62
(3,-3)	-12.70	-3.19	-22.90	-4.83
(4,-4)	-26.30	-5.60	-44.00	-7.91
(5,-5)	-32.80	-6.14	-53.20	-8.29
(6,-6)	-45.60	-7.46	-68.60	-9.51
(7,-7)	-51.10	-7.59	-75.80	-9.68
(8,-8)	-58.00	-8.00	-85.60	-10.30
(9,-9)	-61.00	-8.02	-90.40	-10.53
(10,-10)	-65.20	-8.18	-96.40	-10.78

Ross (2001) finds empirical evidence that natural resources are negatively associated with democratic measures. Additionally, Ross (2001) posits that earning direct and considerable revenues from oil extraction may reduce the need for government to increase taxes. Low-taxed citizens may then demand less accountability of the government, thereby lowering pressure to improve institutional quality. Rodrik et al. (2004) observe that what matters in differentiating economic success or failure are institutions, in particular the role of property rights and rule of law. Following these findings, we test for the effects of oil strikes on governance quality.

We use a data set by World Bank (2017b), Worldwide Governance Indicators (WGI), to corroborate the findings by Ross (2001) and estimate the relationship between oil discovery and governance. Our goal is to determine whether there is a relationship between oil discovery and governance quality. This relationship, once established, could in turn explain the decline in innovative activity after oil discovery. We examine whether governance quality trends change after oil discovery. Hence, our focus is on the respective governance quality estimates post-strike relative to pre-strike periods. We estimate the following regression model:

$$y_{j,t} = \beta_j + \sum_{\tau=-10}^{10} (\beta_\tau \delta_{\tau,j,t}) + \rho_1 \boldsymbol{X}_{j,t} + y_{j,t-1} + \gamma_j t + \epsilon_{j,t} \tag{2}$$

where: $y_{j,t}$ is a governance measure. We consider six governance measures: voice and accountability (VAE), political stability and absence of violence (PVE), government effectiveness (GEE), regulatory quality (RQE), rule of law (RLE) and control of corruption (CCE). $y_{j,t-1}$ is the lagged dependent variable and the rest of the variables remain the same as in equation 1.

We show our regression results in a graphical presentation in Figure 3.[25] We show results for PVE, GEE and RQE in graph A and RLE, VAE, and CCE in B. Our regression results show that there is a significantly negative relationship between oil discovery and the estimates RQE and CCE.[26]

Figure 3 shows that governance quality improvements slow down or decline after the discovery of oil. In the period before the strike, we observe that PVE, RQE and RLE estimates are improving over time. GEE, CCE and VAE are somewhat stable in the period before oil discovery. These observations are consistent with the findings by the World Bank (2017b) that the majority of countries in our sample have significantly improved in at least one of the six governance estimates over the period 1996-2005. However, once oil discoveries are made, this upward trend in governance quality is interrupted and we

[25] Regression results from which the graphs in Figure 3 are derived are given in Appendix D.1.

[26] We include results for the other estimates RLE and PVE which show a negative but insignificant result as well as VAE and GEE which show a positive and insignificant result.

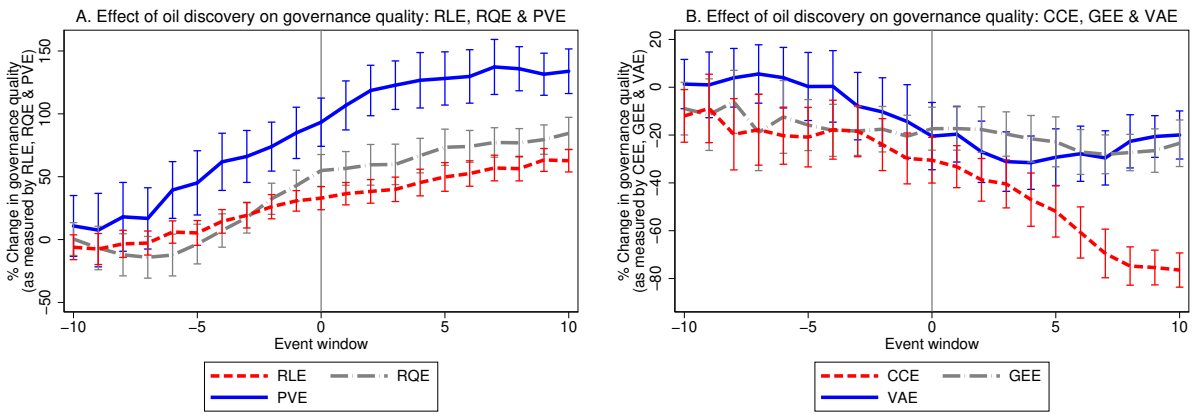

Figure 3: The effects of oil discoveries on governance quality. The line graphs show the cumulative of regression estimates for the effect of oil discoveries on governance quality shown in Table D.1 in Appendix D. Governance quality measures used are rule of law (RLE), regulatory quality (RQE) and political stability and absence of violence (PVE)in graph A and control of corruption (CCE), government effectiveness (GEE) and voice and accountability (VAE) and in graph B. The event window from -10 to -1 shows the period in years before oil discovery, time 0 is the time when each individual oil discovery is made. The event window from 1 to 10 years shows the period after oil discovery.

observe a slowdown in governance quality improvements. CCE is fairly stable in the pre-strike period. However, in the post-strike period, we observe declining CCE estimates, suggesting that windfalls lead to increased corruption.

To estimate by how much governance quality worsens in the post-strike relative to the pre-strike period, we consider each event window and our results are shown in Table 7. Our results show that post-strike PVE, RQE, RLE and CCE estimates decline by 10.60%, 36.70%, 7.93% and 11.90% respectively (relative to trend) in the 5-year window.[27] These results show that governance quality worsens in the period after oil discovery. Our results for RQE and CCE are negatively significant at the 5% level for the 5-year window reported.

These results suggest that declining governance quality (specifically regulatory quality and control of corruption) is a possible channel through which oil strikes have a negative effect on innovation. Overall our results show that when giant oil deposits are discovered, they impact negatively on governance quality, as shown by the slowdown in PVE, RQE, RLE and CCE in the period after the strike relative to pre-strike periods.

6.1.3 Governance effects on innovation

We have observed that governance quality declines after resource booms. Our results show that regulatory quality and control of corruption improvements significantly slow down after oil discovery.

[27] The full event window results are shown in Appendix D.2.

Table 7: This table shows the percentage change in governance quality five years before and after oil discovery. We show that RQE, CCE, PVE and RLE estimates decline in the 5 years after oil discovery relative to the same period pre-discovery. Full results are shown in Table D.2 in Appendix D. Our results show that governance quality estimates (excluding VAE and GEE) decline after oil discovery. Only results for RQE are significant at the 5% level.

RQE	-36.7% (-2.86)
CCE	-11.9% (-1.28)
PVE	-10.6% (-0.47)
RLE	-7.9% (-0.85)
VAE	9.5% (0.61)
GEE	2.6% (0.26)

To establish whether declining governance quality is a possible channel that ultimately leads to declining innovative activity, we explore the relationship between each governance variable and innovative activity. Our results are shown in Table 8. We observe that all the six governance estimates (political stability and absence of violence, regulatory quality, rule of law, control of corruption, voice and accountability, and government effectiveness) are significantly positively related to innovative activity.[28]

These results cement our earlier findings in Section 6.1.2. The positive relationship between governance and innovation activity implies that impediments to governance quality also negatively affect innovation. Hence, governance quality decline becomes a channel through which natural resource booms hurt innovation.

Our findings are in support of Sachs and Warner (1995), Sachs and Warner (1999), Sachs and Warner (2001), and Arezki and Van der Ploeg (2008) who find that natural resources hurt institutional quality, eventually leading to poor economic outcomes. While these studies focused on natural resource dependence and its harmful effects on economic growth, our results show a similar relationship for innovation activity.

6.2 Developed and emerging economies

Van der Ploeg (2011) suggests that countries that are more developed do not experience exacerbated effects of the natural resource curse, relative to emerging economies. In addition, he finds that emerging economies seem unable to successfully convert their depleting exhaustible resources into other productive assets, thus they experience the natural resource curse more severely. We test whether there are any differences in how developed and emerging economies respond to giant oil discoveries, in line with these findings. Since we have already shown results for civil and common law country splits in Section 6.1.1, we

[28] When we include all governance estimates in our regression model, as shown by models 7 and 14 in Table 8, we observe the effects of multicollinearity on PVE and RQE as their effect on innovation changes from being positive to negative. The simple regression models 1-6 and 8-13 for PVE, RQE, RLE CCE, VAE and GEE however show that these governance estimates are positively correlated to innovative activity.

Table 8: This table shows the effects of governance on innovation. We show simple regression models for the effects of governance estimates on patent activity (innovation quantity) in models 1-7 and on citations activity (innovation quality) in models 8-14. We observe that governance is significantly positively correlated to innovation.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
				PAT			
PVE	0.457***						-0.1496***
	(0.00792)						(0.0101)
RQE		0.496***					-0.2825***
		(0.00812)					(0.0166)
RLE			0.549***				0.5948***
			(0.00773)				(0.0193)
CCE				0.487***			0.3093***
				(0.00697)			(0.0160)
VAE					0.485***		0.0362***
					(0.00788)		(0.0100)
GEE						0.516***	-0.0407*
						(0.00769)	(0.0241)
Observations	19,490	19,470	19,840	19,480	19,840	19,470	19,470
R-squared	0.135	0.161	0.219	0.211	0.159	0.190	0.2375

VARIABLES	(8)	(9)	(10)	(11)	(12)	(13)	(14)
				CITES			
PVE	0.397***						-0.1344***
	(0.00785)						(0.0107)
RQE		0.444***					-0.2068***
		(0.00840)					(0.0171)
RLE			0.483***				0.4917***
			(0.00789)				(0.0189)
CCE				0.429***			0.3211***
				(0.00711)			(0.0165)
VAE					0.433***		0.0401***
					(0.00804)		(0.0098)
GEE						0.455***	-0.1038***
						(0.00787)	(0.0239)
Observations	18,250	18,230	18,570	18,240	18,570	18,230	18,230
R-squared	0.109	0.134	0.178	0.174	0.130	0.154	0.1932

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

run the risk of repeating the same results with our developed and emerging countries splits in this section if there are a substantial number of emerging civil law countries and developed common law countries. Therefore we carry out a four-way split in our data sample, where we consider developed and emerging countries, given that they are either civil or common law countries. To create this four-way split of our sample data we flag countries as being developed or emerging economies as well as civil or common law countries.[29] The resultant effect after controlling for legal origins therefore explains the effect of oil discoveries on innovation activity for developed and emerging economies.

Figure 4 shows that both developed and emerging economies experience decline in innovation after oil discovery. We observe that results for developed common-law countries in graph A of Figure 4 are consistent with baseline findings; we observe slowdown in the period after oil discovery. The scale of decline in innovative activity for developed economies is diminutive relative to emerging-common law economies. The suggestion by Van der Ploeg (2011) that developed economies are able to convert their exhaustible wealth into other productive assets and hence experience superior outcomes after resource windfalls is therefore supported by our findings. Graph B in Figure 4 shows that emerging common-law economies have worse outcomes following resource discovery, results that are consistent with findings by Van der Ploeg (2011). The steep decline in innovation after oil discovery is consistent with emerging economies failing to convert resource wealth. Graph C of Figure 4 shows that developed civil-law economies experience slowdowns following oil discovery while Graph D shows that emerging civil-law economies have a slight, if any, decline. If we were to place these results on a scale we would find emerging civil law countries on the low extreme of innovation decline after oil strike and emerging common law countries on the upper extreme. Developed common law and civil law countries would lie somewhere in between these extremes. Our results suggest that both developed and emerging economies experience innovative activity decline after oil discovery, with emerging common law economies experiencing worse outcomes than developed economies.

To estimate the magnitude of the slowdown effect, we construct event windows as shown in Table 9, where we show results for the 5-year event window for both developed and emerging economies.[30] The top line shows event window analysis for innovative quantity while the bottom line shows the 5-year event window analysis for innovative quality in developed and emerging economies. We observe

[29] Our country classification is based on the April 2015 World Economic Outlook database that divides the world economies into three major groups: developed, emerging and developing economies. See www.imf.org/external/datamapper/FMEconGroup.xlsx We show these country splits in Appendix B and the resultant regression results in Appendix E.

[30] Full event window results for developed and emerging economies are shown in Appendix E.2.

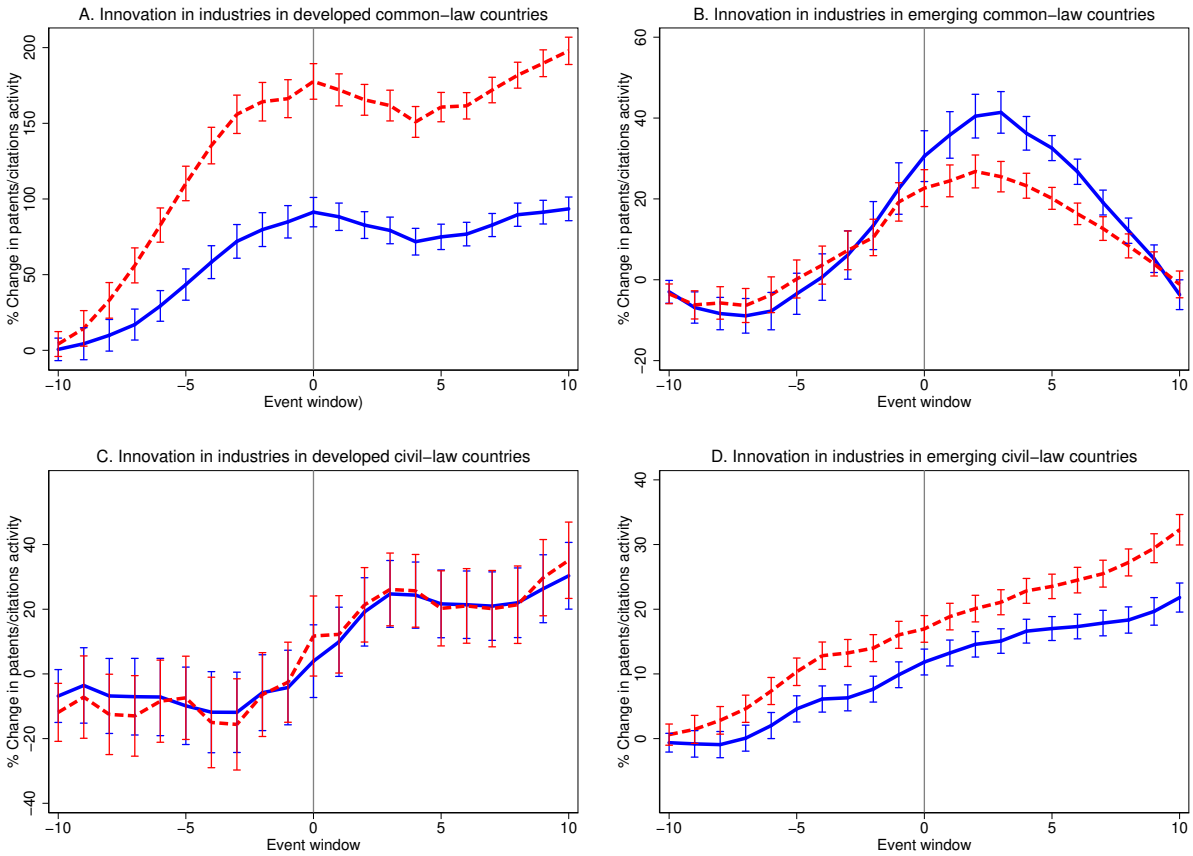

Figure 4: This graph shows the effect of oil discoveries on innovative activity for industries in developed and emerging economies for the period 1975-2005. The line graphs show the cumulative of estimates in regression results in Table E.1 in Appendix E, where we show the impact of oil discovery on patents and citations activity for industry i in country j, in year t. Graphs A and C show innovative activity for industries in developed economies, while B and D show activity for industries in emerging economies, while controlling for legal origins. The solid lines show effects of oil discovery on innovative quantity as measured by $\log(1 + PAT)_{i,j,t}$, while the dashed lines show results for innovative quality as measured by $\log(1 + CITES)_{i,j,t}$. The event window from -10 to -1 shows the period in years before oil discovery, time 0 is the time when each individual oil discovery is made. The event window from 1 to 10 years shows the period after oil discovery. After controlling for legal origins, industries in both developed and emerging countries experience decline in innovative activity after the discovery of oil. The decline is huge in emerging-common law origin countries and minimal in emerging civil law countries.

significant innovative slowdown in developed-common law and emerging common law countries. Results for developed civil law countries show that innovation activity increases after oil discovery although these results are not significant. Emerging civil law economies experience low magnitudes of decline after oil discovery. These results allude to the suggestion that both developed and emerging economies experience decline in innovation following oil discovery, albeit in varying degrees.

Table 9: This table shows the percentage change in innovation activity five years before and after oil discovery for industries in developed and emerging economies (while controlling for legal origins) 5 years before and after oil discovery. A negative change shows that innovative activity declines after oil discovery. The corresponding t-statistics at the 5% level is shown in parenthesis for each result. The top line shows the 5-year event window for innovative quantity while the bottom line shows the 5-year event window for innovative quality. Full results are shown in Table E.2 in Appendix E.

	Developed|Common	Developed|Civil	Emerging|Common	Emerging|Civil
PAT	-71.9% (-6.08)	14.8% (1.58)	-28.3% (-6.00)	-2.7% (-1.81)
CITES	-100.5% (-7.09)	2.7% (0.25)	-25.5% (-7.04)	-2.1% (-1.26)

6.3 Civil war

Civil war has been identified as one of the channels through which a natural resource windfall can lead to declining economic growth rates.[31] According to Frankel (2010), domestic conflict is bad for economic development, especially when violent. Ross (2004) suggests that oil discovery increases the likelihood of conflict, particularly separatist conflict. In addition, Ross (2004) concludes that resource wealth partly intensifies existing conflicts as well as prolonging them. Lei and Michaels (2014) finds that giant oil discoveries increase the incidence of internal armed conflicts by about 5-8% within 4-8 years of discovery, compared to a baseline probability of about 10%. Van der Ploeg (2011) suggests that when a country is plunged into a civil war following oil discovery, the economy suffers. We posit that the economic disruption due to civil war would be harmful to innovation, and therefore our findings could be driven by countries that have experienced a civil war in the period 1975-2005.

We use data on civil wars from Sarkees and Wayman (2010) to establish countries that have civil wars between 1975-2005. We drop all these countries and estimate the effect of oil discoveries on the sample of countries with no civil war.[32]

[31] Civil war is defined by Sarkees and Wayman (2010) as sustained combat predominantly taking place within the same state, resulting in a minimum of 1,000 battle-related fatalities within a twelve month period or more.

[32] Regression results and subsequent event window analysis are shown in Appendix F.

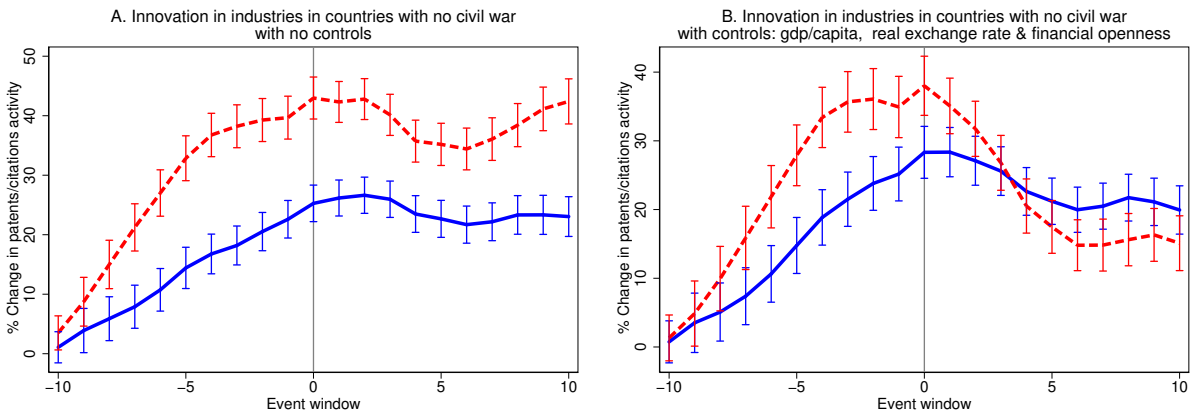

Figure 5: This graph shows the effect of oil discovery on innovative activity for industries in countries that have not experienced civil wars for the period 1975-2005. The line graphs show the cumulative of estimates in regression results in Table F.1 in Appendix F, where we show the impact of oil discovery on patents and citations activity for industry i in country j, in year t. The solid lines show the effects of oil discovery on innovative quantity as measured by $\log(1+PAT)_{i,j,t}$, while the dashed lines show results for innovative quality as measured by $\log(1+CITES)_{i,j,t}$. Graph A shows results without any controls while graph B shows results after adding GDP/capita, real exchange rates and financial openness as controls.

In Figure 5, we find that our results remain robust after dropping all countries that have experienced civil war, leading us to suggest that our results are not driven by the subsample of countries that experienced civil wars.

6.4 Country-level robustness

Our results so far have been at the industry level. We check for robustness by considering country-level results for the data set with 159 countries. In total, our data set at country-level consists of 159 countries, with 47 of these having both giant oil discoveries and registered patents. We run a slightly different regression model to (1) as follows:

$$y_{j,t} = \beta_j + \sum_{\tau=-10}^{10} (\beta_\tau \delta_{\tau,j,t}) + \rho_1 \boldsymbol{X}_{j,t} + \gamma_j t + \epsilon_{j,t} \tag{3}$$

where $y_{j,t}$ represents either the $\log(1+PAT)_{j,t}$, or the $\log(1+CITES)_{j,t}$, for country j, in year t, β_τ represent the respective lag/lead coefficients of the strike variables $(\delta_{\tau,j,t})$ for the period ten years before the strike to ten years after the strike, $\boldsymbol{X}_{j,t}$ represents control variables, with ρ_1 as their effects on innovation. $\gamma_j t$ denotes country-year time trend, β_j represents constants and $\epsilon_{j,t}$ represents residuals. Regression results are shown in Appendix G.1, but we show the graphical representation of these results in Figure 6.

The solid lines in graphs A-B in Figure 6 show cumulative innovative quantity while the dashed lines

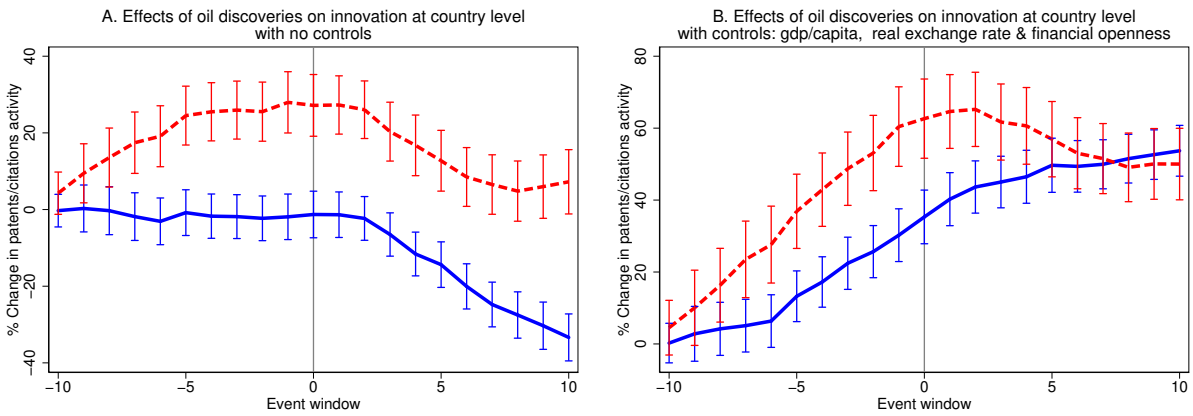

Figure 6: This graph shows the effect of oil discoveries on innovative activity for 159 countries for the period 1975-2005. The line graphs show the cumulative of estimates in regression results in Table G.1 in Appendix G, where we show the impact of oil discovery on patents and citations activity in country j, in year t. The solid lines show effects of oil discovery on innovative quantity as measured by $\log(1+PAT)_{j,t}$, while the dashed lines show results for innovative quality as measured by $\log(1+CITES)_{j,t}$. The event window from -10 to -1 shows the period in years before oil discovery, time 0 is the time when each individual oil discovery is made. The event window from 1 to 10 years shows the period after oil discovery.

show cumulative innovative quality results. We observe that innovative quantity, as shown by solid lines, declines significantly after oil discovery. The dashed lines in graphs A-B in Figure 6 show that innovative quality declines contemporaneously with the strike. At country-level, our results in Figure 6 are consistent with our baseline (industry-level) findings for innovative quantity and quality.

We further estimate the innovation differences for the five years before and after the strike. Our results are presented in Table 10.[33] We observe that both innovation quantity and quality decline after oil discovery. For example, the five-year window for innovation quantity shows a 14.3% and 9.5% decline in the top panel of Table 10. The same trend is observed for innovation quality, where the 5-year window shows a decline of 23.3% and 38.5% in the bottom panel. These results are consistent with baseline findings and are significant at the 5% level (except for the patent results with controls). Our results at the industry level are better than the results at country level, as we observe that the event window estimates for the innovative quantity lose significance at the 5% level.

Table 10: This table shows the change in innovation activity five years before and after oil discovery for 159 countries in the period 1975-2007 for the event window 5 years before and after oil discovery. A negative result shows that innovative activity declines after oil discovery, while a positive one shows that innovative activity increases after oil discovery. The corresponding t-statistics at the 5% level is shown in parenthesis for each result. Results show that at country-level, in the 5 years after oil discovery innovative activity declines significantly relative to the same period pre-strike. These results are consistent with our baseline results.

	No controls	Controls
PAT	-14.3% (-2.58)	-9.5% (-1.27)
CITES	-23.3% (-3.41)	-3.9% (-3.60)

[33]The full event window analysis is shown in Appendix G.2.

6.5 First oil discovery

In Table 1 we observe that countries like Australia, Brazil, China, Nigeria, Norway, Russia and Saudi Arabia have received on average 13 giant oil discoveries over the period 1975-2005. This arguably removes the element of shock to the news of subsequent oil discoveries. In this regard, only the first oil discovery is important in showing the causal effects of giant oil discoveries on innovative activity.[34] The results showing the effects of the first oil discovery on innovation are available upon request from the authors. Results are consistent with baseline findings. Innovative activity decline in the period following oil discovery, relative to the same period before the discovery of oil.

6.6 Extending the post-oil discovery window

This analysis has only considered the ten year window surrounding oil discoveries. Questions may arise as to whether there are residual effects beyond this window. Does innovation activity change in the period in excess of ten years after oil discovery? We extend the post oil discovery window to 15 years, to assess the pattern of innovation 15 years after oil discovery. Beyond ten years, the oil reserve discovered will be fully depleted, but however there could possibly be residual effects on innovation. Our results show that the additional 5 years after oil is depleted at point source have no significant effect on innovative activity.[35] In the fifteen years after oil discovery, innovative activity is still depressed. There is no significant difference in innovation activity beyond the ten years after oil discovery.

[34] While Arezki et al. (2017) made efforts to explain that each oil discovery is unexpected in terms of timing and size, the high frequency with which some countries receive giant oil discoveries can arguably mean subsequent discoveries are expected to some extent. For example, Saudi Arabia received 16 giant oil discoveries over a 30 year period; that is about 1 oil discovery every two years. To rule out this argument, we consider only the first oil discovery and its effect on innovation activity.

[35] Results are available upon request from the authors

7 Conclusion

Our study contributes to three strands of literature. First, we show evidence for the natural resource curse at industry-level across both developed and emerging economies. We show that declining governance quality is a possible mechanism through which natural resource wealth hurts innovation, thereby becoming a curse rather than a blessing. We establish a negative relationship between oil discoveries and governance, which in turn hurts innovation activity.

Secondly, we provide empirical evidence on the economic consequences of legal origins. We find that common law countries experience significantly larger declines relative to civil law countries. Natural resource discoveries provide a false sense of security for all citizens, notably in common law countries that are characterized by more equitable distribution of resources, ultimately leading to a decline in innovative activity.

Our results show that innovation declines are more pronounced for developed common-law and emerging common-law countries; supporting Van der Ploeg (2011)'s assertion that developed economies are better able to channel the influx of wealth into longer term growth. We find that innovation activity slows down moderately for civil law origin countries and this may be due to high income inequality (measured by the gini index) that characterises these countries.

Lastly, our paper adds to growing literature focusing on oil and gas field discoveries as a directly observable measure of future activity. Weber (2012) shows the effects of gas booms on employment and income, concluding that the impact has been moderate. Our study potentially conflicts with the findings by Guntner (2019) who shows that country-level production and domestic consumption increase following the discovery of large oil fields.

This paper has focused on innovative activity at industry level, and briefly discussed results at country level, possible extensions might analyze innovation activity at firm level by linking granted patents to firm data. Exploring the effects of giant oil discoveries at such a granulated level is likely to show how natural resource revenues are intermediated, if at all, may be another topic for future research. Regional effects of oil discoveries and wealth capture through large oil conglomerates are beyond the scope of this paper and may be explored in future research.

Appendix

A Summary statistics

Table A.1: This table reports summary statistics for the country-year observations of registered patents for 159 countries in the period 1975-2005. Data on patent counts is from Lai et al. (2015).

	PATENTS							
1	2	3	4	5	6	7	8	9
Country	Mean	Median	SD	Skew	Kurtosis	Min	Max	Total
Albania	0.10	-	0.30	2.73	8.44	-	1.00	3.00
Algeria	0.13	-	0.34	2.21	5.90	-	1.00	4.00
Andorra	0.32	-	0.54	1.39	3.96	-	2.00	10.00
Antigua and Barbuda	0.35	-	0.66	2.31	9.16	-	3.00	11.00
Argentina	29.65	25.00	15.92	1.10	3.61	10.00	74.00	919.00
Armenia	0.55	-	1.06	2.01	6.04	-	4.00	17.00
Aruba	0.19	-	0.48	2.43	8.20	-	2.00	6.00
Australia	532.87	439.00	260.38	0.83	2.55	227.00	1,143.00	16,519.00
Austria	375.10	329.00	118.92	1.25	3.56	254.00	672.00	11,628.00
Azerbaijan	0.29	-	0.64	1.97	5.37	-	2.00	9.00
Bahamas	5.39	5.00	3.65	0.92	3.08	-	15.00	167.00
Bahrain	0.16	-	0.37	1.84	4.39	-	1.00	5.00
Bangladesh	0.16	-	0.45	2.84	10.45	-	2.00	5.00
Barbados	0.35	-	0.75	2.16	6.86	-	3.00	11.00
Belarus	2.10	-	2.74	0.87	2.26	-	8.00	65.00
Belgium	423.71	343.00	203.51	0.73	1.91	214.00	789.00	13,135.00
Bermuda	1.90	1.00	2.18	1.89	6.10	-	9.00	59.00
Bolivia	0.58	-	0.72	0.80	2.37	-	2.00	18.00
Bosnia & Herzegovina	0.16	-	0.37	1.84	4.39	-	1.00	5.00
Brazil	57.84	55.00	36.64	0.84	2.59	20.00	141.00	1,793.00
Brunei Darussalam	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Bulgaria	14.48	15.00	10.72	0.36	2.05	1.00	38.00	449.00
Canada	2138.45	1,967.00	970.09	0.57	1.98	1,074.00	3,975.00	66,292.00
Cayman Islands	1.55	1.00	1.67	1.40	4.40	-	6.00	48.00
Chad	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Chile	7.03	7.00	4.98	0.60	2.37	1.00	18.00	218.00
China	154.00	50.00	253.51	1.93	5.55	-	944.00	4,774.00
Colombia	5.48	4.00	3.50	0.42	2.10	-	13.00	170.00
Congo, Rep	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Costa Rica	2.48	1.00	2.51	1.93	7.70	-	12.00	77.00
Cote d'Ivoire	0.13	-	0.34	2.21	5.90	-	1.00	4.00
Croatia	1.52	-	2.28	1.46	4.73	-	9.00	47.00
Cuba	2.48	1.00	2.62	1.33	3.95	-	10.00	77.00
Cyprus	0.94	1.00	1.03	1.99	8.78	-	5.00	29.00
Czech Republic	36.87	35.00	17.59	1.51	5.45	14.00	91.00	1,143.00
Denmark	268.26	198.00	148.26	1.04	2.55	136.00	602.00	8,316.00
Dominica	0.06	-	0.25	3.55	13.57	-	1.00	2.00
Dominican Republic	0.71	-	1.01	1.80	5.92	-	4.00	22.00
Ecuador	1.10	1.00	0.91	0.63	2.76	-	3.00	34.00
Egypt	2.71	2.00	2.28	0.55	2.14	-	7.00	84.00
El Salvador	0.65	-	1.02	1.72	5.48	-	4.00	20.00
Estonia	1.16	-	1.83	1.19	2.76	-	5.00	36.00
Ethiopia	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Faroe Islands	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Fiji	0.19	-	0.48	2.43	8.20	-	2.00	6.00
Finland	417.74	332.00	309.96	1.00	2.92	102.00	1,152.00	12,950.00
France	2919.13	2,881.00	809.50	0.76	2.37	2,061.00	4,689.00	90,493.00
French Polynesia	0.16	-	0.45	2.84	10.45	-	2.00	5.00
Gambia	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Georgia	0.61	-	1.15	1.75	4.72	-	4.00	19.00
Germany	7871.61	7,175.00	2331.01	1.30	3.61	5,489.00	13,909.00	244,020.00
Ghana	0.13	-	0.34	2.21	5.90	-	1.00	4.00
Greece	13.48	12.00	7.62	0.74	2.96	3.00	32.00	418.00
Greenland	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Guam	0.16	-	0.90	5.29	29.03	-	5.00	5.00
Guatemala	0.87	1.00	0.76	0.67	3.33	-	3.00	27.00
Guyana	0.10	-	0.30	2.73	8.44	-	1.00	3.00
Haiti	0.42	-	0.72	1.92	6.69	-	3.00	13.00
Honduras	0.55	-	1.03	2.87	12.47	-	5.00	17.00
Hong Kong	102.35	62.00	96.12	0.98	2.55	14.00	312.00	3,173.00
Hungary	76.84	75.00	25.89	0.07	1.74	36.00	120.00	2,382.00
Iceland	7.10	4.00	7.29	1.06	2.78	-	24.00	220.00
India	132.84	29.00	204.35	1.60	3.96	5.00	638.00	4,118.00
Indonesia	3.61	2.00	2.89	0.82	2.56	-	10.00	112.00
Iran	2.39	2.00	2.82	1.87	6.26	-	11.00	74.00
Iraq	0.29	-	0.69	2.62	9.53	-	3.00	9.00
Ireland	74.48	52.00	57.65	0.85	2.45	15.00	203.00	2,309.00
Israel	496.87	316.00	407.17	0.89	2.55	98.00	1,410.00	15,403.00
Italy	1190.87	1,192.00	393.58	0.61	2.41	704.00	2,110.00	36,917.00
Jamaica	0.90	1.00	0.98	1.28	4.70	-	4.00	28.00
Japan	20918.23	22,073.00	10428.54	0.15	1.80	6,042.00	40,110.00	648,465.00

Country	Mean	Median	SD	Skew	Kurtosis	Min	Max	Total
Jordan	0.65	-	1.02	1.52	4.05	-	3.00	20.00
Kazakhstan	0.65	-	1.31	2.15	6.55	-	5.00	20.00
Kenya	1.06	-	1.61	2.13	7.77	-	7.00	33.00
Korea, Dem. Rep.	0.42	-	0.89	2.59	9.96	-	4.00	13.00
Korea, Rep.	1649.42	509.00	1953.91	0.70	1.78	8.00	5,264.00	51,132.00
Kuwait	2.23	1.00	2.77	0.92	2.50	-	8.00	69.00
Kyrgyz Republic	0.16	-	0.37	1.84	4.39	-	1.00	5.00
Latvia	0.68	-	1.22	1.75	4.79	-	4.00	21.00
Lebanon	1.32	1.00	1.80	1.93	5.91	-	7.00	41.00
Liberia	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Liechtenstein	14.87	14.00	4.18	0.33	4.10	4.00	26.00	461.00
Luxembourg	27.23	26.00	8.25	0.80	3.75	12.00	50.00	844.00
Macao	0.13	-	0.34	2.21	5.90	-	1.00	4.00
Macedonia, FYR	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Madagascar	0.16	-	0.37	1.84	4.39	-	1.00	5.00
Malawi	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Malaysia	28.13	8.00	42.67	1.83	5.36	-	160.00	872.00
Mali	0.06	-	0.25	3.55	13.57	-	1.00	2.00
Malta	0.61	-	0.88	1.43	4.27	-	3.00	19.00
Marshall Islands,Rep	0.06	-	0.25	3.55	13.57	-	1.00	2.00
Mauritius	0.19	-	0.40	1.55	3.41	-	1.00	6.00
Mexico	51.00	43.00	20.21	1.27	4.04	25.00	112.00	1,581.00
Moldova	0.23	-	0.72	2.96	10.32	-	3.00	7.00
Monaco	6.58	6.00	3.89	0.91	3.63	2.00	18.00	204.00
Morocco	0.97	1.00	1.11	0.96	3.12	-	4.00	30.00
Myanmar	0.13	-	0.34	2.21	5.90	-	1.00	4.00
Netherlands	958.45	853.00	299.15	0.88	2.69	640.00	1,706.00	29,712.00
New Caledonia	0.03	-	0.18	5.29	29.03	-	1.00	1.00
New Zealand	72.35	52.00	42.91	1.11	2.90	26.00	175.00	2,243.00
Nicaragua	0.16	-	0.37	1.84	4.39	-	1.00	5.00
Niger	0.13	-	0.34	2.21	5.90	-	1.00	4.00
Nigeria	1.10	1.00	1.14	0.92	2.93	-	4.00	34.00
Norway	149.52	120.00	77.28	1.23	3.40	66.00	341.00	4,635.00
Oman	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Pakistan	0.90	1.00	1.16	2.76	12.88	-	6.00	28.00
Palau	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Panama	8.42	1.00	16.98	2.27	6.61	-	59.00	261.00
Papua New Guinea	0.10	-	0.30	2.73	8.44	-	1.00	3.00
Paraguay	0.19	-	0.40	1.55	3.41	-	1.00	6.00
Peru	2.26	2.00	1.69	0.47	2.20	-	6.00	70.00
Philippines	8.61	5.00	7.75	1.64	4.49	1.00	29.00	267.00
Poland	20.32	18.00	11.31	0.64	2.42	6.00	45.00	630.00
Portugal	7.03	6.00	4.94	0.92	2.98	1.00	19.00	218.00
Puerto Rico	0.87	-	2.54	2.77	9.07	-	10.00	27.00
Qatar	0.10	-	0.40	4.14	19.27	-	2.00	3.00
Romania	5.65	4.00	4.85	0.83	3.01	-	19.00	175.00
Russia	207.19	182.00	108.92	1.05	3.15	77.00	465.00	6,423.00
Saudi Arabia	8.77	7.00	6.50	0.54	2.20	-	22.00	272.00
Senegal	0.19	-	0.40	1.55	3.41	-	1.00	6.00
Seychelles	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Sierra Leone	0.06	-	0.25	3.55	13.57	-	1.00	2.00
Singapore	127.32	21.00	172.27	1.15	2.77	1.00	513.00	3,947.00
Slovak Republic	1.84	-	2.68	1.11	2.95	-	9.00	57.00
Slovenia	4.65	-	6.61	1.26	3.45	-	23.00	144.00
South Africa	95.03	92.00	25.91	-0.30	3.34	24.00	139.00	2,946.00
Spain	166.55	144.00	96.42	0.84	2.97	51.00	426.00	5,163.00
Sri Lanka	0.68	-	0.94	1.16	3.21	-	3.00	21.00
St. Kitts and Nevis	0.39	-	0.84	2.22	6.87	-	3.00	12.00
St. Vincent & Grens.	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Suriname	0.10	-	0.30	2.73	8.44	-	1.00	3.00
Swaziland	0.10	-	0.30	2.73	8.44	-	1.00	3.00
Sweden	966.71	801.00	398.15	1.34	3.30	533.00	1,869.00	29,968.00
Switzerland	1231.97	1,239.00	197.20	-0.75	4.31	659.00	1,618.00	38,191.00
Syrian Arab Republic	0.45	-	1.03	3.13	13.62	-	5.00	14.00
Tanzania	0.13	-	0.34	2.21	5.90	-	1.00	4.00
Thailand	9.52	4.00	12.06	1.94	7.46	-	55.00	295.00
Trinidad and Tobago	1.19	1.00	1.54	1.24	3.42	-	5.00	37.00
Tunisia	0.58	-	0.96	2.08	7.25	-	4.00	18.00
Turkey	5.77	3.00	6.48	1.47	4.11	-	23.00	179.00
Uganda	0.13	-	0.43	3.39	13.83	-	2.00	4.00
Ukraine	8.06	1.00	9.49	0.56	1.65	-	26.00	250.00
United Arab Emirates	1.81	1.00	2.34	1.72	5.35	-	9.00	56.00
United Kingdom	2854.61	2,611.00	761.05	0.97	2.89	1,622.00	4,560.00	88,493.00
United States	57527.03	52,904.00	21345.27	0.68	2.01	34,193.00	98,014.00	1,783,338.00
Uruguay	1.06	1.00	1.00	0.28	1.78	-	3.00	33.00
Uzbekistan	0.35	-	0.66	1.61	4.19	-	2.00	11.00
Vanuatu	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Venezuela	18.32	15.00	8.40	0.04	1.54	4.00	31.00	568.00
Vietnam	0.23	-	0.62	3.31	14.44	-	3.00	7.00
Virgin Islands (U.S.)	0.19	-	0.65	3.43	13.76	-	3.00	6.00
Yemen, Rep.	0.06	-	0.25	3.55	13.57	-	1.00	2.00
Zimbabwe	0.81	1.00	0.91	0.93	3.03	-	3.00	25.00

Table A.2: This table reports summary statistics for the country-year observations of registered patent citations for 159 countries in the period 1975-2005. Data on patent citations is from Lai et al. (2015).

	CITATIONS							
1	2	3	4	5	6	7	8	9
Country	Mean	Median	SD	Skew	Kurtosis	Min	Max	Total
Albania	0.81	-	3.00	3.57	13.91	-	13.00	25.00
Algeria	0.10	-	0.54	5.29	29.03	-	3.00	3.00
Andorra	1.03	-	2.58	3.55	16.35	-	13.00	32.00
Antigua and Barbuda	6.77	-	18.63	3.56	15.80	-	92.00	210.00
Argentina	273.00	181.00	238.47	0.99	2.62	1.00	800.00	8,463.00
Armenia	1.87	-	5.55	3.81	17.54	-	28.00	58.00
Aruba	1.23	-	4.47	3.71	15.50	-	21.00	38.00
Australia	3,980.71	3,919.00	1,969.71	0.01	2.24	208.00	8,042.00	123,402.00
Austria	2,001.77	2,142.00	763.30	- 1.21	3.89	47.00	3,044.00	62,055.00
Azerbaijan	1.42	-	4.15	3.37	14.46	-	20.00	44.00
Bahamas	91.45	30.00	147.40	2.99	12.77	-	732.00	2,835.00
Bahrain	1.13	-	4.24	4.69	24.44	-	23.00	35.00
Bangladesh	0.06	-	0.25	3.55	13.57	-	1.00	2.00
Barbados	3.19	-	8.44	2.61	8.31	-	32.00	99.00
Belarus	12.45	-	28.86	3.08	12.30	-	134.00	386.00
Belgium	2,669.58	2,488.00	1,289.20	0.03	2.99	56.00	5,424.00	82,757.00
Bermuda	13.55	9.00	19.92	2.53	9.09	-	87.00	420.00
Bolivia	3.94	-	8.57	3.54	16.62	-	44.00	122.00
Bosnia & Herzegovina	0.35	-	1.14	3.10	11.44	-	5.00	11.00
Brazil	296.29	261.00	160.05	0.55	2.82	10.00	667.00	9,185.00
Brunei Darussalam	0.23	-	1.26	5.29	29.03	-	7.00	7.00
Bulgaria	60.29	34.00	58.51	0.50	1.71	-	168.00	1,869.00
Canada	19,275.39	17,034.00	10,552.95	0.20	2.08	680.00	38,193.00	597,537.00
Cayman Islands	12.74	9.00	15.19	1.37	4.21	-	53.00	395.00
Chad	0.06	-	0.36	5.29	29.03	-	2.00	2.00
Chile	29.29	20.00	38.57	3.63	17.84	-	213.00	908.00
China	475.03	446.00	460.92	0.93	3.28	-	1,626.00	14,726.00
Colombia	43.90	34.00	32.75	0.58	2.42	-	115.00	1,361.00
Congo, Rep	0.06	-	0.36	5.29	29.03	-	2.00	2.00
Costa Rica	19.55	9.00	22.46	1.22	3.22	-	75.00	606.00
Cote d'Ivoire	2.16	-	6.92	3.15	11.66	-	30.00	67.00
Croatia	7.77	-	17.39	3.62	17.34	-	90.00	241.00
Cuba	7.58	3.00	10.42	1.48	4.15	-	38.00	235.00
Cyprus	4.45	-	8.88	2.63	9.47	-	38.00	138.00
Czech Republic	202.10	178.00	154.70	1.93	8.64	3.00	807.00	6,265.00
Denmark	1,733.65	1,605.00	830.46	- 0.10	2.66	49.00	3,331.00	53,743.00
Dominica	0.06	-	0.36	5.29	29.03	-	2.00	2.00
Dominican Republic	6.94	-	13.85	2.48	9.35	-	62.00	215.00
Ecuador	10.10	3.00	16.99	2.51	8.63	-	72.00	313.00
Egypt	24.45	5.00	42.18	2.40	8.39	-	183.00	758.00
El Salvador	6.61	-	17.45	3.41	14.71	-	85.00	205.00
Estonia	2.45	-	5.68	2.76	10.22	-	25.00	76.00
Ethiopia	0.06	-	0.36	5.29	29.03	-	2.00	2.00
Faroe Islands	0.13	-	0.72	5.29	29.03	-	4.00	4.00
Fiji	0.10	-	0.40	4.14	19.27	-	2.00	3.00
Finland	2,743.10	1,742.00	2,181.91	1.17	3.68	73.00	8,626.00	85,036.00
France	19,769.64	19,564.00	8,408.33	- 0.96	3.17	348.00	30,514.00	612,859.00
French Polynesia	0.77	-	3.14	4.72	24.67	-	17.00	24.00
Gambia	0.42	-	2.33	5.29	29.03	-	13.00	13.00
Georgia	2.77	-	8.63	4.31	21.75	-	46.00	86.00
Germany	47,807.97	53,417.00	17,618.82	- 1.55	4.46	1,359.00	66,381.00	1,482,047.00
Ghana	0.16	-	0.58	4.10	19.67	-	3.00	5.00
Greece	76.58	68.00	56.45	0.46	2.17	1.00	202.00	2,374.00
Greenland	0.19	-	1.08	5.29	29.03	-	6.00	6.00
Guam	1.00	-	5.57	5.29	29.03	-	31.00	31.00
Guatemala	12.29	3.00	22.26	2.10	6.45	-	87.00	381.00
Guyana	0.48	-	1.65	3.62	15.71	-	8.00	15.00
Haiti	4.06	-	8.77	2.13	6.02	-	29.00	126.00
Honduras	2.58	-	5.32	2.17	6.46	-	20.00	80.00
Hong Kong	712.94	493.00	567.05	0.75	2.22	67.00	1,851.00	22,101.00
Hungary	358.68	347.00	221.01	0.12	1.89	6.00	737.00	11,119.00
Iceland	46.74	13.00	76.79	2.90	12.02	-	373.00	1,449.00
India	322.26	192.00	316.40	1.29	3.55	13.00	1,198.00	9,990.00
Indonesia	19.26	17.00	17.96	0.84	2.68	-	60.00	597.00
Iran	21.90	7.00	42.06	2.87	11.24	-	197.00	679.00
Iraq	2.52	-	7.99	3.71	16.24	-	39.00	78.00
Ireland	631.48	580.00	444.24	0.51	2.17	52.00	1,618.00	19,576.00
Israel	4,716.65	3,433.00	4,030.07	0.87	2.46	216.00	13,880.00	146,216.00
Italy	6,790.03	6,797.00	2,726.70	- 1.00	3.28	222.00	9,859.00	210,491.00
Jamaica	8.03	1.00	19.91	4.42	22.83	-	109.00	249.00
Japan	164,537.80	167,329.00	91,553.30	- 0.02	1.71	8,395.00	310,122.00	5,100,671.00
Jordan	3.00	-	6.02	2.41	8.06	-	24.00	93.00
Kazakhstan	0.52	-	1.12	1.90	5.22	-	4.00	16.00
Kenya	3.19	-	4.89	1.22	3.00	-	15.00	99.00
Korea, Dem. Rep.	1.97	-	5.43	2.74	9.02	-	20.00	61.00
Korea, Rep.	7,838.39	3,594.00	9,596.41	1.08	2.83	72.00	29,329.00	242,990.00
Kuwait	9.35	3.00	14.64	1.84	5.37	-	52.00	290.00
Kyrgyz Republic	0.19	-	0.54	2.68	8.80	-	2.00	6.00
Latvia	1.13	-	2.79	2.82	10.29	-	12.00	35.00
Lebanon	11.68	3.00	17.34	1.56	4.49	-	64.00	362.00
Liberia	0.77	-	4.31	5.29	29.03	-	24.00	24.00
Liechtenstein	122.97	118.00	93.62	1.88	8.08	1.00	479.00	3,812.00
Luxembourg	141.26	143.00	68.44	0.78	6.11	-	373.00	4,379.00

Country	Mean	Median	SD	Skew	Kurtosis	Min	Max	Total
Macao	1.97	-	8.38	4.68	24.14	-	45.00	61.00
Macedonia, FYR	0.06	-	0.36	5.29	29.03	-	2.00	2.00
Madagascar	0.45	-	2.03	4.81	25.18	-	11.00	14.00
Malawi	0.32	-	1.80	5.29	29.03	-	10.00	10.00
Malaysia	114.74	86.00	120.80	1.17	3.91	-	483.00	3,557.00
Mali	0.13	-	0.56	4.63	23.62	-	3.00	4.00
Malta	2.23	-	4.59	2.98	12.52	-	22.00	69.00
Marshall Islands,Rep	1.19	-	5.95	5.18	28.20	-	33.00	37.00
Mauritius	0.74	-	2.66	4.33	21.56	-	14.00	23.00
Mexico	301.68	325.00	122.96	- 0.89	3.26	12.00	480.00	9,352.00
Moldova	0.42	-	1.54	4.18	20.31	-	8.00	13.00
Monaco	41.16	34.00	35.62	1.13	3.59	-	130.00	1,276.00
Morocco	9.84	-	21.60	2.67	9.56	-	94.00	305.00
Myanmar	0.94	-	3.19	3.91	17.90	-	16.00	29.00
Netherlands	6,862.61	7,134.00	2,914.06	- 0.71	3.15	109.00	11,419.00	212,741.00
New Caledonia	0.06	-	0.36	5.29	29.03	-	2.00	2.00
New Zealand	445.00	401.00	236.88	0.62	3.56	16.00	1,044.00	13,795.00
Nicaragua	1.94	-	6.15	3.31	12.74	-	27.00	60.00
Niger	0.52	-	2.87	5.29	29.03	-	16.00	16.00
Nigeria	5.74	1.00	9.12	2.36	9.21	-	42.00	178.00
Norway	905.71	790.00	446.75	0.03	2.50	26.00	1,806.00	28,077.00
Oman	0.10	-	0.54	5.29	29.03	-	3.00	3.00
Pakistan	7.23	-	28.10	5.03	27.08	-	156.00	224.00
Palau	0.13	-	0.72	5.29	29.03	-	4.00	4.00
Panama	75.81	6.00	163.82	2.58	8.79	-	684.00	2,350.00
Papua New Guinea	0.39	-	1.58	4.14	19.27	-	8.00	12.00
Paraguay	1.52	-	3.97	3.20	13.52	-	19.00	47.00
Peru	14.32	9.00	16.92	2.17	8.01	-	77.00	444.00
Philippines	49.35	33.00	41.19	1.83	6.81	2.00	199.00	1,530.00
Poland	93.84	83.00	54.51	0.62	2.39	6.00	206.00	2,909.00
Portugal	32.00	30.00	23.98	0.90	3.73	-	104.00	992.00
Puerto Rico	6.35	-	18.77	2.83	9.43	-	74.00	197.00
Qatar	0.03	-	0.18	5.29	29.03	-	1.00	1.00
Romania	28.52	20.00	30.55	1.13	3.33	-	110.00	884.00
Russia	1,192.07	1,221.00	667.38	0.37	2.89	60.00	2,623.00	36,954.00
Saudi Arabia	62.19	50.00	55.16	0.96	3.19	-	205.00	1,928.00
Senegal	2.65	-	8.01	3.48	14.13	-	37.00	82.00
Seychelles	0.19	-	1.08	5.29	29.03	-	6.00	6.00
Sierra Leone	0.10	-	0.54	5.29	29.03	-	3.00	3.00
Singapore	830.35	212.00	1,077.74	1.15	2.92	4.00	3,397.00	25,741.00
Slovak Republic	4.52	-	9.44	2.28	7.57	-	39.00	140.00
Slovenia	14.03	-	24.51	2.10	6.93	-	100.00	435.00
South Africa	722.58	729.00	370.08	- 0.09	3.19	3.00	1,561.00	22,400.00
Spain	777.65	652.00	410.63	0.09	1.79	58.00	1,494.00	24,107.00
Sri Lanka	4.74	-	13.79	4.36	22.04	-	74.00	147.00
St. Kitts and Nevis	1.35	-	3.44	2.46	7.62	-	13.00	42.00
St. Vincent & Grens.	0.29	-	1.62	5.29	29.03	-	9.00	9.00
Suriname	0.29	-	1.19	4.14	19.27	-	6.00	9.00
Swaziland	0.58	-	3.23	5.29	29.03	-	18.00	18.00
Sweden	7,416.71	7,409.00	3,485.47	- 0.14	3.57	112.00	15,721.00	229,918.00
Switzerland	8,418.13	9,840.00	3,539.03	- 1.24	3.44	110.00	13,542.00	260,962.00
Syrian Arab Republic	2.35	-	5.50	2.64	9.55	-	24.00	73.00
Tanzania	0.68	-	2.21	3.12	11.23	-	9.00	21.00
Thailand	52.00	36.00	51.65	0.91	2.70	-	182.00	1,612.00
Trinidad and Tobago	6.42	1.00	11.64	2.39	8.20	-	48.00	199.00
Tunisia	3.29	-	6.09	1.80	5.11	-	22.00	102.00
Turkey	24.26	13.00	28.66	1.93	7.23	-	130.00	752.00
Uganda	0.52	-	2.51	5.21	28.47	-	14.00	16.00
Ukraine	34.55	10.00	49.15	1.47	4.15	-	174.00	1,071.00
United Arab Emirates	10.90	2.00	23.63	3.73	17.71	-	123.00	338.00
United Kingdom	23,351.45	25,008.00	9,300.12	- 1.25	3.89	350.00	35,302.00	723,895.00
United States	657,297.50	564,403.00	340,700.80	0.17	2.32	23,690.00	1,279,368.00	20,400,000.00
Uruguay	3.77	-	7.78	2.99	11.78	-	36.00	117.00
Uzbekistan	1.06	-	3.07	3.50	15.33	-	15.00	33.00
Vanuatu	0.10	-	0.54	5.29	29.03	-	3.00	3.00
Venezuela	119.58	130.00	77.61	0.39	2.68	-	314.00	3,707.00
Vietnam	0.35	-	1.80	5.22	28.46	-	10.00	11.00
Virgin Islands (U.S.)	1.87	-	6.92	3.78	16.10	-	33.00	58.00
Yemen, Rep.	0.06	-	0.36	5.29	29.03	-	2.00	2.00
Zimbabwe	4.39	-	9.57	3.00	12.75	-	46.00	136.00

B Country classification

This table shows country classification by legal origins, with civil law origin countries in panel A and common law origin countries in panel B. WE also show each country's economic level, and whether the country had civil war in the period 1975-2005.

Country	Economic level	Legal origin	Civil war
Panel A: Civil law countries			
Albania	emerging	civil	no
Algeria	emerging	civil	yes
Argentina	emerging	french	no
Armenia	emerging	civil	no
Austria	developed	german	no
Azerbaijan	emerging	civil	yes
Belarus	emerging	german	no
Belgium	developed	french	no
Bolivia	emerging	french	no
Bosnia & Herzegovina	emerging	civil	yes
Brazil	emerging	french	no
Bulgaria	emerging	socialist	no
Burkina Faso	emerging	civil	no
Cambodia	emerging	civil	yes
Cameroon	emerging	civil	no
Chad	emerging	civil	yes
Chile	emerging	french	no
China	emerging	socialist	yes
Colombia	emerging	french	no
Congo, Rep	emerging	civil	yes
Costa Rica	emerging	french	no
Cote d'Ivoire	emerging	french	yes
Croatia	emerging	socialist	yes
Cuba	emerging	civil	yes
Czech Republic	developed	socialist	no
Denmark	developed	scandinavian	no
Dominican Republic	emerging	french	no
Ecuador	emerging	french	no
Egypt	emerging	french	no
El Salvador	emerging	french	yes
Estonia	developed	socialist	no
Ethiopia	emerging	civil	yes
Faroe Islands	developed	scandinavian	no
Finland	developed	scandinavian	no
France	developed	french	no
French Polynesia	developed	french	no
Georgia	emerging	socialist	yes
Germany	developed	german	no
Greece	developed	french	no
Greenland	emerging	civil	no
Guatemala	emerging	french	yes
Guinea	emerging	civil	yes
Guyana	emerging	civil	no
Haiti	emerging	civil	no
Honduras	emerging	french	no
Hungary	emerging	socialist	no
Iceland	developed	scandinavian	no
Indonesia	emerging	french	yes
Iran	emerging	islamic	yes
Iraq	emerging	civil	yes
Italy	developed	french	no
Japan	developed	german	no
Jordan	emerging	french	no
Kazakhstan	emerging	socialist	no
Korea, Dem. Rep.	emerging	german	no
Korea, Rep.	emerging	german	no
Kuwait	emerging	french	no
Kyrgyz Republic	emerging	civil	no

Country	Economic level	Legal origin	Civil war
Latvia	emerging	socialist	no
Lebanon	emerging	french	yes
Liberia	emerging	civil	yes
Liechtenstein	developed	civil	no
Luxembourg	developed	french	no
Macao	emerging	civil	no
Macedonia, FYR	emerging	civil	no
Madagascar	emerging	french	no
Mali	emerging	french	no
Malta	developed	french	no
Mauritania	emerging	civil	no
Mauritius	emerging	civil	no
Mexico	emerging	french	no
Moldova	emerging	socialist	yes
Monaco	developed	french	no
Montenegro	emerging	civil	no
Morocco	emerging	french	no
Netherlands	developed	french	no
New Caledonia	developed	french	no
Nicaragua	emerging	french	yes
Niger	emerging	french	no
Norway	developed	scandinavian	no
Oman	emerging	civil	yes
Panama	emerging	french	no
Paraguay	emerging	french	no
Peru	emerging	french	yes
Philippines	emerging	french	yes
Poland	emerging	socialist	no
Portugal	developed	french	no
Puerto Rico	emerging	civil	no
Qatar	emerging	civil	no
Romania	emerging	socialist	yes
Russia	emerging	socialist	yes
Saudi Arabia	emerging	civil	no
Senegal	emerging	french	yes
Serbia	emerging	civil	no
Seychelles	emerging	civil	no
Slovak Republic	developed	civil	no
Slovenia	developed	socialist	no
Spain	developed	french	no
Suriname	emerging	civil	no
Sweden	developed	scandinavian	no
Switzerland	developed	german	no
Syrian Arab Republic	emerging	civil	no
Tunisia	emerging	french	no
Turkey	emerging	french	yes
Turkmenistan	emerging	civil	no
Ukraine	emerging	socialist	no
Uruguay	emerging	french	no
Uzbekistan	emerging	civil	no
Venezuela	emerging	french	no
Vietnam	emerging	socialist	yes
Yemen, Rep.	emerging	islamic	yes
Panel B Common Law Countries			
Antigua and Barbuda	emerging	common	no
Australia	developed	common	no
Bahamas	emerging	common	no
Bahrain	emerging	common	no

Country	Economic level	Legal origin	Civil war
Bangladesh	emerging	common	no
Barbados	developed	common	no
Bermuda	developed	common	no
Brunei Darussalam	developed	common	no
Canada	developed	common	no
Cayman Islands	emerging	common	no
Cyprus	developed	common	no
Dominica	emerging	common	no
Fiji	emerging	common	no
Gambia	emerging	common	no
Ghana	emerging	common	no
Guam	emerging	common	no
Hong Kong	developed	common	no
India	emerging	common	yes
Ireland	developed	common	no
Israel	developed	common	no
Jamaica	emerging	common	no
Kenya	emerging	common	no
Malawi	emerging	common	no
Malaysia	emerging	common	no
Marshall Islands,Rep	emerging	common	no
Myanmar	emerging	common	no
Nepal	emerging	common	yes
New Zealand	developed	common	no
Nigeria	emerging	common	yes
Pakistan	emerging	common	yes
Palau	emerging	common	no
Papua New Guinea	emerging	common	yes
Sierra Leone	emerging	common	yes
Singapore	developed	common	no
Solomon Islands	emerging	common	no
South Africa	emerging	common	no
Sri Lanka	emerging	common	yes
St. Kitts and Nevis	emerging	common	no
St. Vincent & Grens.	emerging	common	no
Swaziland	emerging	common	no
Tanzania	emerging	common	yes
Thailand	emerging	common	no
Trinidad and Tobago	developed	common	no
Uganda	emerging	common	yes
United Arab Emirates	developed	common	no
United Kingdom	developed	common	no
United States	developed	common	no
Vanuatu	emerging	common	no
Virgin Islands (U.S.)	emerging	common	no
Zimbabwe	emerging	common	yes

C Legal origins

C.1 Regression Results for Legal Origins

Table C.1: Regression results for the effect of oil discovery on industries in civil and common law countries. This table shows regression results for the effect of oil discoveries on innovation activity for industries in civil law and common law countries. Regression models 1 to 4 show results for civil law origin countries, while 5-8 show results for common law countries. 1, 2, 5 and 6 show results with $log(1+PAT)_{i,j,t}$ as the dependent variable, while 3, 4, 7 and 8 show results with $log(1+CITES)_{i,j,t}$ as dependent variable. The sample period is 1975-2005.

	civil law origin				common law origin			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	no controls	gdp erate open	no controls	gdp erate open	no controls	gdp erate open	no controls	gdp erate open
-10	0.0180**	-0.0110	0.0137*	-0.0166*	0.0014	0.0034	0.0443*	0.0389
	(0.0074)	(0.0090)	(0.0080)	(0.0099)	(0.0228)	(0.0254)	(0.0251)	(0.0282)
-9	0.0267***	0.0028	0.0270***	0.0034	0.0242	0.0267	0.0809***	0.0780***
	(0.0072)	(0.0089)	(0.0078)	(0.0097)	(0.0232)	(0.0257)	(0.0261)	(0.0290)
-8	0.0008	-0.0063	0.0051	-0.0049	0.0367	0.0400	0.1161***	0.1388***
	(0.0073)	(0.0085)	(0.0077)	(0.0093)	(0.0227)	(0.0253)	(0.0255)	(0.0290)
-7	0.0065	0.0080	0.0096	0.0124	0.0332	0.0431*	0.1078***	0.1371***
	(0.0075)	(0.0086)	(0.0078)	(0.0093)	(0.0220)	(0.0252)	(0.0247)	(0.0286)
-6	0.0084	0.0146*	0.0118	0.0186**	0.0568***	0.0797***	0.1139***	0.1619***
	(0.0074)	(0.0084)	(0.0078)	(0.0091)	(0.0219)	(0.0251)	(0.0239)	(0.0280)
-5	0.0146**	0.0180**	0.0186**	0.0212**	0.0652***	0.0958***	0.0968***	0.1513***
	(0.0073)	(0.0084)	(0.0079)	(0.0092)	(0.0207)	(0.0248)	(0.0225)	(0.0268)
-4	0.0173**	0.0116	0.0193**	0.0166*	0.0335	0.0964***	0.0544**	0.1305***
	(0.0072)	(0.0084)	(0.0078)	(0.0093)	(0.0209)	(0.0249)	(0.0223)	(0.0270)
-3	0.0154**	0.0016	0.0126	0.0019	0.0351*	0.0876***	0.0328	0.0857***
	(0.0072)	(0.0084)	(0.0077)	(0.0092)	(0.0203)	(0.0238)	(0.0223)	(0.0265)
-2	0.0347***	0.0197**	0.0278***	0.0174*	0.0275	0.0604**	-0.0083	0.0033
	(0.0072)	(0.0088)	(0.0077)	(0.0096)	(0.0202)	(0.0237)	(0.0224)	(0.0262)
-1	0.0300***	0.0207**	0.0247***	0.0245**	0.0316	0.0548**	0.0045	0.0064
	(0.0072)	(0.0088)	(0.0077)	(0.0095)	(0.0196)	(0.0233)	(0.0222)	(0.0268)
$\tau = 0$	0.0275***	0.0277***	0.0192**	0.0251***	0.0298	0.0631***	0.0365*	0.0616**
	(0.0071)	(0.0087)	(0.0077)	(0.0095)	(0.0184)	(0.0220)	(0.0206)	(0.0246)
1	0.0206***	0.0213**	0.0155**	0.0154*	-0.0035	0.0023	-0.0305	-0.0374
	(0.0073)	(0.0087)	(0.0076)	(0.0091)	(0.0185)	(0.0219)	(0.0207)	(0.0243)
2	0.0300***	0.0279***	0.0260***	0.0209**	-0.0173	-0.0162	-0.0155	-0.0296
	(0.0073)	(0.0087)	(0.0078)	(0.0095)	(0.0187)	(0.0218)	(0.0211)	(0.0251)
3	0.0089	0.0160*	0.0077	0.0105	-0.0302	-0.0269	-0.0678***	-0.0634**
	(0.0072)	(0.0083)	(0.0075)	(0.0088)	(0.0191)	(0.0222)	(0.0215)	(0.0249)
4	0.0050	0.0160**	0.0064	0.0104	-0.0666***	-0.0597***	-0.0942***	-0.0865***
	(0.0071)	(0.0081)	(0.0078)	(0.0090)	(0.0195)	(0.0220)	(0.0228)	(0.0258)
5	-0.0036	-0.0011	-0.0081	-0.0109	-0.0206	-0.0052	0.0048	0.0267
	(0.0073)	(0.0082)	(0.0079)	(0.0088)	(0.0191)	(0.0197)	(0.0217)	(0.0223)
6	-0.0037	0.0022	0.0024	0.0029	-0.0232	-0.0104	-0.0232	-0.0079
	(0.0076)	(0.0084)	(0.0083)	(0.0092)	(0.0192)	(0.0197)	(0.0218)	(0.0221)
7	-0.0130*	0.0034	-0.0045	0.0026	0.0004	0.0156	0.0385*	0.0557**
	(0.0078)	(0.0085)	(0.0085)	(0.0094)	(0.0194)	(0.0197)	(0.0219)	(0.0222)
8	-0.0155*	0.0018	-0.0005	0.0087	0.0163	0.0283	0.0413*	0.0541**
	(0.0082)	(0.0088)	(0.0087)	(0.0094)	(0.0197)	(0.0198)	(0.0218)	(0.0221)
9	-0.0026	0.0116	0.0163*	0.0235**	-0.0052	0.0030	0.0406*	0.0503**
	(0.0084)	(0.0091)	(0.0091)	(0.0100)	(0.0201)	(0.0202)	(0.0225)	(0.0230)
10	0.0003	0.0169*	0.0207**	0.0261**	-0.0138	-0.0033	0.0090	0.0218
	(0.0085)	(0.0093)	(0.0091)	(0.0102)	(0.0200)	(0.0198)	(0.0229)	(0.0229)
lgdpcapita		0.1634***		0.1460***		0.0876***		0.1370***
		(0.0098)		(0.0104)		(0.0149)		(0.0175)
finopendummy		10.6392***		26.3154***		-9.1529***		-5.9873**
		(1.6456)		(1.8359)		(2.2886)		(2.6598)
lreer_gdp		-0.0001**		-0.0000		-0.0006***		-0.0010***
		(0.0000)		(0.0000)		(0.0002)		(0.0002)
Observations	44,330	29,470	41,261	27,966	17,794	12,671	16,802	12,091
R-squared	0.818	0.826	0.782	0.784	0.905	0.906	0.892	0.891
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

C.2 Event window analysis for legal origins

Table C.2: This table shows the change in innovation activity for event windows 1-10. The top panel shows the change in innovation activity for industries in civil law countries, models 1 and 2 show results for innovation quantity while models 3 and 4 show results for innovative quality. The bottom panel shows the change in innovation activity for industries in civil law countries, models 5 and 6 show results for innovation quantity while models 7 and 8 show results for innovative quality. Results show that innovative activity declines more significantly in common law countries than civil law countries. Civil law countries have no incentive to slow down inventive activity even in the midst of abundance.

	Civil law origin							
	PAT				CITES			
	1		2		3		4	
Event window	% Change	t-stat	% Change	t-stat	% Change	t-stat	% Change	t-stat
(1,-1)	-0.94%	-0.91	0.05%	0.04	-0.93%	-0.86	-0.91%	-0.70
(2,-2)	-1.41%	-1.01	0.87%	0.54	-1.10%	-0.77	-0.56%	-0.32
(3,-3)	-2.06%	-1.26	2.31%	1.23	-1.59%	-0.94	0.31%	0.16
(4,-4)	-3.30%	-1.85	2.75%	1.35	-2.87%	-1.55	-0.31%	-0.14
(5,-5)	-5.12%	-2.61	0.84%	0.38	-5.54%	-2.69	-3.52%	-1.47
(6,-6)	-6.33%	-3.02	-0.40%	-0.17	-6.49%	-2.95	-5.10%	-2.01
(7,-7)	-8.28%	-3.72	-0.86%	-0.35	-7.90%	-3.41	-6.08%	-2.26
(8,-8)	-9.90%	-4.30	-0.05%	-0.02	-8.46%	-3.44	-4.71%	-1.62
(9,-9)	12.80%	-5.05	0.83%	0.29	-9.52%	-3.54	-2.70%	-0.85
(10,-10)	-14.60%	-5.05	3.62%	1.13	-8.82%	-2.97	1.57%	0.45

	Common law origin							
	PAT				CITES			
	5		6		7		8	
Event window	% Change	t-stat	% Change	t-stat	% Change	t-stat	% Change	t-stat
(1,-1)	-3.51%	-1.27	-5.25%	-1.59	-3.51%	-1.18	-4.38%	-1.21
(2,-2)	-7.99%	-2.41	-12.90%	-3.20	-4.22%	-1.11	-7.66%	-1.62
(3,-3)	-14.50%	-3.71	-24.30%	-5.36	-14.30%	-3.30	-22.60%	-4.39
(4,-4)	-24.50%	-5.30	-40.00%	-7.52	-29.10%	-5.78	-44.30%	-7.42
(5,-5)	-33.10%	-6.47	-50.10%	-8.35	-38.30	-6.70	-56.70%	-8.28
(6,-6)	-41.10%	-7.30	-59.10%	-8.98	-52.10	-8.02	-73.70%	-9.64
(7,-7)	-44.40%	-7.28	-61.80%	-8.84	-59.00%	-8.29	-81.80%	-9.89
(8,-8)	-46.40%	-7.06	-63.00%	-8.48	-66.50%	-8.69	-90.30%	-10.26
(9,-9)	-49.40%	-7.11	-65.40%	-8.42	-70.50%	-8.74	-93.10%	-10.16
(10,-10)	-50.90%	-6.96	-66.00%	-8.10	-74.00%	-8.70	-94.80%	-9.87

C.3 Gini Index and legal origins

D Governance 1996-2007

D.1 Effects of Oil Strikes on Governance

We present the full regression results for the effects of oil strikes on governance quality, showing results for all six governance estimates and their response to oil discovery.

Table C.3: This table shows the country splits between low-Gini index from 22.5-40% and high-Gini index from 40-60.6%.

Low Gini Index				High Gini Index			
Country	**Average Gini**	**Economic Status**	**Legal Origin**	**Country**	**Average Gini**	**Economic Status**	**Legal Origin**
Albania	29.77	emerging	civil	Angola	52.00	emerging	civil
Armenia	35.48	emerging	civil	Argentina	48.05	emerging	french
Australia	32.81	developed	common	Bolivia	56.26	emerging	french
Austria	29.33	developed	german	Brazil	58.68	emerging	french
Azerbaijan	29.42	emerging	civil	Chile	54.91	emerging	french
Belgium	29.30	developed	french	Cote d'Ivoire	40.15	emerging	french
Bangladesh	29.81	emerging	common	Congo, Rep.	47.30	emerging	civil
Bosnia and Herzegovina	32.00	emerging	civil	Colombia	55.63	emerging	french
Belarus	29.84	emerging	german	Costa Rica	46.64	emerging	french
Canada	32.25	developed	common	Dominican Republic	50.13	emerging	french
China	37.88	emerging	socialist	Ecuador	53.63	emerging	french
Cyprus	30.20	developed	common	Gambia, The	47.90	emerging	common
Czech Republic	26.70	developed	socialist	Guatemala	57.37	emerging	french
Germany	29.78	developed	german	Guyana	44.60	emerging	civil
Denmark	25.23	developed	scandinavian	Honduras	55.80	emerging	french
Algeria	37.75	emerging	civil	Iran, Islamic Rep.	44.34	emerging	islamic
Egypt, Arab Rep.	31.68	emerging	french	Jamaica	42.61	emerging	common
Spain	32.50	developed	french	Kenya	48.03	emerging	common
Estonia	35.93	developed	socialist	Madagascar	42.92	emerging	french
Ethiopia	34.80	emerging	civil	Mexico	49.26	emerging	french
Finland	27.73	developed	scandinavian	Mali	45.15	emerging	french
Fiji	38.10	emerging	common	Malawi	52.85	emerging	common
France	30.60	developed	french	Malaysia	47.60	emerging	common
United Kingdom	35.15	developed	common	Niger	40.67	emerging	french
Georgia	38.68	emerging	socialist	Nigeria	43.93	emerging	common
Ghana	38.52	emerging	common	Nicaragua	53.38	emerging	french
Greece	33.67	developed	french	Panama	56.16	emerging	french
Croatia	22.80	emerging	socialist	Peru	52.61	emerging	french
Hungary	27.70	emerging	socialist	Philippines	42.67	emerging	french
Indonesia	31.49	emerging	french	Papua New Guinea	55.40	emerging	common
India	32.68	emerging	common	Paraguay	53.22	emerging	french
Ireland	33.40	developed	common	Russian Federation	40.12	emerging	socialist
Iceland	27.93	developed	scandinavian	Senegal	43.98	emerging	french
Israel	37.83	developed	common	Sierra Leone	40.20	emerging	common
Italy	34.33	developed	french	El Salvador	51.19	emerging	french
Jordan	38.23	emerging	french	Suriname	57.60	emerging	civil
Kazakhstan	35.25	emerging	socialist	Thailand	43.67	emerging	common
Kyrgyz Republic	33.43	emerging	civil	Turkmenistan	40.80	emerging	civil
Sri Lanka	35.33	emerging	common	Trinidad and Tobago	41.45	developed	common
Luxembourg	30.40	developed	french	Tunisia	40.76	emerging	french
Latvia	33.00	emerging	socialist	Turkey	42.05	emerging	french
Morocco	39.63	emerging	french	Uganda	42.65	emerging	common
Moldova	37.27	emerging	socialist	Uruguay	43.00	emerging	french
Netherlands	29.40	developed	french	Venezuela, RB	49.51	emerging	french
Norway	29.93	developed	scandinavian	South Africa	60.65	emerging	common
Pakistan	31.99	emerging	common				
Poland	32.90	emerging	socialist				
Portugal	38.70	developed	french				
Romania	25.67	emerging	socialist				
Slovak Republic	27.40	developed	civil				
Slovenia	26.20	developed	socialist				
Sweden	26.07	developed	scandinavian				
Syrian Arab Republic	35.80	emerging	civil				
Chad	39.80	emerging	civil				
Tanzania	36.30	emerging	common				
Ukraine	31.09	emerging	socialist				
United States	38.89	developed	common				
Uzbekistan	37.28	emerging	civil				
Vietnam	36.23	emerging	socialist				
Yemen, Rep.	34.85	emerging	islamic				

Table D.1: This table shows regression results on the effect of oil strikes on governance quality as measured by the six governance estimates: VAE, PVE, GEE, RQE, RLE, and CCE for the period 1996-2005.

VARIABLES	(1) VAE	(2) PVE	(3) GEE	(4) RQE	(5) RLE	(6) CCE
-10	0.0132	0.1086	-0.0895	0.0043	-0.0610	-0.1198**
	(0.0526)	(0.1234)	(0.0561)	(0.0665)	(0.0503)	(0.0562)
-9	-0.0033	-0.0333	-0.0250	-0.0713	-0.0142	0.0312
	(0.0463)	(0.0835)	(0.0519)	(0.0579)	(0.0378)	(0.0467)
-8	0.0297	0.1055	0.0533	-0.0542	0.0412	-0.1082*
	(0.0421)	(0.1119)	(0.0429)	(0.0629)	(0.0400)	(0.0600)
-7	0.0159	-0.0124	-0.1276*	-0.0199	0.0065	0.0190
	(0.0460)	(0.0543)	(0.0695)	(0.0566)	(0.0278)	(0.0460)
-6	-0.0156	0.2259**	0.0647*	0.0182	0.0875**	-0.0250
	(0.0454)	(0.1015)	(0.0347)	(0.0632)	(0.0358)	(0.0400)
-5	-0.0368	0.0566	-0.0341	0.0871*	-0.0072	-0.0060
	(0.0566)	(0.0817)	(0.0419)	(0.0500)	(0.0353)	(0.0493)
-4	0.0004	0.1674**	-0.0221	0.1078**	0.0921***	0.0312
	(0.0512)	(0.0824)	(0.0365)	(0.0456)	(0.0324)	(0.0390)
-3	-0.0825	0.0428	-0.0025	0.1024**	0.0480	-0.0063
	(0.0505)	(0.0656)	(0.0372)	(0.0428)	(0.0398)	(0.0379)
-2	-0.0242	0.0782	0.0074	0.1498***	0.0686**	-0.0561
	(0.0525)	(0.0747)	(0.0312)	(0.0466)	(0.0287)	(0.0404)
-1	-0.0402	0.1093	-0.0293	0.1050**	0.0464	-0.0577
	(0.0585)	(0.0725)	(0.0320)	(0.0416)	(0.0302)	(0.0364)
$\tau = 0$	-0.0610	0.0849	0.0315	0.1198**	0.0218	-0.0075
	(0.0416)	(0.0656)	(0.0329)	(0.0501)	(0.0361)	(0.0325)
1	0.0081	0.1334*	0.0005	0.0170	0.0353	-0.0270
	(0.0425)	(0.0747)	(0.0323)	(0.0466)	(0.0276)	(0.0308)
2	-0.0737	0.1188*	-0.0042	0.0285	0.0184	-0.0550
	(0.0498)	(0.0699)	(0.0362)	(0.0681)	(0.0392)	(0.0335)
3	-0.0410	0.0423	-0.0187	0.0035	0.0163	-0.0171
	(0.0394)	(0.0693)	(0.0305)	(0.0458)	(0.0302)	(0.0387)
4	-0.0045	0.0391	-0.0199	0.0696	0.0541	-0.0658
	(0.0411)	(0.0886)	(0.0392)	(0.0531)	(0.0449)	(0.0416)
5	0.0225	0.0144	-0.0129	0.0665	0.0445	-0.0487
	(0.0447)	(0.0618)	(0.0360)	(0.0508)	(0.0372)	(0.0360)
6	0.0149	0.0160	-0.0423	0.0066	0.0272	-0.0886**
	(0.0384)	(0.0891)	(0.0315)	(0.0402)	(0.0357)	(0.0410)
7	-0.0174	0.0755	-0.0097	0.0316	0.0437	-0.0878***
	(0.0433)	(0.0674)	(0.0268)	(0.0443)	(0.0379)	(0.0318)
8	0.0692*	-0.0142	0.0074	-0.0029	-0.0047	-0.0526**
	(0.0367)	(0.0589)	(0.0280)	(0.0369)	(0.0322)	(0.0257)
9	0.0203	-0.0438	0.0082	0.0257	0.0690**	-0.0062
	(0.0251)	(0.0620)	(0.0370)	(0.0467)	(0.0333)	(0.0267)
10	0.0064	0.0239	0.0305	0.0496	-0.0062	-0.0105
	(0.0448)	(0.0660)	(0.0332)	(0.0456)	(0.0309)	(0.0249)
lgdpcapita	0.0152	-0.0002	0.0236	0.2494***	0.1106*	0.0203
	(0.0485)	(0.0805)	(0.0671)	(0.0921)	(0.0628)	(0.0631)
lreer_gdp	0.0006	0.0020*	0.0000	0.0013*	0.0005	0.0008
	(0.0008)	(0.0012)	(0.0010)	(0.0008)	(0.0006)	(0.0006)
lag_vae	0.0620***					
	(0.0152)					
lag_pve		0.0120				
		(0.0234)				
lag_gee			0.0209			
			(0.0175)			
lag_rqe				-0.0115		
				(0.0258)		
lag_rle					0.0137	
					(0.0136)	
lag_cce						-0.0124
						(0.0157)
Observations	12,591	12,551	12,579	12,579	12,591	12,580
R-squared	0.980	0.944	0.982	0.971	0.987	0.984
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

D.2 Event window analysis for the effect of oil discovery on governance.

Table D.2: This table shows ten event windows for the effects of oil discovery on voice and accountability (VAE), political stability and absence of violence (PVE), government effectiveness (GEE), regulatory quality (RQE), rule of law (RLE) and control of corruption (CCE). Each event window shows innovation activity t years before and after oil discovery. A negative result shows that innovation activity after oil discovery is less than activity before oil discovery. Top panel shows event windows for the effect of oil discovery on VAE, PVE and GEE while the bottom panel shows results for RQE, RLE and CCE. For RQE our results are negatively significant for the one-year to eight-year windows. CCE also has negatively significant results in the 6-year to 9-year windows.

	VAE		PVE		GEE	
Event window	% Change	t-stat	% Change	t-stat	% Change	t-stat
(1,-1)	4.83%	1.20	2.41%	0.38	2.98%	0.90
(2,-2)	-0.12%	-0.02	6.47%	0.64	1.83%	0.43
(3,-3)	4.03%	0.40	6.41%	0.42	0.21%	0.03
(4,-4)	3.54%	0.27	-6.42%	-0.33	0.44%	0.05
(5,-5)	9.47%	0.61	-10.60%	-0.47	2.55%	0.26
(6,-6)	12.50%	0.75	-31.60%	-1.24	-8.15%	-0.80
(7,-7)	9.18%	0.62	-22.80%	-0.86	3.64%	0.36
(8,-8)	13.10%	0.91	-34.80%	-1.25	-0.95%	-0.08
(9,-9)	15.50%	1.21	-35.90%	-1.23	2.37%	0.19
(10,-10)	14.80%	1.14	-44.30%	-1.36	14.40%	0.96

	RQE		RLE		CCE	
Event window	% Change	t-stat	% Change	t-stat	% Change	t-stat
(1,-1)	-8.80%	-2.20	-1.11%	-0.47	3.07%	0.96
(2,-2)	-20.90%	-3.01	-6.13%	-1.45	3.18%	0.66
(3,-3)	-30.80%	-3.42	-9.30%	-1.53	2.10%	0.37
(4,-4)	-34.60%	-3.37	-13.10%	-1.60	-7.60%	-0.98
(5,-5)	-36.70%	-2.86	-7.93%	-0.85	-11.90%	-1.28
(6,-6)	-37.90%	-2.57	-14.00%	-1.25	-18.20%	-1.88
(7,-7)	-32.70%	-2.19	-10.20%	-0.82	-28.90%	-2.44
(8,-8)	-27.60%	-1.99	-14.80%	-1.19	-23.40%	-1.89
(9,-9)	-17.90%	-1.03	-6.52%	-0.44	-27.10%	-1.88
(10,-10)	-13.40%	-0.67	-1.04%	-0.08	-16.20%	-1.07

E Developed and Emerging Economies

E.1 Regression results for the effect of oil discoveries on innovation activity for industries in developed and emerging economies

We show the regression results after splitting our sample into developed and emerging economies.

Table E.1: This table shows regression results for the effect of oil discoveries on innovation activity for industries in developed and emerging economies after controlling for legal origins. We split our sample into developed and emerging economies, given that they are either civil or common law origin countries. Odd numbered regression models represent results for innovative quantity while even numbered models represent results for innovative quality. Control variables are GDP/capita, real exchange rate and financial openness (not shown). The sample period is 1975-2005.

	Dev|Common		Emerg|Common		Dev|Civil		Emerg|Civil	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	PAT	CITES	PAT	CITES	PAT	CITES	PAT	CITES
-10	0.0063	0.0415	-0.0298**	-0.0348***	-0.0683	-0.1189***	-0.0063	0.0062
	(0.0380)	(0.0419)	(0.0144)	(0.0125)	(0.0417)	(0.0457)	(0.0074)	(0.0084)
-9	0.0374	0.1034**	-0.0388***	-0.0273**	0.0327	0.0472	-0.0019	0.0081
	(0.0384)	(0.0428)	(0.0135)	(0.0127)	(0.0424)	(0.0461)	(0.0074)	(0.0082)
-8	0.0557	0.1852***	-0.0150	0.0048	-0.0325	-0.0535	-0.0011	0.0139*
	(0.0371)	(0.0421)	(0.0153)	(0.0161)	(0.0412)	(0.0434)	(0.0072)	(0.0080)
-7	0.0708*	0.2311***	-0.0055	-0.0063	-0.0023	-0.0046	0.0100	0.0179**
	(0.0367)	(0.0414)	(0.0156)	(0.0142)	(0.0442)	(0.0463)	(0.0073)	(0.0079)
-6	0.1231***	0.2664***	0.0116	0.0266	-0.0010	0.0455	0.0195***	0.0274***
	(0.0364)	(0.0403)	(0.0177)	(0.0176)	(0.0420)	(0.0453)	(0.0073)	(0.0078)
-5	0.1414***	0.2750***	0.0429**	0.0390**	-0.0272	0.0104	0.0258***	0.0297***
	(0.0383)	(0.0419)	(0.0190)	(0.0163)	(0.0443)	(0.0476)	(0.0073)	(0.0080)
-4	0.1479***	0.2503***	0.0413*	0.0343*	-0.0197	-0.0761	0.0153**	0.0249***
	(0.0401)	(0.0451)	(0.0223)	(0.0176)	(0.0461)	(0.0532)	(0.0073)	(0.0079)
-3	0.1373***	0.2066***	0.0545***	0.0365**	-0.0004	-0.0060	0.0018	0.0042
	(0.0402)	(0.0463)	(0.0208)	(0.0169)	(0.0434)	(0.0485)	(0.0072)	(0.0078)
-2	0.0778*	0.0831*	0.0729***	0.0319**	0.0607	0.0923**	0.0135*	0.0075
	(0.0404)	(0.0455)	(0.0220)	(0.0155)	(0.0412)	(0.0450)	(0.0072)	(0.0078)
-1	0.0515	0.0201	0.0916***	0.0879***	0.0160	0.0381	0.0222***	0.0205***
	(0.0366)	(0.0449)	(0.0239)	(0.0186)	(0.0420)	(0.0443)	(0.0072)	(0.0079)
$\tau = 0$	0.0640*	0.1140***	0.0801***	0.0341**	0.0815**	0.1429***	0.0197***	0.0092
	(0.0333)	(0.0397)	(0.0214)	(0.0140)	(0.0390)	(0.0450)	(0.0072)	(0.0077)
1	-0.0307	-0.0556	0.0525***	0.0180	0.0599	0.0051	0.0140*	0.0191**
	(0.0320)	(0.0364)	(0.0201)	(0.0144)	(0.0381)	(0.0412)	(0.0072)	(0.0076)
2	-0.0549*	-0.0660*	0.0465**	0.0233	0.0925**	0.0913**	0.0134*	0.0123
	(0.0317)	(0.0371)	(0.0189)	(0.0149)	(0.0380)	(0.0418)	(0.0070)	(0.0076)
3	-0.0354	-0.0379	0.0093	-0.0129	0.0556	0.0476	0.0051	0.0098
	(0.0318)	(0.0362)	(0.0182)	(0.0121)	(0.0364)	(0.0393)	(0.0067)	(0.0070)
4	-0.0744**	-0.1081***	-0.0517***	-0.0224**	-0.0037	-0.0043	0.0153**	0.0176**
	(0.0318)	(0.0372)	(0.0109)	(0.0101)	(0.0373)	(0.0418)	(0.0066)	(0.0072)
5	0.0318	0.0980***	-0.0366***	-0.0312***	-0.0271	-0.0542	0.0040	0.0069
	(0.0286)	(0.0326)	(0.0114)	(0.0094)	(0.0382)	(0.0420)	(0.0067)	(0.0070)
6	0.0183	0.0084	-0.0585***	-0.0383***	-0.0026	0.0076	0.0031	0.0097
	(0.0276)	(0.0302)	(0.0111)	(0.0098)	(0.0370)	(0.0412)	(0.0070)	(0.0075)
7	0.0599**	0.1044***	-0.0761***	-0.0364***	-0.0043	-0.0084	0.0054	0.0100
	(0.0275)	(0.0306)	(0.0111)	(0.0113)	(0.0393)	(0.0439)	(0.0073)	(0.0080)
8	0.0683**	0.0981***	-0.0697***	-0.0429***	0.0103	0.0122	0.0047	0.0173**
	(0.0279)	(0.0312)	(0.0115)	(0.0101)	(0.0384)	(0.0425)	(0.0074)	(0.0078)
9	0.0168	0.0789**	-0.0693***	-0.0446***	0.0434	0.0836**	0.0133*	0.0220**
	(0.0285)	(0.0326)	(0.0131)	(0.0114)	(0.0374)	(0.0426)	(0.0080)	(0.0087)
10	0.0217	0.0820**	-0.0890***	-0.0506***	0.0401	0.0538	0.0214***	0.0285***
	(0.0279)	(0.0324)	(0.0135)	(0.0124)	(0.0370)	(0.0426)	(0.0082)	(0.0089)
Observations	7,249	7,041	5,422	5,050	11,826	11,607	17,644	16,359
R-squared	0.914	0.895	0.394	0.330	0.843	0.792	0.521	0.435
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

E.2 Event window analysis for developed and economies.

The complete event window analysis for developed and emerging economies after controlling for legal origins.

Table E.2: This table shows ten event windows for the effect of oil discoveries on innovation activity for industries in developed and emerging economies, while controlling for legal origins. Each event window shows innovation activity t years before and after oil discovery. A negative result shows that innovation activity after oil discovery is less than activity before oil discovery. The left panel shows event window analysis for developed economies after controlling for common law (in models 1 and 2) and civil law origins (in models 5 and 6). The right panel shows event window analysis for emerging economies after controlling for common law (in models 3 and 4) and civil law origins (in models 7 and 8). Models 1,3,5 and 7 show results for innovative quantity while the even numbered models show results for innovative quality.

	PAT		CITES		PAT		CITES	
	Developed|Common law				Emerging|Common law			
	1		2		3		4	
Event window	% Change	t-stat	% Change	t-stat	% Change	t-stat	% Change	t-stat
(1,-1)	-8.22%	-1.72	-7.57%	-1.35	-3.91%	-1.18	-6.99%	-2.80
(2,-2)	-21.50%	-3.32	-22.50%	-2.94	-6.55%	-2.15	-7.86%	-2.97
(3,-3)	-38.80%	-4.45	-46.90%	-4.60	-11.10%	-3.38	-12.80%	-4.67
(4,-4)	-61.00%	-5.80	-82.80%	-6.70	-20.40%	-4.96	-18.50%	-5.87
(5,-5)	-71.90%	-6.08	-100.50%	-7.09	-28.30%	-6.00	-25.50%	-7.04
(6,-6)	-82.40%	-6.88	-126.30%	-8.70	-35.30%	-6.54	-32.00%	-7.34
(7,-7)	-83.50%	-7.05	-138.90%	-9.53	-42.40%	-7.31	-35.00%	-7.53
(8,-8)	-82.20%	-7.04	-147.70%	-10.25	-47.90%	-7.72	-39.80%	-7.84
(9,-9)	-84.30%	-7.30	-150.10%	-10.52	-50.90%	-7.85	-41.50%	-7.87
(10,-10)	-82.80%	-7.30	-146.10%	-10.52	-56.80%	-8.39	-43.10%	-7.87
	Developed|Civil law				Emerging|Civil law			
	5		6		7		8	
Event window	% Change	t-stat	% Change	t-stat	% Change	t-stat	% Change	t-stat
(1,-1)	4.39%	0.82	-3.30%	-0.58	-0.82%	-0.81	-0.15%	-0.14
(2,-2)	7.56%	1.11	-3.40%	-0.47	-0.83%	-0.67	0.34%	0.25
(3,-3)	13.20%	1.71	1.96%	0.22	-0.50%	-0.37	0.90%	0.62
(4,-4)	14.80%	1.69	9.14%	0.93	-0.50%	-0.38	0.17%	0.11
(5,-5)	14.80%	1.58	2.68%	0.25	-2.67%	-1.81	-2.11%	-1.26
(6,-6)	14.60%	1.46	-1.11%	-0.10	-4.32%	-2.63	-3.88%	-2.06
(7,-7)	14.40%	1.38	-1.49%	-0.13	-4.78%	-2.51	-4.68%	-2.18
(8,-8)	18.70%	1.69	5.08%	0.42	-4.19%	-2.04	-4.34%	-1.87
(9,-9)	19.80%	1.57	8.72%	0.61	-2.67%	-1.17	-2.95%	-1.16
(10,-10)	30.60%	2.12	26.00%	1.59	0.10%	0.04	-0.71%	-0.25

F Countries with no civil war

F.1 Regression results for countries that have not experienced civil war

Table F.1: This table shows regression results for the effect of oil discoveries on innovation activity for industries in countries that have not experienced civil war in the period 1975-2005. Regression models 1-2 have $\log(1 + PAT)_{i,j,t}$ as the dependent variable and models 3-4 have $\log(1 + CITES)_{i,j,t}$ as the dependent variable. Our results show that innovative activity declines after oil discovery, even after dropping all civil war countries.

VARIABLES	(1) no controls	(2) gdp erate open	(3) no controls	(4) gdp erate open
-10	0.0108	0.0075	0.0350**	0.0132
	(0.0134)	(0.0156)	(0.0146)	(0.0170)
-9	0.0282**	0.0277*	0.0524***	0.0354**
	(0.0135)	(0.0156)	(0.0150)	(0.0172)
-8	0.0199	0.0157	0.0626***	0.0508***
	(0.0131)	(0.0149)	(0.0144)	(0.0166)
-7	0.0201	0.0230	0.0623***	0.0593***
	(0.0130)	(0.0150)	(0.0142)	(0.0166)
-6	0.0284**	0.0324**	0.0578***	0.0599***
	(0.0128)	(0.0147)	(0.0139)	(0.0162)
-5	0.0369***	0.0414***	0.0584***	0.0602***
	(0.0122)	(0.0147)	(0.0133)	(0.0157)
-4	0.0234**	0.0408***	0.0391***	0.0552***
	(0.0119)	(0.0144)	(0.0130)	(0.0159)
-3	0.0143	0.0265*	0.0146	0.0226
	(0.0117)	(0.0141)	(0.0130)	(0.0159)
-2	0.0233**	0.0230	0.0105	0.0041
	(0.0115)	(0.0142)	(0.0131)	(0.0161)
-1	0.0207*	0.0137	0.0040	-0.0115
	(0.0113)	(0.0141)	(0.0129)	(0.0161)
$\tau = 0$	0.0267**	0.0316**	0.0330***	0.0309**
	(0.0109)	(0.0132)	(0.0125)	(0.0150)
1	0.0090	0.0003	-0.0066	-0.0293**
	(0.0109)	(0.0127)	(0.0123)	(0.0142)
2	0.0046	-0.0125	0.0048	-0.0333**
	(0.0110)	(0.0130)	(0.0125)	(0.0148)
3	-0.0067	-0.0150	-0.0265**	-0.0495***
	(0.0110)	(0.0125)	(0.0124)	(0.0140)
4	-0.0248**	-0.0296**	-0.0442***	-0.0628***
	(0.0112)	(0.0125)	(0.0130)	(0.0144)
5	-0.0082	-0.0143	-0.0055	-0.0304**
	(0.0112)	(0.0118)	(0.0126)	(0.0133)
6	-0.0097	-0.0124	-0.0077	-0.0266**
	(0.0113)	(0.0120)	(0.0128)	(0.0134)
7	0.0048	0.0052	0.0166	0.0002
	(0.0116)	(0.0122)	(0.0131)	(0.0138)
8	0.0115	0.0124	0.0235*	0.0079
	(0.0118)	(0.0123)	(0.0131)	(0.0136)
9	0.0001	-0.0061	0.0273**	0.0069
	(0.0119)	(0.0126)	(0.0134)	(0.0141)
10	-0.0029	-0.0118	0.0126	-0.0121
	(0.0122)	(0.0128)	(0.0140)	(0.0147)
Observations	50,561	34,687	47,771	33,203
R-squared	0.859	0.861	0.835	0.833
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

F.2 Event window analysis for countries that have not experienced civil war

Table F.2: This table shows event windows for the effect of oil discoveries on innovation activity for industries in countries that have not experienced civil war. Each event window shows innovation activity t years before and after oil discovery. A negative result shows that innovation activity after oil discovery is less than activity before oil discovery. The top panel shows results for innovation quantity while the bottom panel shows results for innovation quality. Results for models 1 and 3 show results without controls while models 2 and 4 show results with controls (GDP/capita, real exchange rate and financial openness). All event window show that innovative activity declines in the post-strike period.

	PAT			
	1		2	
Event window	% Change in innovation	t-stat	% Change in innovation	t-stat
(1,-1)	-1.17%	-0.74	-1.34%	-0.72
(2,-2)	-3.04%	-1.47	-4.89%	-1.98
(3,-3)	-5.14%	-2.17	-9.04%	-3.25
(4,-4)	-9.96%	-3.65	-16.10%	-5.00
(5,-5)	-14.50%	-4.77	-21.70%	-6.03
(6,-6)	-18.30%	-5.49	-26.10%	-6.66
(7,-7)	-19.80%	-5.68	-27.90%	-6.73
(8,-8)	-20.60%	-5.53	-28.20%	-6.34
(9,-9)	-23.40%	-5.79	-31.60%	-6.49
(10,-10)	-24.80%	-5.53	-33.60%	-6.23

	CITES			
	3		4	
Event window	% Change in innovation	t-stat	% Change in innovation	t-stat
(1,-1)	-1.06%	-0.61	-1.78%	-0.86
(2,-2)	-1.63%	-0.69	-5.52%	-1.95
(3,-3)	-5.75%	-2.18	-12.70%	-4.10
(4,-4)	-14.10%	-4.69	-24.50%	-6.87
(5,-5)	-20.50%	-5.97	-33.60%	-8.30
(6,-6)	-27.00%	-7.11	-42.30%	-9.45
(7,-7)	-31.60%	-7.81	-48.20%	-10.00
(8,-8)	-35.50%	-8.16	-52.50%	-10.08
(9,-9)	-38.00%	-8.07	-55.30%	-9.76
(10,-10)	-40.20%	-7.72	-57.80%	-9.24

G Country level Regression Results

G.1 Regression results at country-level.

Table G.1: The effect of oil discoveries in innovation activity for industries in 159 countries. This table shows the regression results of country-level panel regressions of oil discoveries on innovation activity for the period 1975-2005. Columns 1 and 2 show results where the dependent variable is the logarithm of one plus the number of patents granted by the USPTO (PATENTS), $\log(1 + PAT)_{j,t}$. Columns 3 and 4 show results where the dependent variable is the logarithm of one plus the number of citations of patents granted by the USPTO (CITATIONS), $\log(1 + CITES)_{j,t}$. The effect of oil discoveries on innovation activity is shown through the period ten years before and after oil discovery. Time $\tau = 0$ is the event date in calender time. Interval $(\tau - 10) - (\tau - 1)$ is the pre-event period that shows the pattern of innovation before oil discovery. Interval $(\tau - 10) - (\tau + 10)$ is the event window and interval $(\tau + 1) - (\tau + 10)$ is the post-event window that shows pattern of innovation after oil discovery. The pre-event window provides the information needed to specify normal trend. The post-event window is used to investigate longer term patents and citations performance following the event. Regression models 2 and 4 include control variables, GDP/capita, log of real exchange rate and financial openness (controls are unreported). The symbols ***,**, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	(1) no controls	(2) gdp erate open	(3) no controls	(4) gdp erate open
-10	-0.0028	0.0024	0.0427	0.0452
	(0.0217)	(0.0281)	(0.0281)	(0.0388)
-9	0.0057	0.0257	0.0519*	0.0553
	(0.0224)	(0.0269)	(0.0275)	(0.0366)
-8	-0.0058	0.0139	0.0411	0.0628*
	(0.0227)	(0.0263)	(0.0281)	(0.0373)
-7	-0.0155	0.0089	0.0387	0.0719*
	(0.0221)	(0.0266)	(0.0297)	(0.0394)
-6	-0.0124	0.0127	0.0169	0.0411
	(0.0218)	(0.0262)	(0.0276)	(0.0377)
-5	0.0227	0.0690***	0.0539*	0.0926**
	(0.0212)	(0.0247)	(0.0278)	(0.0368)
-4	-0.0092	0.0397	0.0099	0.0601
	(0.0205)	(0.0259)	(0.0270)	(0.0368)
-3	-0.0012	0.0520**	0.0044	0.0583
	(0.0208)	(0.0264)	(0.0276)	(0.0368)
-2	-0.0044	0.0324	-0.0041	0.0436
	(0.0213)	(0.0259)	(0.0281)	(0.0388)
-1	0.0039	0.0458*	0.0243	0.0735*
	(0.0216)	(0.0270)	(0.0296)	(0.0410)
$\tau = 0$	0.0061	0.0508*	-0.0079	0.0221
	(0.0222)	(0.0268)	(0.0285)	(0.0385)
1	-0.0006	0.0493*	0.0011	0.0199
	(0.0206)	(0.0264)	(0.0263)	(0.0355)
2	-0.0097	0.0338	-0.0124	0.0059
	(0.0206)	(0.0260)	(0.0279)	(0.0389)
3	-0.0420**	0.0138	-0.0571**	-0.0352
	(0.0202)	(0.0258)	(0.0275)	(0.0374)
4	-0.0509**	0.0147	-0.0359	-0.0107
	(0.0210)	(0.0273)	(0.0295)	(0.0395)
5	-0.0277	0.0320	-0.0401	-0.0370
	(0.0219)	(0.0269)	(0.0276)	(0.0360)
6	-0.0567***	-0.0031	-0.0424	-0.0390
	(0.0207)	(0.0248)	(0.0277)	(0.0352)
7	-0.0473**	0.0058	-0.0197	-0.0150
	(0.0214)	(0.0245)	(0.0283)	(0.0351)
8	-0.0274	0.0157	-0.0171	-0.0244
	(0.0222)	(0.0244)	(0.0284)	(0.0338)
9	-0.0279	0.0112	0.0117	0.0096
	(0.0223)	(0.0253)	(0.0312)	(0.0371)
10	-0.0305	0.0107	0.0126	-0.0004
	(0.0219)	(0.0257)	(0.0293)	(0.0346)
Observations	4,960	3,036	4,972	3,048
R-squared	0.987	0.989	0.977	0.978
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

G.2 Event window analysis for country-level results.

We show the full event window analysis for country-level results.

Table G.2: Event window for the effect of oil discoveries on innovation activity at country-level. This table shows the effect of oil discoveries on innovation activity in country j in year t for the period 1975-2005. Each event window shows innovation activity t years before and after oil discovery. A negative result shows that innovation activity after oil discovery is less than activity before oil discovery. The top panel represents event windows for innovative quantity (without controls in model 1 and with GDP exchange rate and financial openness controls in model 2) while the bottom panel shows event windows for innovative quality. Innovative quality declines significantly from the 5-year to 10-year windows. Innovative quantity results are mostly insignificant at the 5% level when we add controls in model 2.

	PAT			
	1		2	
Event window	% Change in innovation	t-stat	% Change in innovation	t-stat
(1,-1)	-0.46%	-0.17	0.36%	0.11
(2,-2)	-0.98%	-0.26	0.51%	0.11
(3,-3)	-5.05%	-1.16	-3.31%	-0.60
(4,-4)	-9.22%	-1.79	-5.82%	-0.87
(5,-5)	-14.30%	-2.58	-9.52%	-1.27
(6,-6)	-18.70%	-3.20	-11.10%	-1.40
(7,-7)	-21.90%	-3.53	-11.40%	-1.33
(8,-8)	-24.00%	-3.67	-11.20%	-1.19
(9,-9)	-27.40%	-4.15	-12.70%	-1.27
(10,-10)	-30.20%	-4.02	-11.80%	-1.04
	CITES			
	3		4	
Event window	% Change in innovation	t-stat	% Change in innovation	t-stat
(1,-1)	-2.32%	-0.64	-5.36%	-1.11
(2,-2)	-3.15%	-0.64	-9.13%	-1.37
(3,-3)	-9.31%	-1.73	-18.50%	-2.50
(4,-4)	-13.90%	-2.21	-25.60%	-2.80
(5,-5)	-23.30%	-3.41	-38.50%	-3.60
(6,-6)	-29.20%	-4.00	-46.50%	-3.95
(7,-7)	-35.10%	-4.50	-55.20%	-4.32
(8,-8)	-40.90%	-4.82	-63.90%	-4.52
(9,-9)	-44.90%	-5.09	-68.50%	-4.52
(10,-10)	-47.90%	-5.06	-73.10%	-4.39

H Extensions

H.1 Regression results for first strike only

H.2 Regression results when extending the window to 15 years

Table H.1: Oil discoveries and innovation activity.
This table shows the regression results of industry-level panel regressions of innovation activity on the first oil discovery in each country for the period 1975-2005. Columns 1 and 2 show results where the dependent variable is the logarithm of one plus the number of patents (adjusted for class-year fixed effects) granted by the USPTO, for industry i in country j, in year t. Columns 3 and 4 show results where the dependent variable is the logarithm of one plus the number of citations (adjusted for class-year fixed effects) of patents granted by the USPTO, for industry i in country j, in year t. The effect of oil discoveries on innovation activity is shown through the period ten years before and after oil discovery. Time $\tau = 0$ is the event date in calendar time. Interval $(\tau-10)-(\tau-1)$ is the pre-event period that shows the pattern of innovation before oil discovery. Interval $(\tau-10)-(\tau+10)$ is the 21-year event window and interval $(\tau+1)-(\tau+10)$ is the post-event window that shows pattern of innovation after oil discovery. The pre-event window provides the information needed to specify normal trend. The post-event window is used to investigate longer term patents and citations performance following oil discovery. Regression models 2 and 4 include control variables, GDP/capita, log of real exchange rate and financial openness (controls are unreported). The symbols ***,**, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable	PAT		CITES	
	(1)	(2)	(3)	(4)
Event window	No controls	With controls	No controls	With controls
-10	-0.0301	-0.0243	-0.0615**	-0.1066**
	(0.0281)	(0.0420)	(0.0302)	(0.0431)
-9	0.0089	0.0207	-0.0061	-0.0061
	(0.0231)	(0.0422)	(0.0279)	(0.0484)
-8	-0.0050	-0.0035	-0.0502**	-0.0867**
	(0.0215)	(0.0395)	(0.0198)	(0.0387)
-7	0.0048	0.0023	-0.0278	-0.0554
	(0.0236)	(0.0382)	(0.0222)	(0.0377)
-6	0.0166	0.0575	-0.0184	0.0015
	(0.0221)	(0.0406)	(0.0226)	(0.0440)
-5	0.0112	0.0350	-0.0069	0.0066
	(0.0200)	(0.0352)	(0.0218)	(0.0382)
-4	0.0221	0.0828***	-0.0112	0.0279
	(0.0189)	(0.0295)	(0.0201)	(0.0327)
-3	0.0200	0.0702**	-0.0130	0.0118
	(0.0182)	(0.0277)	(0.0188)	(0.0272)
-2	0.0254	0.0775***	0.0015	0.0416
	(0.0161)	(0.0288)	(0.0176)	(0.0306)
-1	0.0083	0.0632**	-0.0215	0.0116
	(0.0154)	(0.0281)	(0.0159)	(0.0274)
$\tau = 0$	0.0325**	0.0754***	-0.0029	0.0140
	(0.0152)	(0.0242)	(0.0174)	(0.0259)
1	0.0102	0.0488**	-0.0313*	-0.0245
	(0.0154)	(0.0223)	(0.0166)	(0.0214)
2	-0.0013	0.0441**	-0.0221	-0.0131
	(0.0160)	(0.0212)	(0.0160)	(0.0216)
3	-0.0008	0.0426**	-0.0426***	-0.0256
	(0.0150)	(0.0187)	(0.0156)	(0.0186)
4	-0.0217	0.0214	-0.0560***	-0.0397**
	(0.0144)	(0.0170)	(0.0162)	(0.0183)
5	-0.0281*	-0.0084	-0.0477***	-0.0710***
	(0.0144)	(0.0162)	(0.0153)	(0.0173)
6	-0.0399***	-0.0280*	-0.0633***	-0.0926***
	(0.0134)	(0.0150)	(0.0149)	(0.0165)
7	-0.0457***	-0.0286*	-0.0517***	-0.0749***
	(0.0141)	(0.0156)	(0.0153)	(0.0171)
8	-0.0437***	-0.0192	-0.0604***	-0.0765***
	(0.0142)	(0.0158)	(0.0156)	(0.0174)
9	-0.0424***	-0.0199	-0.0148	-0.0284
	(0.0144)	(0.0161)	(0.0160)	(0.0177)
10	-0.0339**	-0.0135	-0.0114	-0.0218
	(0.0144)	(0.0156)	(0.0164)	(0.0177)
Observations	62,124	42,141	58,063	40,057
R-squared	0.8537	0.8579	0.8320	0.8315
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table H.2: Event window analysis - first oil discovery

PAT				
	Model 1		Model 2	
Event window	% change in innovation	t-stat	% change in innovation	t-stat
(1,-1)	0.20%	0.09	-1.44%	-0.43
(2,-2)	-2.48%	-0.83	-4.77%	-1.01
(3,-3)	-4.57%	-1.22	-7.53%	-1.31
(4,-4)	-8.95%	-2.03	-13.70%	-2.05
(5,-5)	-12.90%	-2.56	-18.00%	-2.32
(6,-6)	-18.50%	-3.27	-26.60%	-2.94
(7,-7)	-23.60%	-3.72	-29.60%	-2.93
(8,-8)	-27.40%	-3.98	-31.20%	-2.77
(9,-9)	-32.60%	-4.34	-35.30%	-2.83
(10,-10)	-33.00%	-4.00	-34.20%	-2.50

CITE				
	Model 3		Model 4	
Event window	% change in innovation	t-stat	% change in innovation	t-stat
(1,-1)	-0.98%	-0.45	-3.61%	-1.14
(2,-2)	-3.34%	-1.07	-9.08%	-1.92
(3,-3)	-6.31%	-1.62	-12.80%	-2.26
(4,-4)	-10.80%	-2.33	-19.60%	-2.90
(5,-5)	-14.90%	-2.79	-27.30%	-3.44
(6,-6)	-19.30%	-3.24	-36.80%	-3.94
(7,-7)	-21.70%	-3.30	-38.70%	-3.73
(8,-8)	-22.80%	-3.20	-37.70%	-3.28
(9,-9)	-23.60%	-3.00	-39.90%	-3.08
(10,-10)	-18.60%	-2.14	-31.40%	-2.21

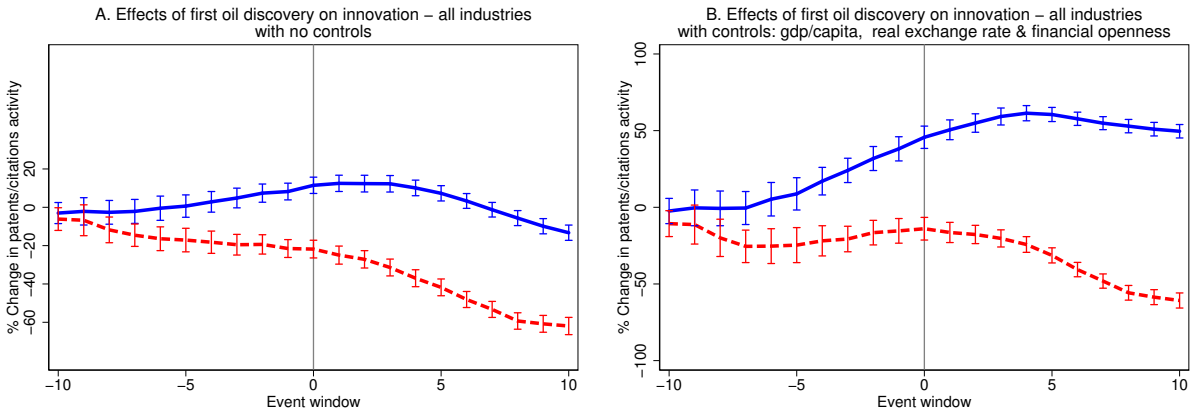

Figure 7: This graph shows the effect of oil discoveries on innovative activity for 159 countries for the period 1975-2005. The line graphs show the cumulative of estimates in regression results in Table G.1 in Appendix G, where we show the impact of oil discovery on patents and citations activity in country j, in year t. The solid lines show effects of oil discovery on innovative quantity as measured by $\log(1+PAT)_{j,t}$, while the dashed lines show results for innovative quality as measured by $\log(1+CITES)_{j,t}$. The event window from -10 to -1 shows the period in years before oil discovery, time 0 is the time when each individual oil discovery is made. The event window from 1 to 10 years shows the period after oil discovery.

Table H.3: Oil discoveries and innovation activity.
This table shows the regression results of industry-level panel regressions of innovation activity on the first oil discovery in each country for the period 1975-2005. Columns 1 and 2 show results where the dependent variable is the logarithm of one plus the number.

Dependent variable	PAT		CITES	
	(1)	(2)	(3)	(4)
Event window	No controls	With controls	No controls	With controls
-10	0.0067	-0.0065	0.0146	-0.0029
	(0.0089)	(0.0109)	(0.0097)	(0.0120)
-9	0.0147*	0.0006	0.0300***	0.0129
	(0.0088)	(0.0108)	(0.0097)	(0.0119)
-8	-0.0025	-0.0096	0.0195**	0.0114
	(0.0088)	(0.0105)	(0.0096)	(0.0117)
-7	0.0031	0.0018	0.0215**	0.0208*
	(0.0087)	(0.0105)	(0.0095)	(0.0117)
-6	0.0052	0.0091	0.0275***	0.0325***
	(0.0087)	(0.0103)	(0.0095)	(0.0115)
-5	0.0151*	0.0161	0.0317***	0.0331***
	(0.0085)	(0.0102)	(0.0094)	(0.0113)
-4	0.0156*	0.0244**	0.0315***	0.0424***
	(0.0086)	(0.0103)	(0.0093)	(0.0112)
-3	0.0243***	0.0306***	0.0349***	0.0433***
	(0.0085)	(0.0102)	(0.0092)	(0.0110)
-2	0.0306***	0.0320***	0.0383***	0.0461***
	(0.0084)	(0.0103)	(0.0091)	(0.0113)
-1	0.0282***	0.0240**	0.0390***	0.0417***
	(0.0083)	(0.0104)	(0.0091)	(0.0113)
t=0	0.0278***	0.0274***	0.0239***	0.0218**
	(0.0082)	(0.0101)	(0.0091)	(0.0111)
1	0.0116	0.0081	0.0023	-0.0065
	(0.0083)	(0.0100)	(0.0093)	(0.0112)
2	0.0142*	0.0084	0.0143	0.0005
	(0.0083)	(0.0100)	(0.0093)	(0.0114)
3	-0.0079	-0.0113	-0.0179*	-0.0271**
	(0.0083)	(0.0097)	(0.0092)	(0.0108)
4	-0.0195**	-0.0169*	-0.0261***	-0.0309***
	(0.0083)	(0.0095)	(0.0096)	(0.0110)
5	-0.0105	-0.0139	-0.0035	-0.0169
	(0.0083)	(0.0091)	(0.0093)	(0.0103)
6	-0.0132	-0.0122	-0.0058	-0.0132
	(0.0084)	(0.0092)	(0.0095)	(0.0104)
7	-0.0079	0.0016	0.0110	0.0096
	(0.0087)	(0.0094)	(0.0099)	(0.0108)
8	-0.0053	0.0043	0.0127	0.0125
	(0.0089)	(0.0095)	(0.0099)	(0.0106)
9	-0.0069	-0.0031	0.0219**	0.0193*
	(0.0091)	(0.0098)	(0.0103)	(0.0111)
10	-0.0057	-0.0041	0.0115	0.0052
	(0.0094)	(0.0100)	(0.0107)	(0.0115)
11	-0.0180*	-0.0154	-0.0104	-0.0156
	(0.0098)	(0.0105)	(0.0113)	(0.0124)
12	0.0067	0.0080	0.0204*	0.0130
	(0.0097)	(0.0104)	(0.0111)	(0.0121)
13	0.0061	0.0053	0.0363***	0.0283**
	(0.0100)	(0.0105)	(0.0114)	(0.0120)
14	-0.0101	-0.0109	0.0218*	0.0163
	(0.0103)	(0.0110)	(0.0123)	(0.0131)
15	0.0044	0.0038	0.0233*	0.0157
	(0.0106)	(0.0115)	(0.0127)	(0.0141)
lgdpcapita		0.1430***		0.1412***
		(0.0081)		(0.0087)
finopendummy		6.6780***		17.1784***
		(1.3615)		(1.5199)
lreer_gdp		-0.0001***		-0.0001***
		(0.0000)		(0.0000)
Observations	62,124	42,141	58,063	40,057
R-squared	0.8539	0.8580	0.8325	0.8320
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table H.4: 15-year event window analyis

PAT				
	Model 1		Model 2	
Event window	% change in innovation	t-stat	% change in innovation	t-stat
(1,-1)	-1.66%	-1.36	-1.60%	-1.11
(2,-2)	-3.30%	-2.11	-3.96%	-2.10
(3,-3)	-6.52%	-3.70	-8.15%	-3.87
(4,-4)	-10.03%	-5.06	-12.29%	-5.23
(5,-5)	-12.59%	-5.70	-15.29%	-5.85
(6,-6)	-14.43%	-6.05	-17.42%	-6.16
(7,-7)	-15.52%	-6.14	-17.44%	-5.77
(8,-8)	-15.81%	-5.93	-16.05%	-4.95
(9,-9)	-17.97%	-6.32	-16.43%	-4.65
(10,-10)	-19.21%	-6.25	-16.18%	-4.21
(11,-10)	-21.69%	-6.83	-17.07%	-4.22
(12,-10)	-21.69%	-6.68	-15.62%	-3.71
(13,-10)	-21.75%	-6.56	-14.43%	-3.33
(14,-10)	-23.44%	-7.03	-14.87%	-3.34
(15,-10)	-23.67%	-7.01	-13.84%	-3.00

CITE				
	Model 3		Model 4	
Event window	% change in innovation	t-stat	% change in innovation	t-stat
(1,-1)	-3.67%	-2.74	-4.82%	-2.99
(2,-2)	-6.07%	-3.48	-9.39%	-4.42
(3,-3)	-11.34%	-5.79	-16.42%	-6.84
(4,-4)	-17.11%	-7.77	-23.75%	-8.79
(5,-5)	-20.62%	-8.20	-28.75%	-9.27
(6,-6)	-23.96%	-8.63	-33.32%	-9.65
(7,-7)	-25.01%	-8.48	-34.45%	-9.20
(8,-8)	-25.68%	-8.35	-34.34%	-8.60
(9,-9)	-26.49%	-8.20	-33.70%	-7.87
(10,-10)	-26.80%	-7.80	-32.90%	-7.09
(11,-10)	-29.30%	-8.09	-34.16%	-6.82
(12,-10)	-28.72%	-7.65	-32.57%	-6.14
(13,-10)	-26.55%	-7.07	-29.45%	-5.46
(14,-10)	-25.83%	-6.88	-27.53%	-4.97
(15,-10)	-24.96%	-6.40	-25.67%	-4.33

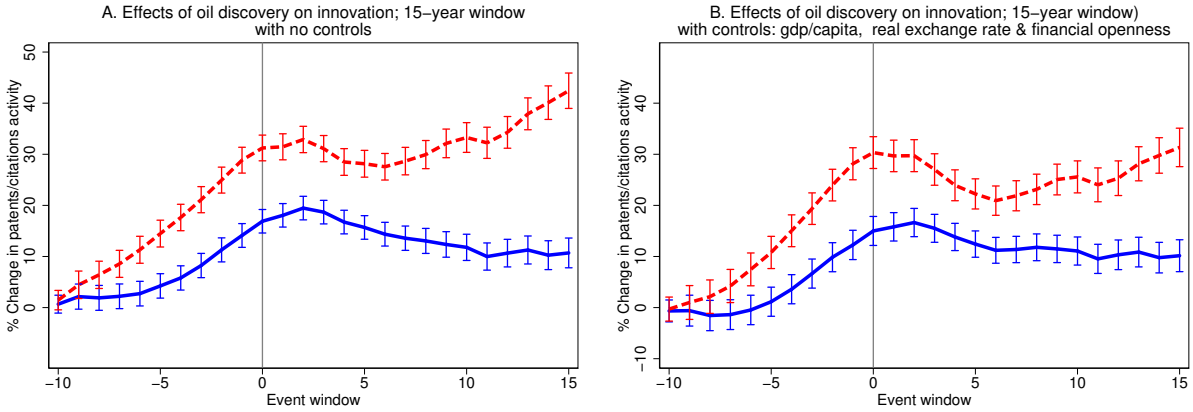

Figure 8: This graph shows the effect of oil discoveries on innovative activity for 159 countries for the period 1975-2005. The line graphs show the cumulative of estimates in regression results in Table G.1 in Appendix G, where we show the impact of oil discovery on patents and citations activity in country j, in year t. The solid lines show effects of oil discovery on innovative quantity as measured by $\log(1+PAT)_{j,t}$, while the dashed lines show results for innovative quality as measured by $\log(1+CITES)_{j,t}$. The event window from -10 to -1 shows the period in years before oil discovery, time 0 is the time when each individual oil discovery is made. The event window from 1 to 10 years shows the period after oil discovery.

References

Alexeev, Michael, and Robert Conrad, 2009, The elusive curse of oil, *The Review of Economics and Statistics* 91:3, 586–598.

Allcott, Hunt, and Daniel Keniston, 2017, Dutch disease or agglomeration? the local economic effects of natural resource booms in modern America, *Review of Economic Studies* 85, 695–731.

Arezki, Rabah, Valerie Ramey, and Liugang Sheng, 2017, News shocks in open economies: Evidence from giant oil discoveries, *Quarterly Journal of Economics* 132, 103–155.

Arezki, Rabah, and Frederick Van der Ploeg, 2008, Can the natural resource curse be turned into a blessing? The role of Trade Policies and Institutions, *OxCarre Working Papers* .

Auty, Richard M., 2002, Sustaining development in mineral economies: The resource curse thesis .

Bornhorst, Fabian, Sanjeev Gupta, and John Thornton, 2008, Natural resource endowmnets, governance and the domestic revenue effort: Evidence from a panel of countries, *International Monetary Fund* Working Paper.

Boyce, John R., and John Emery, 2011, Is a negative correlation between resource abundance and growth sufficient evidence that there is a "resource curse"?, *Resources Policy* 36, 1–13.

Brunnschweiler, Christa, and Erwin Bulte, 2008, The resource curse revisited and revised: A tale of paradoxes and red herrings, *Journal of Environmental Economics and Management* 55, 248–264.

Campbell, John Y., Andrew W. Lo, and A. Craig MacKinlay, 1997, *The econometrics of financial markets* (Wiley).

Cavalcanti, Tiago, Kamiar Mohaddes, and Mehdi Raissi, 2011, Growth, development and natural resources: New evidence using a heterogeneous panel analysis, *The Quarterly Review of Economics and Finance* 51:4, 305–318.

Cornaggia, Jess, Yifei Mao, Xuan Tian, and Brian Wolfe, 2015, Does banking competition affect innovation, *Journal of Financial Economics* 115, 189–209.

Dass, Nishant, Vikram Nanda, and Steven Chong Xiao, 2017, Truncation bias corrections in patent data: Implications for recent research on innovation, *Journal of Corporate Finance* 44, 353–374.

Djankov, Simeon, Rafael La Porta, Florencio Lopez de Silane, and Andrei Shleifer, 2002, Courts: the lex mundi project, NBER Working Papers 8890, National Bureau of Economic Research, Inc.

Frankel, Jeffrey A., 2010, The natural resource curse: A survey, *National Bureau of Economic Research* .

Gelb, Allan, 1988, Oil windfalls: Blessing or curse?, *Oxford and New York: Oxford University Press* .

Glaeser, Edward L., and Andrei Shleifer, 2002, Legal origins, *The Quarterly Journal of Economics* 117, 1193–1229.

Guntner, Jochen H. F., 2019, How do oil producers respond to giant oil field discoveries?, *Energy Economics* 80, 59–74.

Gylfason, Thorvaldur, 2001, Natural resources, education, and economic development, *European Economic Review* 45, 847–859.

Hall, Bronwyn H., Adam B. Jaffe, and Manuel Trajtenberg, 2001, The nber patent citation data file: Lessons, insights and methodological tools .

Horn, Myron K., 2007, Giant fields likely to supply 40%+ of world s oil and gas, *Oil & gas journal* 105, 35–37.

Hsu, Po Hsuan, Xuan Tian, and Yan Xu, 2014, Financial development and innovation: Cross-country evidence, *Journal of Financial Economics* 112, 116–135.

IMF, 2017, World economic outlook, Technical report, International Monetary Fund.

James, Alexander, and David Aadland, 2011, The curse of natural resources: An empirical investigation of u.s. counties, *Resource and Energy Economics* 33, 440–453.

Lai, Ronald, Alexander D'Amour, Amy Yu, Ye Sun, and Lee Fleming, 2015, Disambiguation and co-authorship networks of the U.S. patent inventor database (1975 - 2010).

Lane, Philip, and Aaron Tornell, 1996, Power, growth, and the voracity effect, *Journal of Economic Growth* 1, 213–41.

LaPorta, Rafael, Florencio Lopez de Silane, Andrei Shleifer, and Robert W. Vishny, 2008, Legal determinants of external finance, Technical Report 2.

Lederman, Daniel, and William F Maloney, 2008, *Natural Resources: Neither Curse nor Destiny, Daniel Lederman, William F. Maloney (Eds). The World Bank, Washington DC and Stanford University Press* (Stanford University Press).

Lei, Yu-Hsiang, and Guy Michaels, 2014, Do giant oilfield discoveries fuel internal armed conflicts?, *Journal of Development Economics* 110, 139–157.

Lerner, Josh, and Amit Seru, 2017, The use and misuse of patent data: Issues for corporate finance and beyond .

Lerner, Josh, Morten Sørensen, and Per Strömberg, 2011, Private equity and long-run investment: The case of innovation, *Journal of Finance* 66, 445–477.

Maggio, Giuseppe, Alessandro Romano, and Angela Troisi, 2014, The legal origin of income inequality, *Law and Development Review* 0.

Papyrakis, Elissaios, and Reyer Gerlagh, 2007, Resource abundance and economic growth in the united states 51, 1011–1039.

Porter, M. E., 1992, Capital disadvantage: America's falling capital investment system, *Harvard Business Review 70* .

Robinson, James, Ragnar Torvik, and Thierry Verdier, 2006, Political foundations of the resource curse 79, 446–68.

Rodrik, Dani, Arvind Subramanian, and Francesco Trebbi, 2004, Institutions rule: The primacy of institutions over geography and integration in economic development, *Journal of Economic Growth* 9, 131–165.

Ross, Michael L., 2001, Does oil hinder democracy?, *World Politics* 53, 325–361.

Ross, Michael L., 2004, What do we know about natural resources and civil war?, *Journal of Peace Research* 41, 337–356.

Sachs, Jeffrey D., and Andrew Warner, 1995, Natural resource abundance and economic growth .

Sachs, Jeffrey D., and Andrew Warner, 1999, The big push, natural resource booms and growth, *Journal of Development Economics* 59, 43–76.

Sachs, Jeffrey D., and Andrew Warner, 2001, The curse of natural resources, *European Economic Review* 45, 827–838.

Sarkees, Meredith Reid, and Frank Wayman, 2010, *Resort to war: 1816-2007*.

Solow, Robert M., 1956, A contribution to the theory of economic growth, *Quarterly journal of Economics* 70, 65–94.

Van der Ploeg, F., and S. Poelhekke, 2010, The pungent smell of "red herrings": Subsoil assets, rents, volatility and the resource curse, *Journal of Environmental Economics and Management* 60, 44 – 55.

Van der Ploeg, Frederick, 2011, Natural resource: Curse or blessing?, *Journal of Economic Literature* 49, 366–420.

Weber, Jeremy, 2012, The effects of a natural gas boom on employment and income in colorado, texas, and wyoming, *Energy Economics* 34, 1580–1588.

World Bank, Bank, 2017a, Gini index (world bank estimate).

World Bank, Bank, 2017b, World governance indicators.

World Bank, Bank, 2018, World development indicators 2017.