Institutions and the Location of Oil Exploration

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Motivation

- Governance matters...but how much? Hard to estimate

North and South Korea, from space

Motivation

- Rich countries may have been better at searching for natural resources (Collier, 2011)
- Could this be to do with governance?
- How much natural wealth could countries be missing out on?

Table: Known subsoil resource wealth per kilometre square

Region	Known subsoil assets/km^2 (in US$)
World	105,000
OECD	114,000
sub-Saharan Africa	**23,000**
South Asia	53,000
LAC	95,000
MENA	361,000
East Asia & Pacific	77,000
ECA	93,000

Source: The Changing Wealth of Nations, World Bank, 2006, Collier and Hoeffler calculations, 2011

Approach

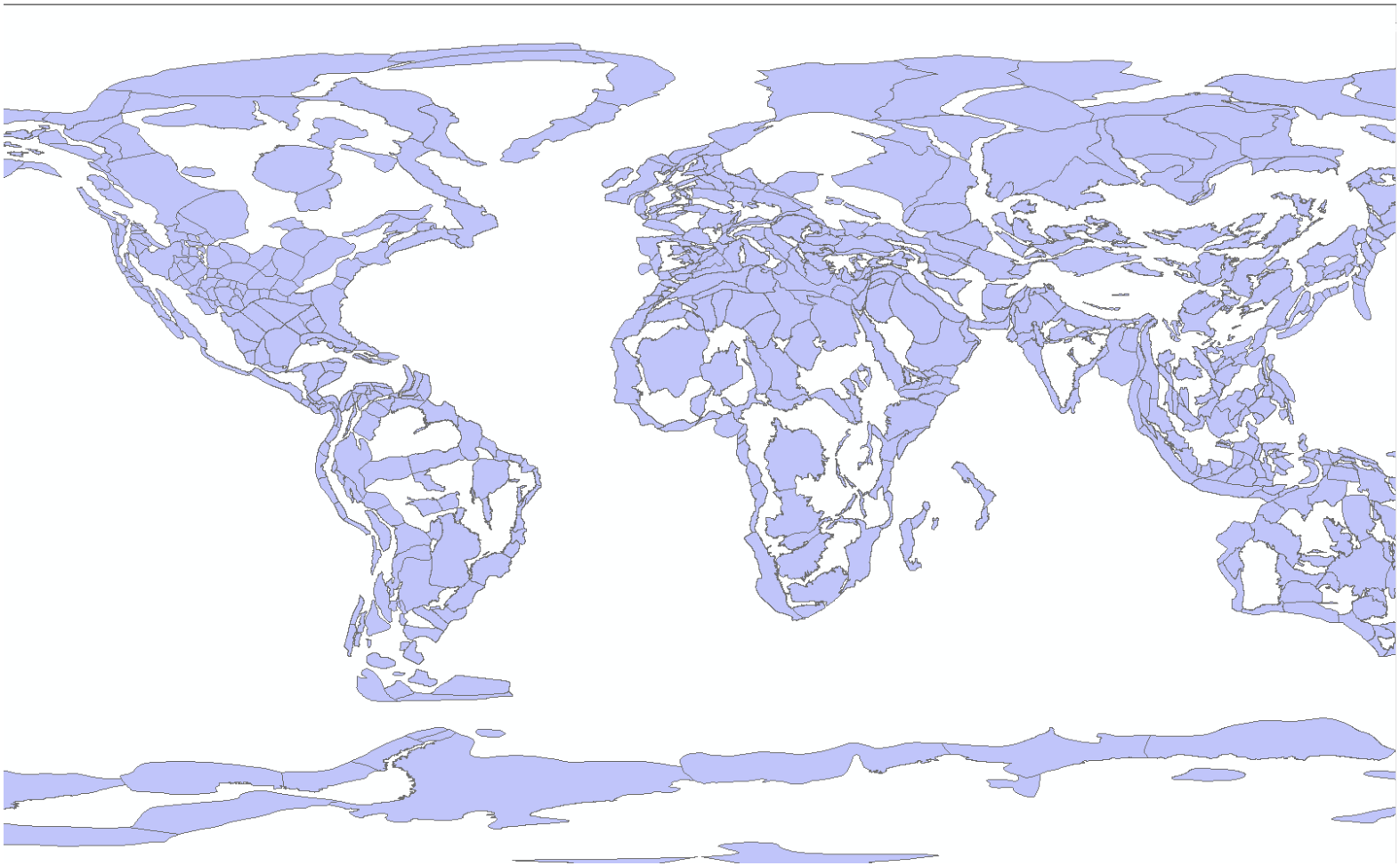

Figure: Geological basins of the world

Approach

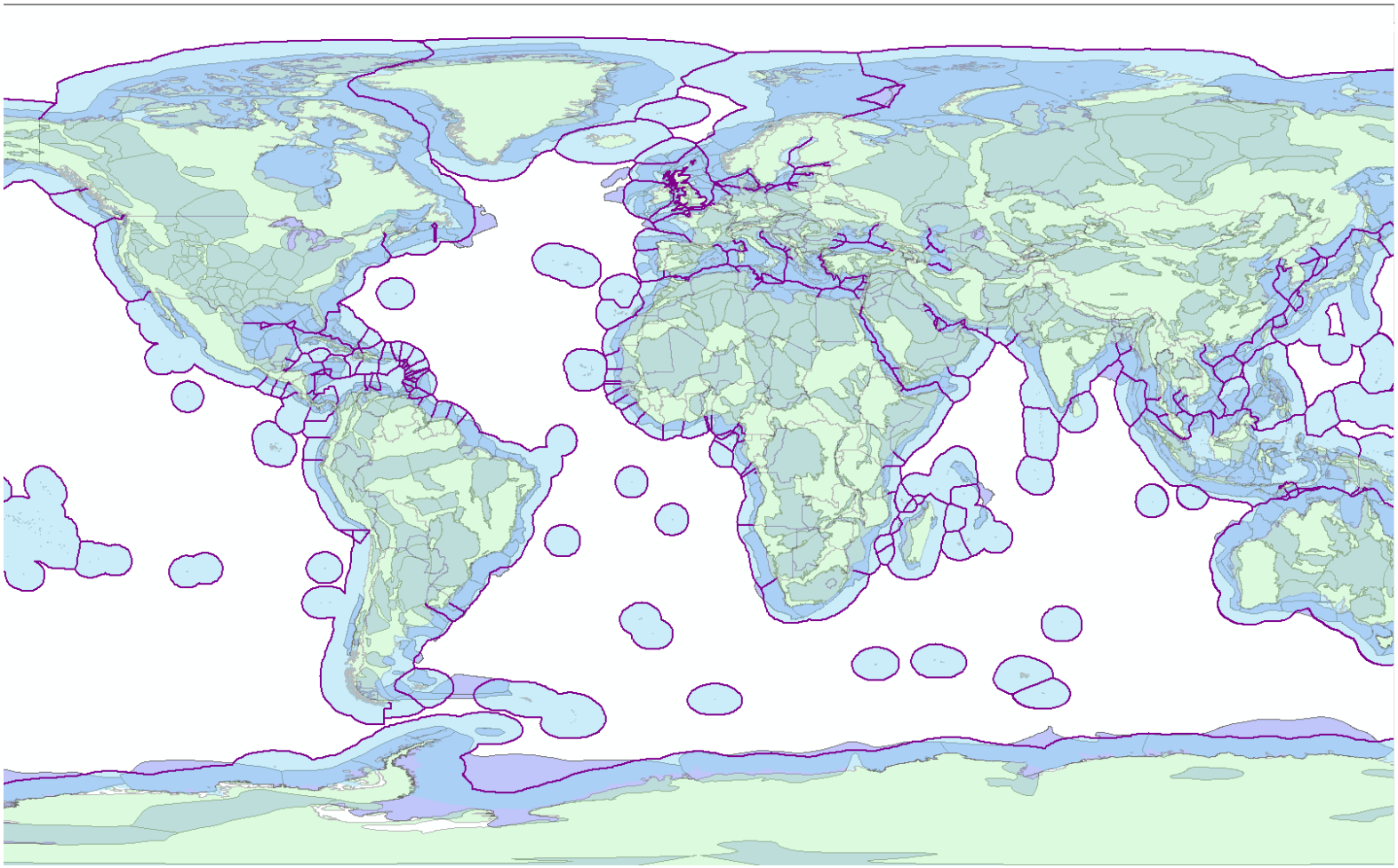

Figure: Borders and basins

Approach

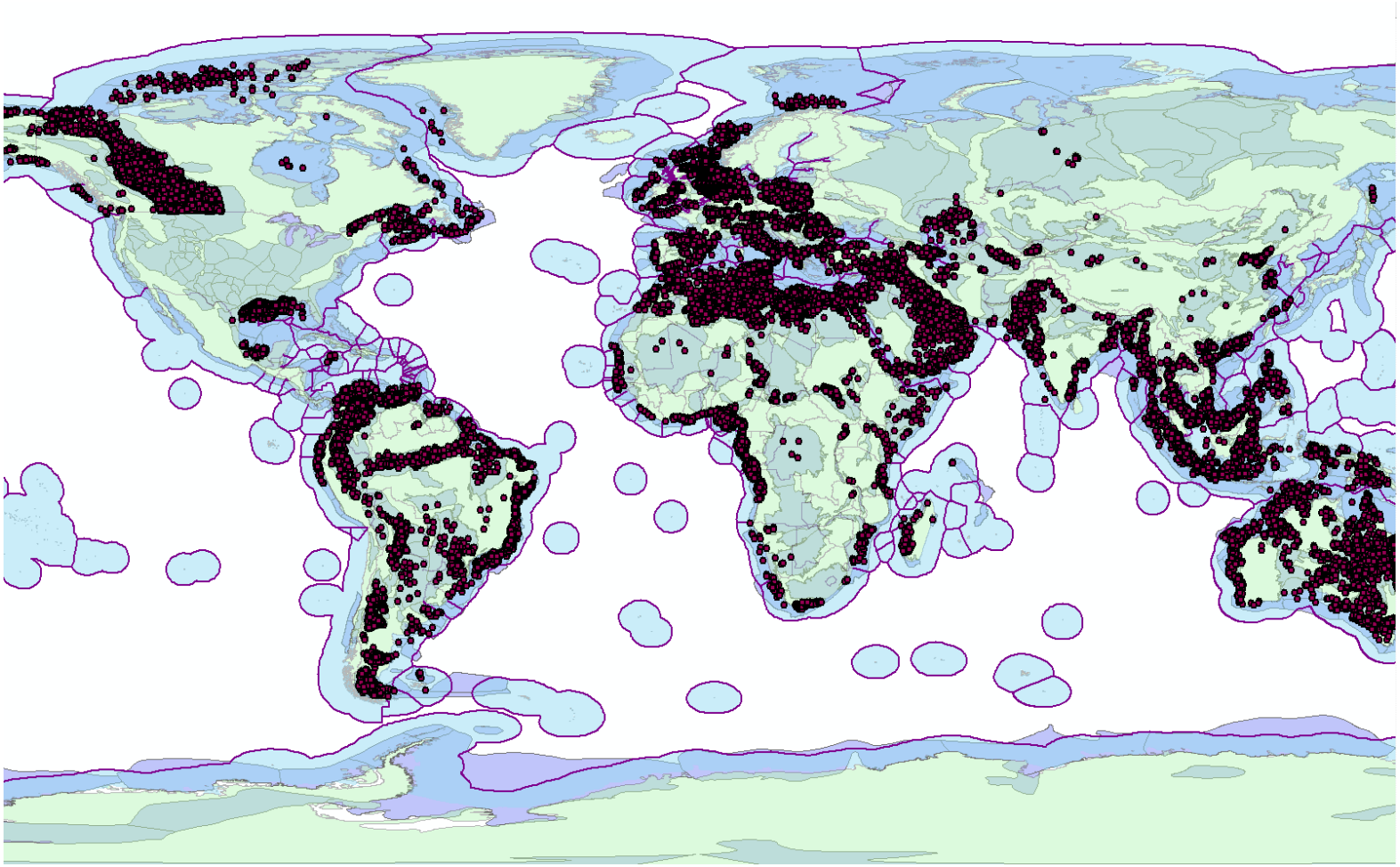

Figure: Borders, Basins, Wells

Approach

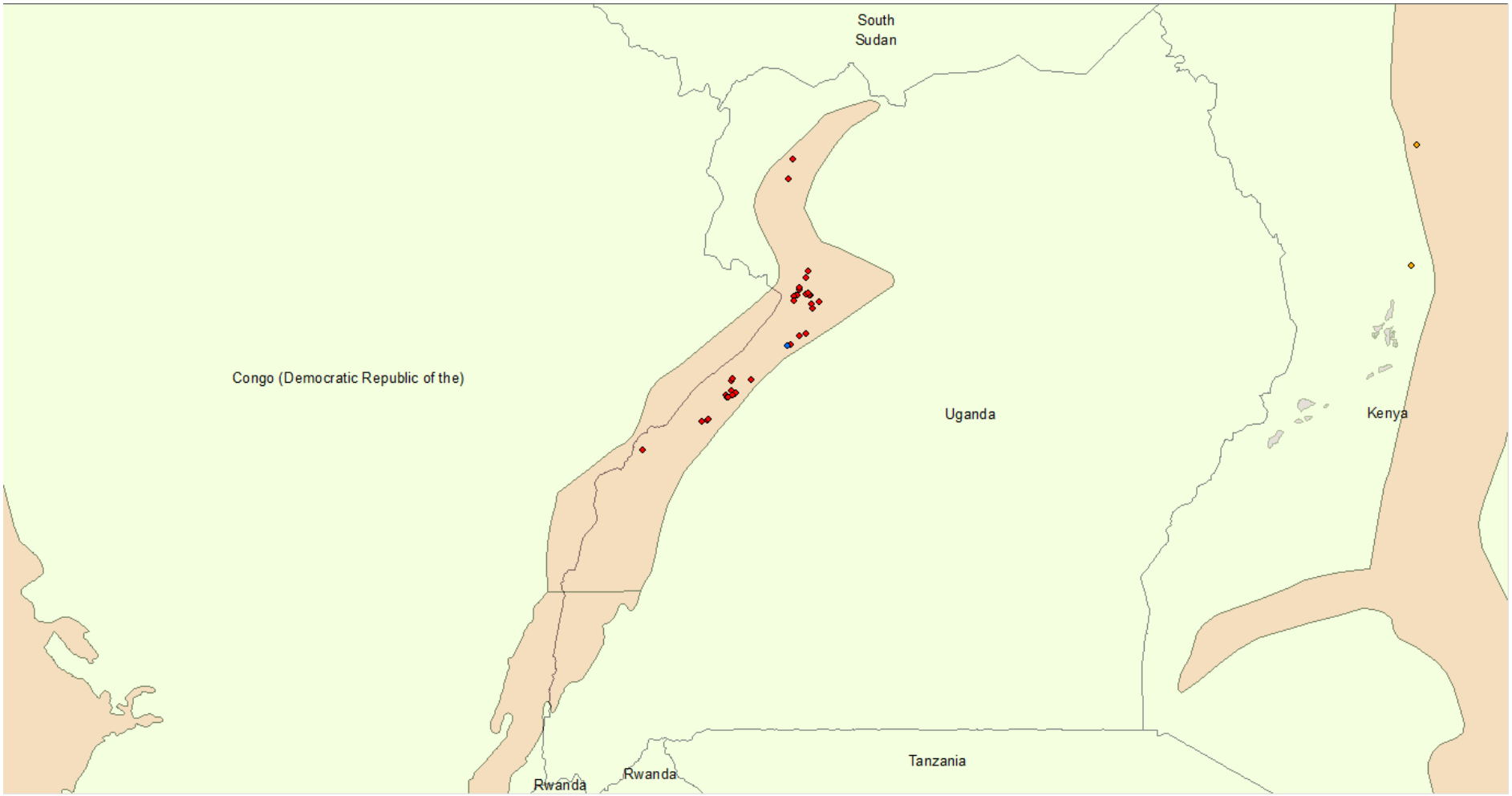

Figure: Albert Rift basin: drilling concentrated in last decade on Ugandan side of the border.

Graphical evidence

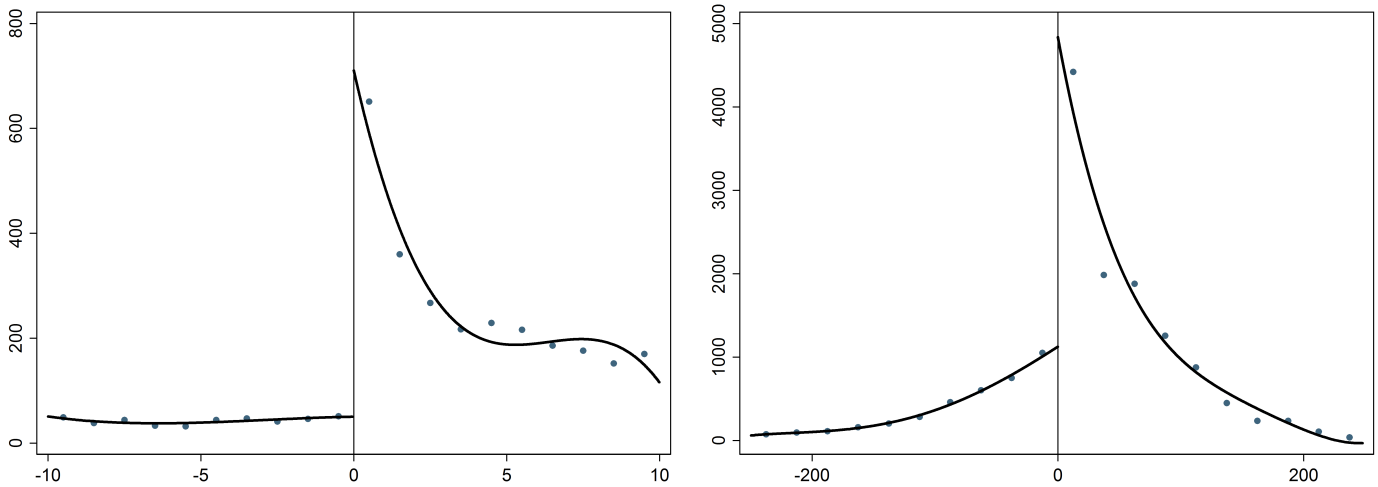

Figure: Sum of wells per 25km bin over 250km.

Note: Right hand side has higher institutional quality.

The likelihood of discovering oil

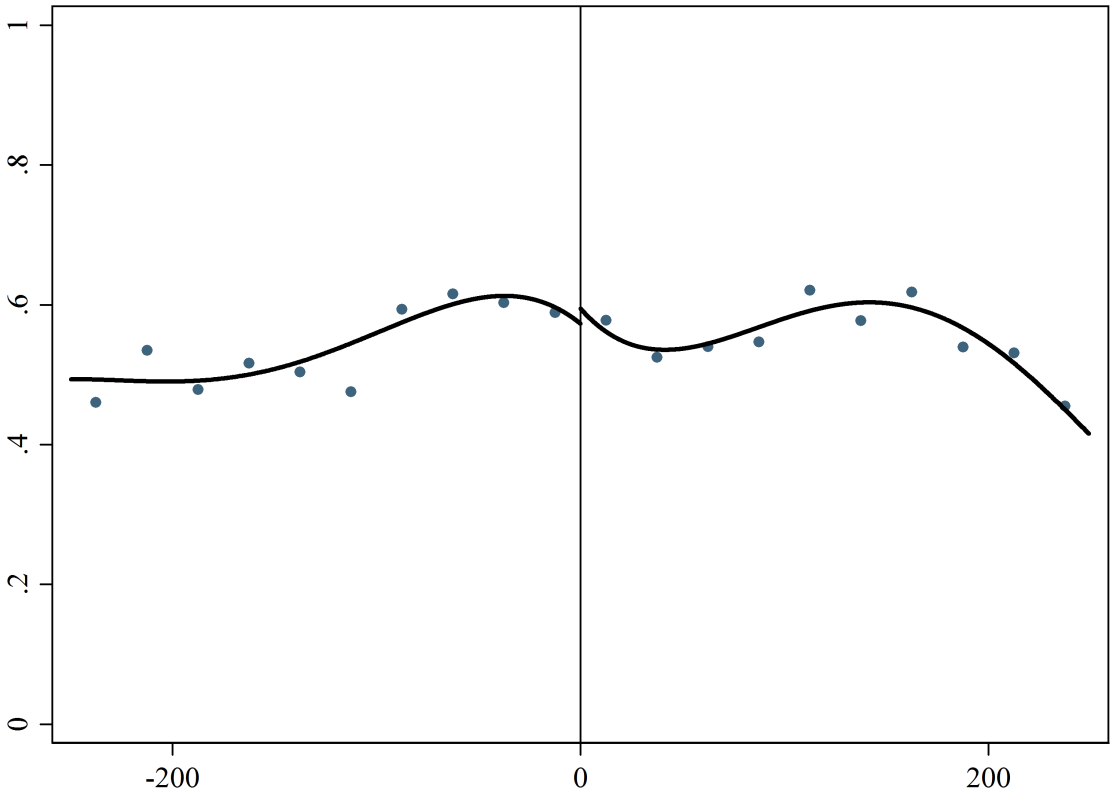

Figure: Share of non-dry wells (onshore).

Note: right hand side has higher institutional quality.

The effect of crossing the border, different inst. measures

Dependent variable →	N: Number of wells				
	(1)	(2)	(3)	(4)	(5)
I: Inst. measure →	FH	Polity	Democ	Autoc	ConEx
			Direct effect of crossing the border:		
D = 1 rhs	4.572***	6.944***	5.380***	-7.820***	7.214***
	(1.246)	(2.038)	(1.605)	(1.954)	(2.156)
$\bar{N}_{left}$	4.81	4.45	4.83	4.61#	4.45
$\hat{\tau} / \bar{N}_{left}$	0.95	1.56	1.11	1.70	1.62
Observations	1197	1228	1228	1228	1228
Countries	29	30	30	30	30
Neighbours	40	39	39	39	39
R-sq	0.15	0.17	0.15	0.19	0.18
Clusters (dbin)	200	200	200	200	200
			Scaled effect (second stage):		
Institutional quality	16.957***	1.009***	1.783**	-2.833***	2.930***
	(5.442)	(0.351)	(0.716)	(0.882)	(0.977)
F instr	131.77	112.79	44.30	72.04	89.90
			Effect of the border on institutional quality (first stage):		
D = 1 rhs	0.270***	6.885***	3.017***	2.760***	2.463***
	(0.023)	(0.648)	(0.453)	(0.325)	(0.260)

Economic significance

- **First stage**: crossing the border gives a jump in the Freedom House democracy score of **0.270**
  (mean=0.45 and std dev=0.26 in our developing country sample)
- **Baseline**: crossing the border gives a jump in *Wells* of **4.5 wells** (95%)

- **Second stage**: the baseline over the first stage: 17 wells
- $\Rightarrow$ a one standard deviation increase in *FH*, about **103 percent** more wells
- $\Rightarrow$ moving from Vietnam to Thailand, *FH* jumps 0.55, and Thailand is likely to drill about **172%** more wells

Note: these are long-run estimates

What are the economic mechanisms through which the border works?

Acemoglu et al (2005), building on North and Thomas:

Proximate (causes of) economic growth:

- Physical and human capital
- Technology and the organisation of production

Fundamental causes of economic growth:

- Institutions
- Geography
- Culture

We focus on institutions; influence economic outcomes by shaping economic incentives

- Geography is "fixed" in our analysis
- Culture? May be less likely to vary sharply by borders. If so we follow Michalopoulos (2013) and show it is not driving results

Heterogeneity across different types of companies?

Dependent variable →	*N*: Number of wells				
	(1)	(2)	(3)	(4)	(5)
Company type →	IOC6	IOC6+	NOC	NOCH	OTH
D(FH)	6.269***	6.179***	8.213***	10.087***	7.987***
	(1.880)	(1.894)	(1.870)	(2.159)	(1.920)
D(FH) x COMP	4.580***	4.508***	-2.335***	-2.391***	-1.709***
	(0.739)	(0.677)	(0.401)	(0.406)	(0.396)
COMP	-0.852***	-1.066***	1.206***	1.615***	-1.241***
	(0.170)	(0.135)	(0.179)	(0.221)	(0.158)
Observations	1248	1250	1323	1254	1324
Countries	30	30	30	30	30
Neighbours	31	31	31	31	31
R-sq	0.27	0.26	0.16	0.19	0.22
Clusters (dbin)	200	200	200	200	200

Drilling over time

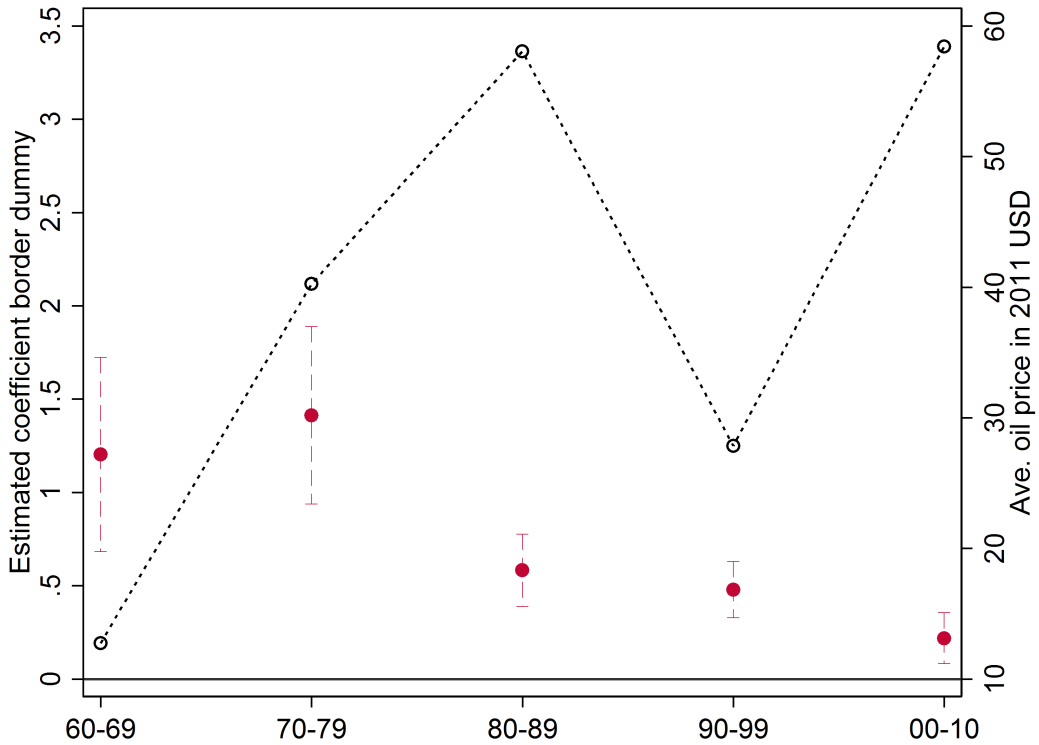

Figure: Estimated baseline coefficients for five decades

Conclusion

- Better governed countries may attract more exploration, at the margin
- The distribution of known oil is driven by governance and not just geology
- The implications for future patterns of discovery could be large...
- And the welfare value of improving governance may also be large...

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Next steps

- What aspects of governance matter the most? What does investors pay attention to?
- How is this pattern changing over time?
- How does offshore exploration respond to *fuzzy* borders?

Thick borders

Dependent variable →	N: Number of wells				
	(1)	(2)	(3)	(4)	(5)
Thickness of border →	0 km	10 km	20 km	40 km	80 km
D = 1 rhs	0.940^{***}	0.356^{***}	0.441^{***}	0.536^{***}	1.227^{***}
	(0.227)	(0.086)	(0.102)	(0.144)	(0.276)
$\bar{N}_{left}$	2.39	1.93	1.75	1.60	1.38
$\hat{\tau} / \bar{N}_{left}$	0.39	0.18	0.25	0.33	0.89
Observations	9995	9390	8798	7759	6138
Countries	43	43	43	38	32
Neighbours	57	56	56	55	53
R-sq	0.10	0.10	0.09	0.07	0.08
Clusters (dbin)	3468	3368	3268	3068	2670

Number of wells and areas size

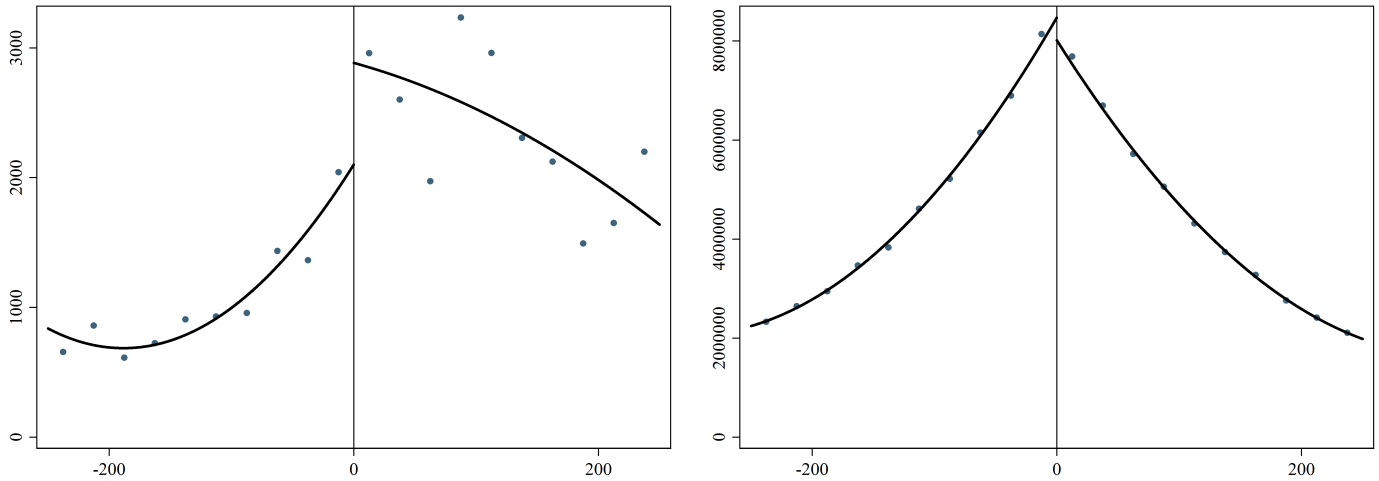
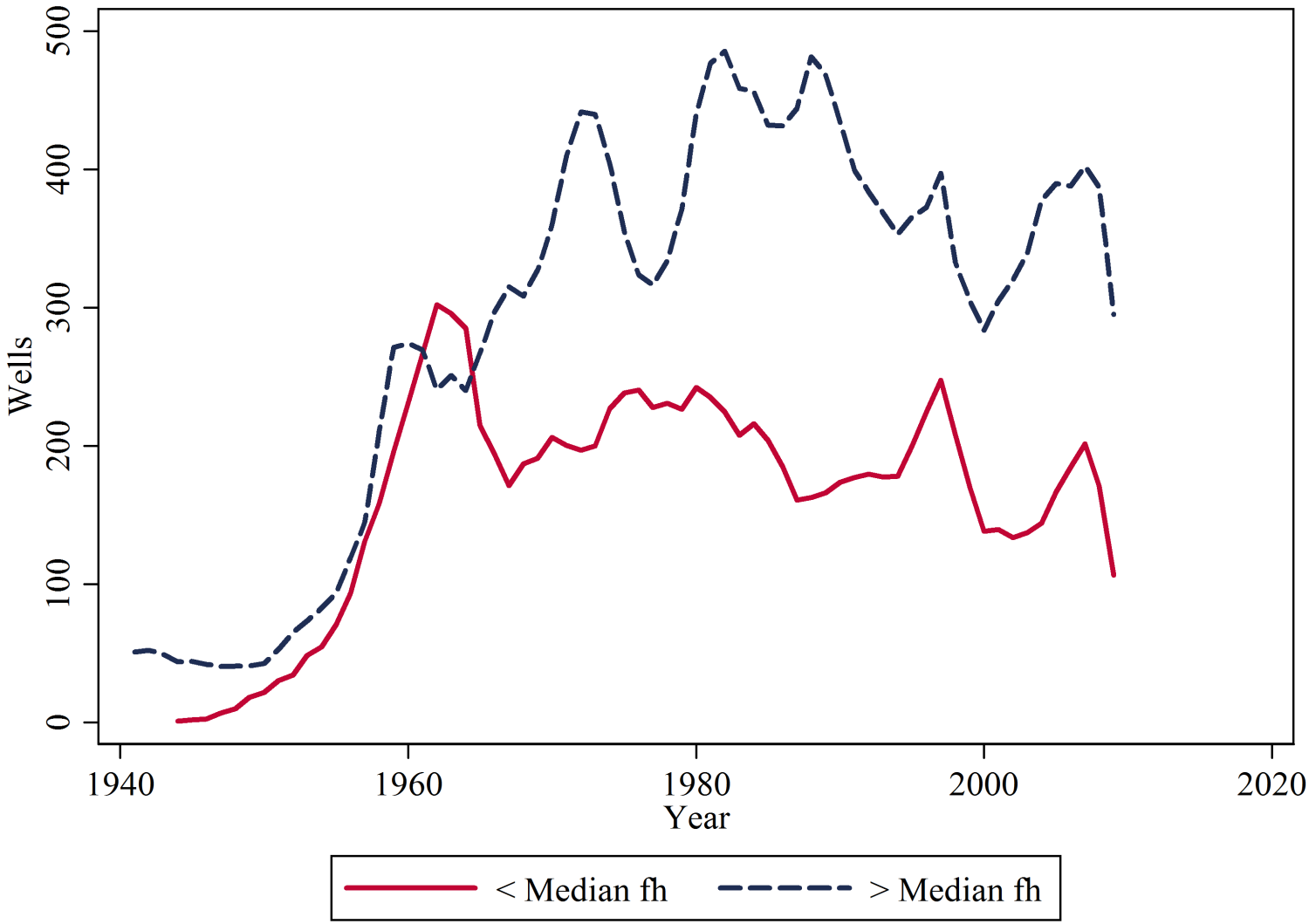


Figure: Pixel data: Number of wells and area size

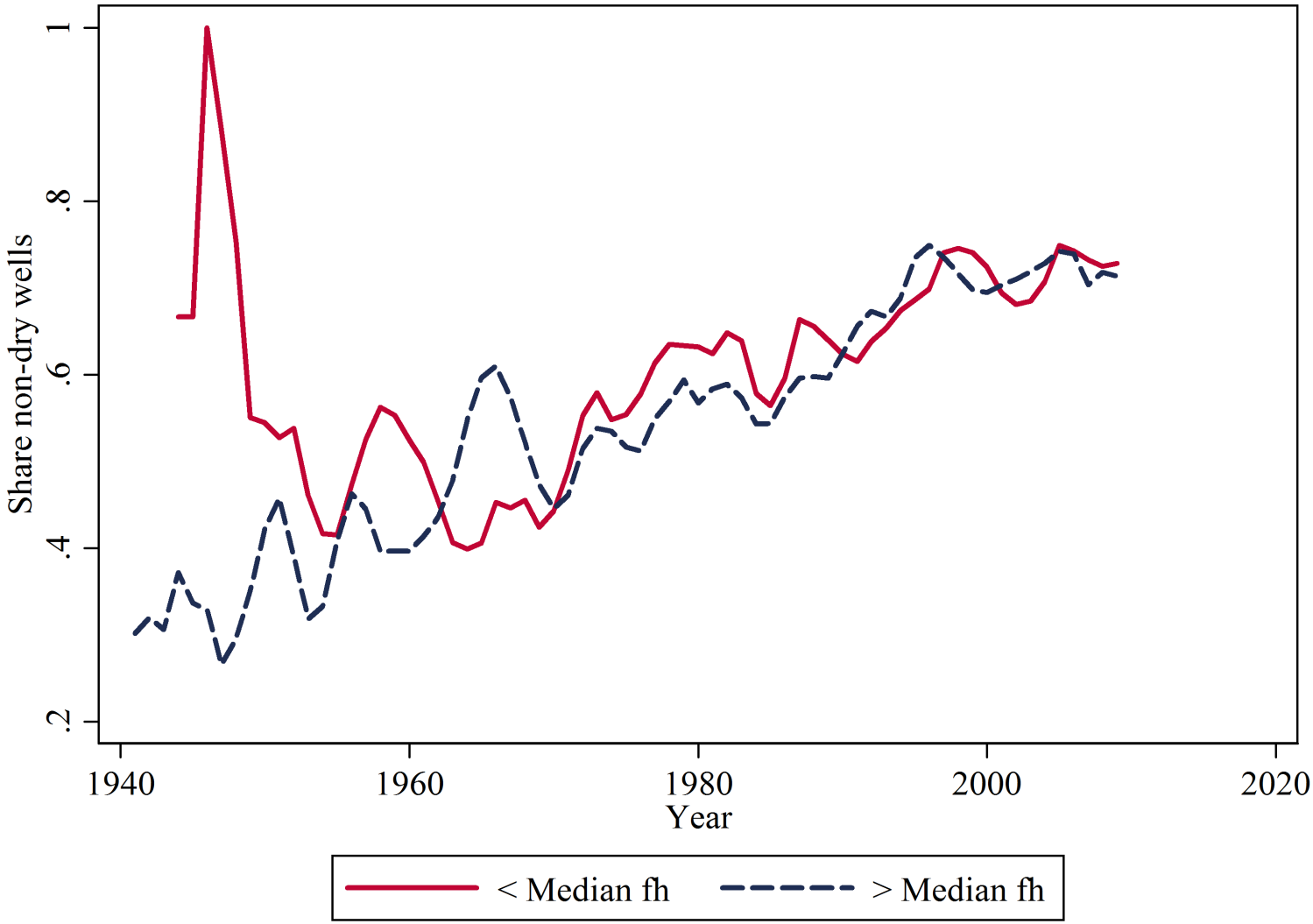
Motivation

Moving average of drilling in developing countries, above vs below median democracy score:



Motivation

Share discoveries in developing countries, above vs below median democracy



score: