

Institutions and Relational Taxation in the Oil and Gas Industry

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HSE, 20th February 2020

Formal institutions

- Rules (e.g. constitutions, laws and regulations) that limit individuals' ability (including the state) to manipulate outcomes to their advantage
- Well-functioning institutions, at least, protect property rights and enforce private contracts
- ⇒ Are a key ingredient for investment, and hence, economic growth and development (Acemoglu, Johnson and Robinson, 2005)

Informal institutions

If formal institutions are weak... **informal institutions** can emerge:

- Hired professional protection of property rights (Gambetta, 1993)
- Networks of information transmission, social norms or punishments (Milgrom, North and Weingast, 1990, Greif, 1993)
- **Relational contracts** (Antras and Foley, 2015, Macchiavello and Morjaria, 2015, Gil et. al. 2017)
 - ⇒ Are informal agreements sustained by the value of future relationships (Malcomson, 2012)
 - ⇒ Future rents are needed to deter short-term opportunism ⇒ incentive constraint

The government

- All the previous examples involve contracting between private parties
- What if the contracting party is the government itself?
- ⇒ To study if relationships with the government can overcome enforcement problems, we need an environment where:
 - Firms make ongoing specific investments in the country
 - It is difficult to enforce contracts

The oil & gas industry

It is a great setting because:

- It is *the* capital intensive sector \Rightarrow 3.3 bill. US\$ per worker during construction \Rightarrow next in line is manufacturing (chemicals) 0.1 bill. US\$ per worker (Heiner, 2009)
- Some oil producing countries have very weak institutions
- Moreover, property rights of oil are with the state

- ⇒ Opportunism is particularly severe
- ⇒ Weak institutions slow down private investment (Bohn and Deacon, 2000 and Cust and Harding, 2019)

Research question

In countries with weak institutions,
can governments sustain
self-enforcing long-term relationships
with private oil & gas companies?

This paper

- Contracts of the major oil & gas companies worldwide for 1975-2013
- With relational contracts, elections weakens the government's credibility (i.e. reduced discount factor) \Rightarrow the incentive constraint tightens \Rightarrow government increases current taxes to reduce the temptation
- Findings:
 - Only governments in countries with weak institutions seem to face a tight incentive constraint
 - Taxes in those countries increase by 8pp on the year of election
 - Investment and taxation in those countries are relatively more back-loaded as theory predicts

Literature

Relational contracts:

- Empirical literature shows that relational contracts are important between and within firms: McMillan and Woodruff (1999), Antras and Foley (2015), Macchiavello and Morjaria (2015), Gibbons and Henderson (2013), etc.
- We have: (1) one side is the government, (2) show evidence of contract backloading

Resource economics:

- Institutions affect investment (Cust and Harding (2019)), insurance provision to the government (Stroebl and Van Benthem (2013)) and expropriation (Guriev et.al. (2011))
- We show in which way institutions shape the agreements

Thomas and Worrall (1994)



Self-enforcing agreement

- The government promises need to be credible
- If government collects different GT_t from agreed \Rightarrow Firm stops investing ever after \Rightarrow Government expropriates firm:

$$(1 - \delta)GT_t + \delta\mathbb{E}[V_{t+1}] \geq (1 - \delta)r(l_t; p_t)$$

- Incentive constraint \Rightarrow government's future value is larger than the current gain from not honoring the agreement

Countries with Weak Institutions

- Governments can expropriate \Rightarrow Government's incentive constraint binding:

$$(1 - \delta)GT_t + \delta\mathbb{E}[V_{t+1}] = (1 - \delta)r(l_t; p_t)$$

- Elections: government may lose power \Rightarrow effective discount factor $\downarrow \delta \Rightarrow$ incentive constraint tightens
- The agreed GT_t on the year of election is larger to prevent the government from expropriating

Countries with Strong Institutions

- Governments cannot expropriate \Rightarrow Government's self-enforcing constraint is never binding:

$$(1 - \delta)GT_t + \delta\mathbb{E}[V_{t+1}] > 0$$

- Elections: the incentive constraint is still slack
- GT_t should not change on the year of election

Data: Oil and Gas contracts

- Proprietary data on 24 private and public gas & oil firms (Source: BP, Wood Mackenzie)
- List from Ross (2012) based on stock & resources value
- For each firm f , country i and year t , we have the realized agreements worldwide for 1975-2013 \Rightarrow 6218 observations, 274 firm-country combinations and 60 countries
- Present values using S&P 500 Index returns incl. dividends \Rightarrow alternative measures: no discounting, real values using US CPI and normalizing by GDP

Government Take

- Key variable
- Total amount of payments received by the government
- Includes bonuses, rentals, royalties, corporate income taxes and other special taxes
- "Price" the firm pays for receiving the right to explore and extract

Data: Institutions and Elections

Institutions from Polity IV:

- Executive constraints: extent of institutional constraints on the decision-making powers of the chief executive
- Normalized to $[0,1]$ (1 = Strong institutions)
- Also political competition & competitiveness of executive recruitment

Elections from World Bank:

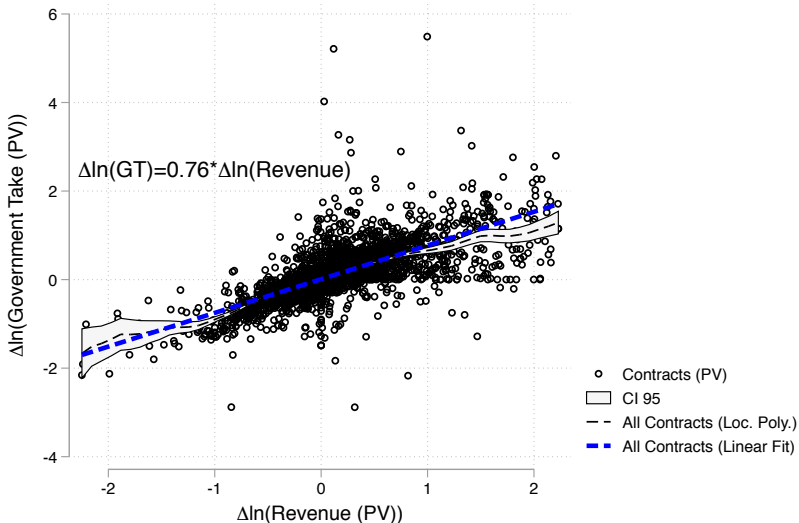
- Legislative and executive elections
- Code the ones that are "unexpected" - outside the regular political cycle

Descriptive Statistics

	mean	p50	sd	max	min
Country-Firm Specific Contracts (mil. 2013 US\$)					
Real Revenue	8293.53	610.91	48202.10	744617.6	0.00
Real Gov. Take	3959.32	166.10	28598.27	456614.4	0.00
Duration	17.92	15.00	12.76	38.00	0.00
Country Specific Institutions (normalized 0-1)					
Political Comp.	0.65	0.80	0.33	0	1
Executive Const.	0.67	0.71	0.32	0.14	1
Comp. Recruit.	0.67	0.67	0.36	0	1
Executive and Legislative Elections					
Election	0.22	0.00	0.42	0	1

First three rows are based on 274 country-firm specific averages.

Linear Contracts



Government Take and Institutions

$$\Delta \ln(\text{GT}_{ift\tau}) = \theta \Delta \ln(\text{Rev}_{ift\tau}) + \alpha \text{Inst}_{it} + \beta \text{Elec}_{it} + \gamma \text{Inst}_{it} \times \text{Elec}_{it} + e_{ift\tau}$$

- $\text{GT}_{ift\tau}$ is country's i government take from firm f in year t at period τ of their relationship, $\text{Rev}_{ift\tau}$ are revenues similarly defined, Inst is quality of institutions in country i at year t , Elec is a dummy with the year of an election in country i and $e_{ift\tau}$ is the error term
- Expect:
 - (1) $\alpha \approx 0$ because account for constant unobservables
 - (2) $\beta > 0$ and $\gamma < 0$ since Inst increases with the quality of institutions

Government Take and Institutions

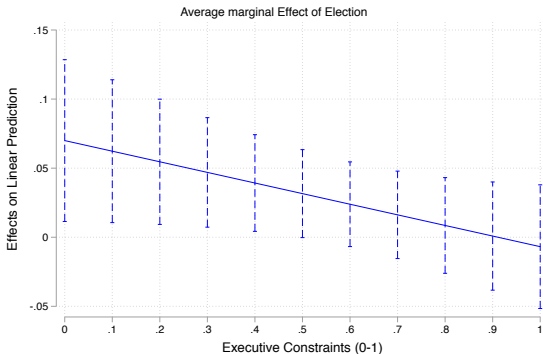
	(1)	(2)	(3)
	$\Delta \ln(\text{GT PV})$	$\Delta \ln(\text{GT PV})$	$\Delta \ln(\text{GT PV})$
$\Delta \ln(\text{Revenue PV})$	0.675*** (0.032)	0.670*** (0.033)	0.669*** (0.033)
Election (=1)		0.018 (0.017)	0.077** (0.031)
Institutions (0-1)		-0.005 (0.013)	0.014 (0.018)
Election (=1) \times Institutions (0-1)			-0.080* (0.040)
N	5279	5213	5213
R-sq	0.56	0.55	0.55

274 firm-country combinations (cross-section) and 16 years on average in the first-differences specification (unbalanced panel). We account for invariant unobservables by taking the first difference. We use only observations for which we know exactly the first year of production following 1965. Standard errors in parenthesis clustered by country and year, and * stands for statistical significance at the 10% level, ** at the 5% level and *** at the 1% percent level.

Alternative Specifications

Marginal effect of Elections

$$\frac{\partial \Delta \ln(GT_{ift\tau})}{\partial Elec_{it}} = \beta + \gamma Inst_{it}$$



Alternative Institutional Measures

Account for a variety of FE

To account for additional confounding factors, we replace the error term $e_{ift\tau}$ by:

$$\mu_t + \omega_\tau + \lambda_{ft} + \eta_{if} + \varepsilon_{ift\tau}$$

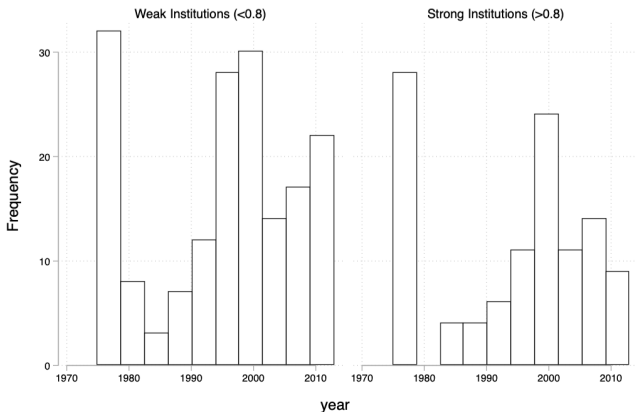
	(1)	(2)	(3)	(4)	(5)
	$\Delta \ln(\text{GT PV})$	$\Delta \ln(\text{GT PV})$	$\Delta \ln(\text{GT PV})$	$\Delta \ln(\text{GT PV})$	$\Delta \ln(\text{GT PV})$
$\Delta \ln(\text{Revenue PV})$	0.678*** (0.031)	0.627*** (0.032)	0.638*** (0.033)	0.617*** (0.033)	0.600*** (0.036)
Election (=1)	0.080** (0.030)	0.073*** (0.027)	0.072** (0.028)	0.065* (0.033)	0.066* (0.035)
Instituions (0-1)	0.016 (0.017)	0.008 (0.015)	0.008 (0.015)	0.003 (0.018)	0.040 (0.037)
Election (=1) × Instituions (0-1)	-0.084** (0.039)	-0.086** (0.038)	-0.086** (0.039)	-0.083* (0.046)	-0.081* (0.048)
N	5634	5634	5634	5634	5634
R-sq	0.56	0.60	0.60	0.65	0.63

In column (2) we add year FE, in column (3) we add relationship length FE in column (4) we add firm-time FE and in column (5) we add a country-firm FE. Standard errors in parenthesis clustered by country and year, and * stands for statistical significance at the 10% level, ** at the 5% level and *** at the 1% percent level.

Countries with strong and weak institutions

- Split countries using Executive Constraints=0.8
- OECD+Latin America versus Asia+Africa

Figure: Number of relationships starting in year t



Countries with weak institutions: heterogeneity effects

- When does the government take change?
- Is the increase associated with regular elections (i.e. pre-established by the political cycle) or with unexpected ones?
- The value of expropriating is larger if there is a large national oil firm \Rightarrow government's incentive constraint is tighter \Rightarrow Is the increase in the government take larger in this case?
- Is the trust-based relationship with the government firm specific? We look at how the increase in government take is allocated between firms that have been in the country for more than 15 years and those that have not

Heterogeneity effects

We use the following specification:

$$\Delta \ln(\text{GT}_{ift\tau}) = \theta \Delta \ln(\text{Rev}_{ift\tau}) + X + \mu_t + \omega_\tau + \lambda_{ft} + \eta_{if} + \varepsilon_{ift\tau}$$

- Timing in the change of GT: $X = \sum_{k=-1}^1 \alpha_k \text{Elec}_{it+k}$
- Expected vs unexpected: $X = \alpha_1 \text{Elec}_{itexp} + \alpha_2 \text{Elec}_{itunexp}$
- Large national oil firm: $X = \alpha_1 \text{Elec}_{itoil} + \alpha_2 \text{Elec}_{itnooil}$
- Early and late entrants: $X = \alpha_1 \text{Elec}_{itf \geq 15 \text{ years}} + \alpha_2 \text{Elec}_{itf < 15 \text{ years}}$

Heterogeneity effects

	(1)	(2)	(3)	(4)	(5)
	$\Delta \ln(\text{GT PV})$	$\Delta \ln(\text{GT PV})$	$\Delta \ln(\text{GT PV})$	$\Delta \ln(\text{GT PV})$	$\Delta \ln(\text{GT PV})$
$\Delta \ln(\text{Revenue PV})$	0.648*** (0.046)	0.622*** (0.048)	0.650*** (0.046)	0.648*** (0.046)	0.647*** (0.046)
Election_{t+1}		-0.002 (0.023)			
$\text{Election}_t (=1)$	0.059** (0.029)	0.047* (0.027)			
Election_{t-1}		-0.060* (0.034)			
Election_t (unexpected)			-0.029 (0.066)		
Election_t (expected)			0.085*** (0.028)		
Election_t (No Big Oil)				0.022 (0.023)	
Election_t (Big Oil)				0.077* (0.043)	
$\text{Election}_t (\geq 15 \text{ years})$					0.034* (0.020)
$\text{Election}_t (< 15 \text{ years})$					0.073* (0.038)
N	3205	3015	3205	3205	3205
R-sq	0.69	0.68	0.69	0.69	0.69

Standard errors in parenthesis clustered by country and year, and * stands for statistical significance at the 10% level, ** at the 5% level and *** at the 1% percent level.

Back to theory

Investment and taxation dynamics

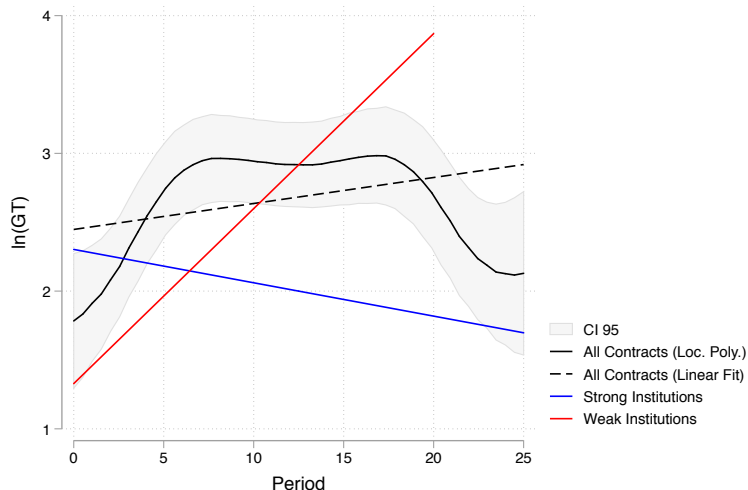
Countries with weak institutions

- Only governments in countries with weak institutions face a binding incentive constraint
- Thomas and Worrall (1994) show that a firm that maximizes initial profits should "back-load" the agreement
- Firm increases the government's value over time by gradually: (1) increasing investment, and (2) increasing government take
- Why? By pushing the government's gains towards later parts of the relationship, firm's threat to terminate the relationship becomes more effective \Rightarrow government's commitment improves!

Countries with strong institutions

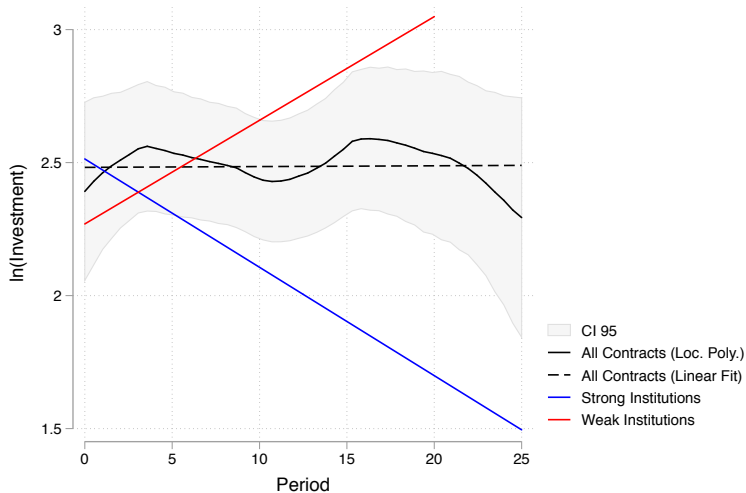
- Governments in countries with strong institutions do not seem to face a binding incentive constraint
- Thomas and Worrall (1994) show that the firm should undertake the "first best" investment every period \Rightarrow However, in the oil & gas industry it is efficient to front-load investment
- The timing of the government take is undetermined

Timing of Government Take by Chevron



Real government take and real investment over the period τ of their relationship.

Timing of Investment by Chevron



Real government take and real investment over the period τ of their relationship.

Which agreements are backloaded?

- Take full sample again
- We estimate this specification for government take:

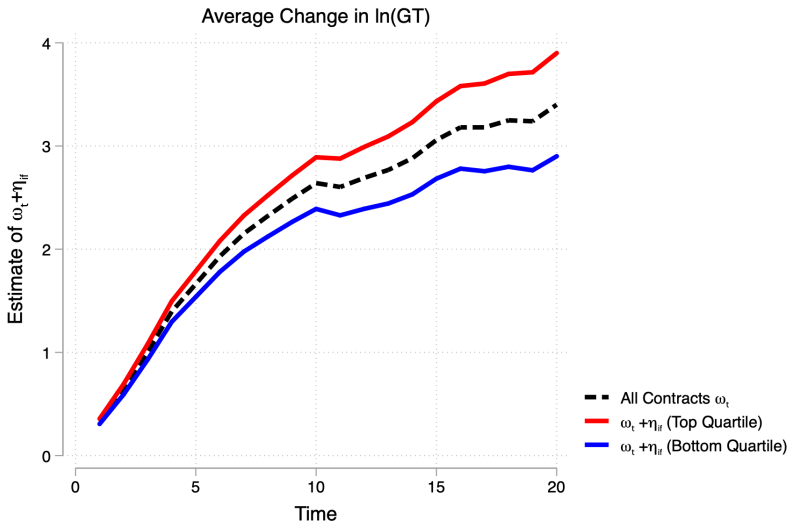
$$\Delta \ln(GT_{ift\tau}) = \theta \Delta \ln(\text{Rev}_{ift\tau}) + \mu_t + \omega_\tau + \eta_{if} + \varepsilon_{ift\tau}$$

- We estimate this specification for investment:

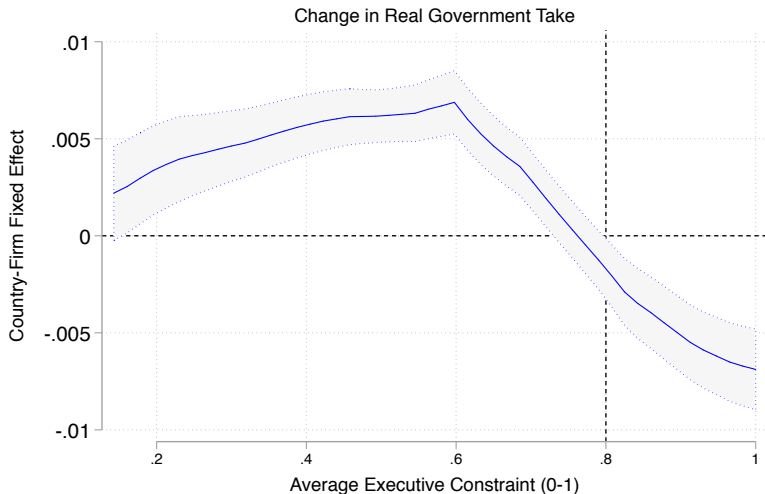
$$\Delta \ln(\text{Inv}_{ift\tau}) = \mu_t + \omega_\tau + \eta_{if} + \varepsilon_{ift\tau}$$

- η_{if} represents the country-firm departure from the average growth \Rightarrow we plot it against the country's average quality of institutions

Government take over time

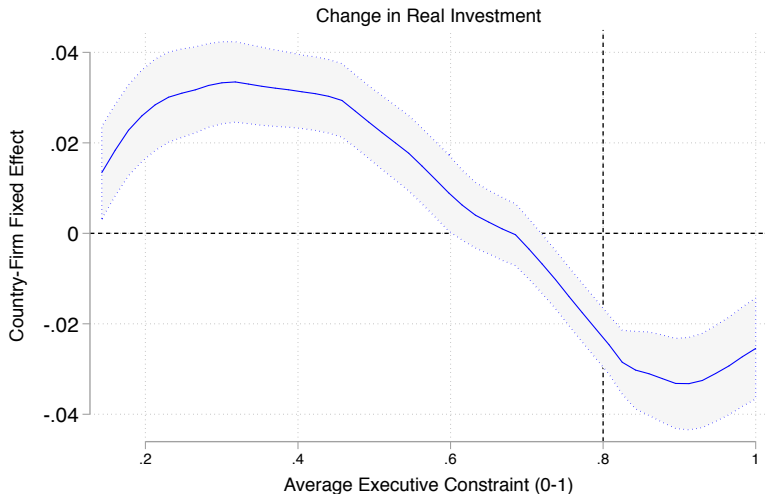


Timing of government take



Average growth in real government take (conditional on year FE, period FEs and logged real revenue) and the average executive constraint.

Timing of investment



Average growth in real investments (conditional on year and period FE) and the average executive constraint.

Conclusions

- The quality of institutions is associated with the government's credibility when contracting with oil and gas firms
- Governments in countries with weak institutions increase the change in government take by 8pp on the year of the election
- This increase is more prominent when there is a successful oil company from this country and is mostly paid by late entrants
- Firms respond to the lack of credibility by backloading investment and the payment of government take

Future work

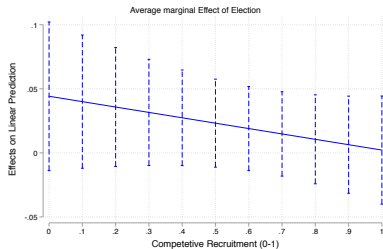
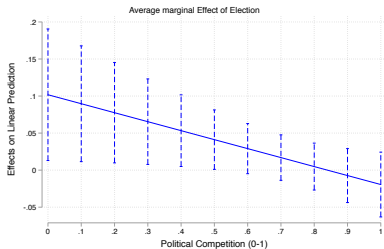
- New theory? A good identification?
- Collecting the data about winners of elections \Rightarrow How is the government take affected when the incumbent wins the election?
- Collecting data on off-shore drilling \Rightarrow harder to expropriate than on-shore
- Collecting data on giant discoveries (\approx shock to profitability) \Rightarrow How does this affect the agreements?

Alternative Specifications

	(1)	(2)	(3)	(4)	(5)
	$\Delta \ln(\text{GT PV})$	$\ln(\text{GT PV})$	$\ln(\text{GT}/\text{CPI})$	$\ln(\text{GT})$	GT/GDP
$\Delta \ln(\text{Revenue PV})$	0.669*** (0.033)				
$\ln(\text{Revenue PV})$		0.856*** (0.021)			
$\ln(\text{Revenue}/\text{CPI})$			0.876*** (0.017)		
$\ln(\text{Revenue})$				0.845*** (0.026)	
$\text{Revenue}/\text{GDP}$					0.514*** (0.032)
Election (=1)	0.077** (0.031)	0.116*** (0.037)	0.147*** (0.054)	0.225*** (0.070)	0.014** (0.006)
Institutions (0-1)	0.014 (0.018)	-0.034 (0.099)	-0.036 (0.171)	0.112 (0.142)	0.001 (0.019)
Election (=1) \times Institutions (0-1)	-0.080* (0.040)	-0.110** (0.043)	-0.141** (0.061)	-0.185* (0.095)	-0.014** (0.007)
N	5213	5541	5541	5541	5450
R-sq	0.55	0.86	0.84	0.74	0.93

(1) reproduces previous results, (2) accounts for the fixed effect by accounting for averages, (3) uses CPI, (4) uses nominal values, (6) divides by GDP. Standard errors in parenthesis clustered by country and year, and * stands for statistical significance at the 10% level, ** at the 5% level and *** at the 1% percent level.

Marginal effect of other measures



Back