Do weak institutions prolong the fall?

On the identification, characteristics and duration of declines during economic slumps

Richard Bluhm[1,2] Denis de Crombrugghe[1] Adam Szirmai[2,1]

[1]Maastricht University / [2]UNU-MERIT

11^{th} NIPFP-DEA Research Meeting, 7-8 September, 2013

Maastricht University

UNITED NATIONS UNIVERSITY
UNU-MERIT

afd AGENCE FRANÇAISE DE DÉVELOPPEMENT

Motivation

Introduction

- For every story of a "growth miracle" we can easily find a "miraculous collapse" as a counterpart
- Since Pritchett (2000), many empirical studies argue that growth is an inherently unstable process
- Flurry of papers identifying and analyzing different patterns: accelerations, slowdowns, slumps, recoveries, and so on.
- We now know that growth is easy to ignite (Hausmann et al. 2005) but hard to sustain (Berg et al. 2012). What about loosing previous gains?
- Add to this an empirical paradox in the institutions literature: strong correlation between GDP *levels* and institutions, but little correlation with *growth rates*. Are we looking for dynamics in the right place?

Contribution

- Our contribution is to *identify slumps* which are truly *negative and pronounced departures from a previously positive trend*
- We examine how key variables behave around the time the slump hits, to show what these slumps look like and ask if they go together with *institutional change*
- We try to identify the variables that determine how long a slump lasts and ask: *do weak institutions prolong the fall?*
- We find that slumps matter for divergence, are preceded by weak institutions and that their duration is longer in weakly institutionalized (and ethnically fragmented) societies

Background

- Large body of political economy theory puts social conflict and the ability of (constrained and durable) institutions to manage such conflict at the center stage
- Some theories (e.g. North et al. 2009) argue that (1) weakly institutionalized societies are prone to collapses, (2) during crises, declining rents and social conflict put further stress on institutions and exacerbate crises
- Institutions determine "... whether there will be *significant swings in the political and social environment leading to crises*, and whether politicians will be induced to *pursue unsustainable policies* in order to remain in power *in the face of deep social cleavages*." (Acemoglu et al. 2003)

Related literature

Three strands of related literatures

1. Growth episodes: accelerations, collapses, etc. (e.g. Rodrik 1999, HPR et al. 2005, HRW 2008, Berg et al. 2012)
2. Broken trend stationarity & unit roots (e.g. Zivot & Andrews 1992, Ben-David & Papell 1998, Papell & Prodan 2011a)
3. Macroeconomic volatility & institutions (e.g. Acemoglu et al. 2003, Mobarak 2005, Klomp & de Haan 2009)

Why add to the study of slumps and their duration?

- Literature still struggles with identifying slumps and generic structural breaks algorithms don't do well on slumps
- Need to find ways of excluding business cycles (small dips)
- Unit root literature faced issue of structural breaks for some time and provides new approaches (Pappel & Prodan 2011a,b)

Identification of slumps

A restricted structural change model

Three criteria which we translate into econometrics

- *a departure from a positive trend* –> structural break
- *negative* –> beginning with a drop (in the intercept)
- *pronounced* –> passing a significance criterion

A *restricted* structural change model (s.t. $\beta > 0$ and $\gamma_1 < 0$):

$$y_t = \alpha + \beta t + \gamma_1 DU_1 + \gamma_{12} DT_1 + \gamma_2 DT_2 + \sum_{i=1}^{p} \delta_i y_{t-i} + \epsilon_t$$

where α is an intercept, β is a time-trend, $DU_1 = \mathbf{1}(t > tb_1)$ is an intercept break, $DT_1 = (t - tb_1)\mathbf{1}(t > tb_1)$ is a trend break, $DT_2 = (t - tb_2)\mathbf{1}(t > tb_2)$ is a second trend break ($tb_2 \geq tb_1 + 4$), $\sum_{i=1}^{p} \delta_i y_{t-i}$ captures serial correlation and ϵ_t is a martingale difference sequence.

A sequential break search

Problems

- Endogenous breaks could occur at any point in the series
- Wald-statistics on the coefficients are not independent.

Solved with a sequential break search algorithm (Bai 1997, 1999, Papell and Prodan 2011a) and a recursive parametric bootstrap (Diebold and Chen 1996).

1. Fit the structural change model to each GDP per capita series
2. Compute sup-W test ($\mathbb{H}_0 : \gamma_1 = \gamma_{12} = \gamma_2 = 0$) over all possible break dates (subject to trimming and min. distance)
3. Bootstrap the empirical distribution of these test statistics
4. Collect breaks with $\leq 1/10$ probability of occurring by chance
5. Split sample before 1^{st} and after 2^{nd} break, repeat from (1) until no more significant breaks or $T < 20$

From break to trough

A slump is finished if pre-slump GDP per capita is recovered. More formally, given the set of possible end years for the decline phase $A = \{a \mid a \in (\widehat{tb}_1, T] \text{ and } y_a \geq y_{\widehat{tb}_1}\}$, we estimate the trough at

$$t_{min} = \begin{cases} \text{argmin}_{j \in (\widehat{tb}_1, a_0]} y_j, & \exists j \in A \\ \text{argmin}_{j \in (\widehat{tb}_1, T]} y_j, & \nexists j \in A \end{cases}$$

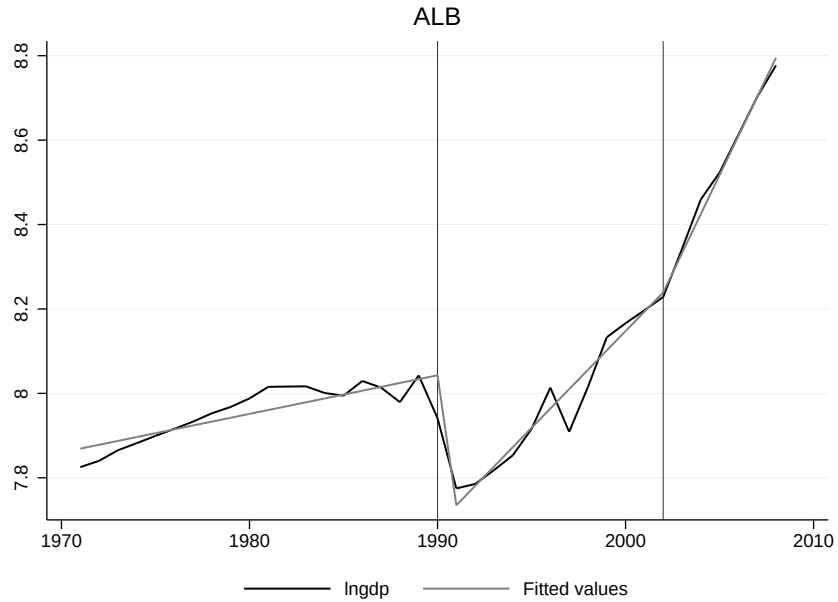
where $a_0 = \min A$ corresponds to the (certain) end of the slump.

If the set A is empty, then the slump is unfinished, and the length of the episode is censored. A provisional trough occurs when y_t attains a minimum after $\widehat{tb}_1$.

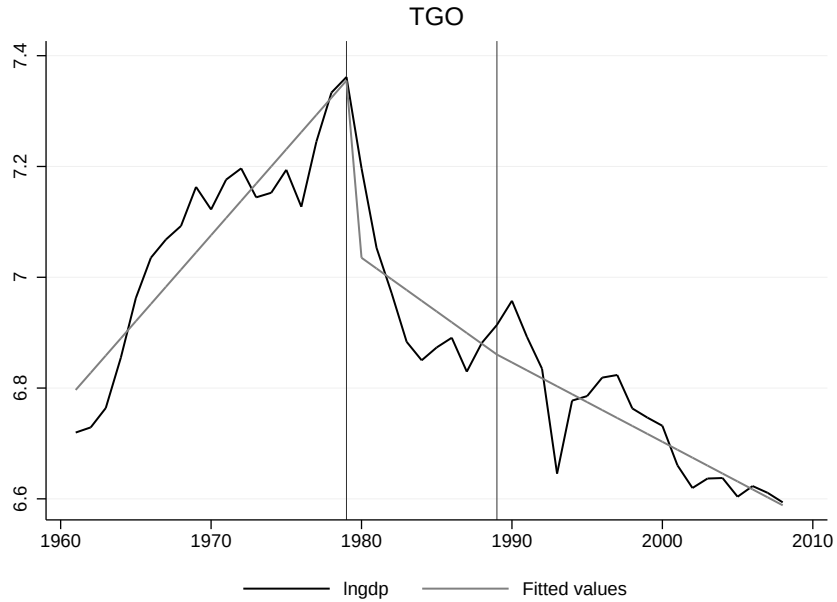
The duration of the decline phase is simply: $\tilde{t}_D = \hat{t}_{min} - \widehat{tb}_1$.

Descriptives

A finished and an unfinished slump



(a) finished



(b) unfinished (and censored)

Models refitted using endogenous $\hat{tb}_1$, $\hat{tb}_2$ without any of the AR(p) terms to emphasize the trend breaks.

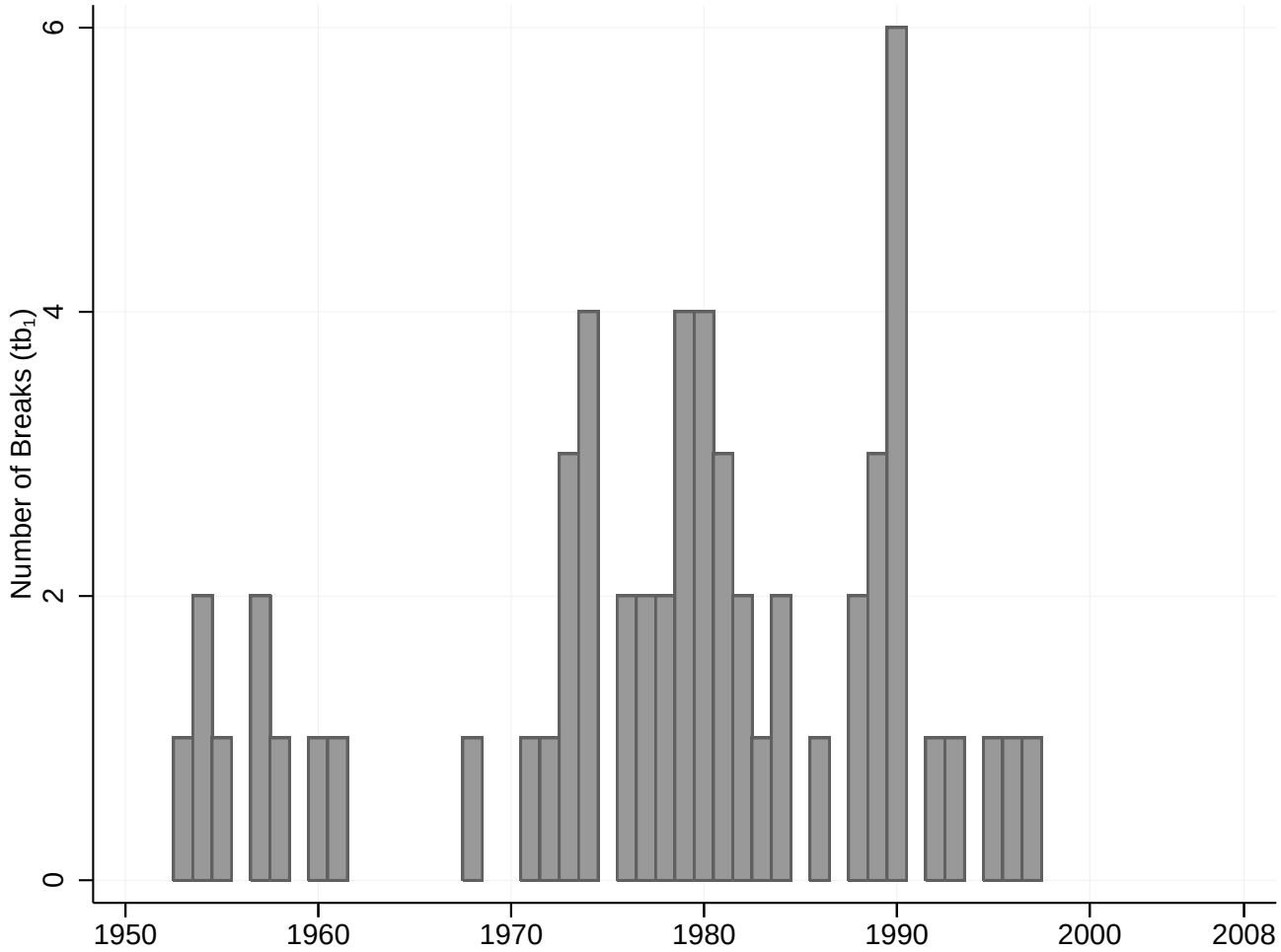
Depth and distribution of slumps

Table: Depth and Duration by Income Level and Geographical Region

	Mean Depth	Mean Duration	Median Duration	# of Spells	Censored Spells	# of Countries
Income Level (2011)						
High-income (OECD)	-7.11%	2.00	1	12	–	29
High-income (Other)	-20.84%	5.38	2	8	1	12
Upper-middle-income	-21.20%	5.39	2	16	2	30
Lower-middle-income	-27.40%[a]	6.00[b]	3	11	3	34
Low-income	-34.17%[a]	15.75[b]	16	11	4	33
Geographical Region						
East Asia & Pacific	-13.63%	2.30	2	10	–	17
Europe & Central Asia	-13.52%	2.36	1	11	–	32
Latin America & Caribbean	-17.34%	5.27	3	15	1	23
Middle East & North Africa	-33.24%[a]	8.66[b]	9	7	3	17
North America	-2.50%	1.00[c]	1[c]	1	–	2
South Asia	-5.32%	1.00[c]	1[c]	1	–	6
Sub-Saharan Africa	-37.14%[a]	17.73[b]	16	13	6	41
Total	-21.87%[a]	7.69[b]	3	58	10	138[d]

Note(s): Depth is defined as the percent decrease in GDP per capita at the trough relative to GDP per capita before the slump (percent, not log difference). a) Restricted mean, last observed value is used to estimate depth. Mean depth is underestimated. b) Restricted mean, last observed value is used as exit time. Mean duration is underestimated. c) Only one spell in this country-group, actual values used instead of estimates. d) After dropping countries with less 1 than million inhabitants and fewer than 20 observations of GDP per capita.

Distribution of "slump starts"



Anatomy of slumps

What happens when slumps hit?

We run panel FE regressions for each time-varying covariate on the distance to a slump (inspired by Gourinchas & Obstfeld 2012):

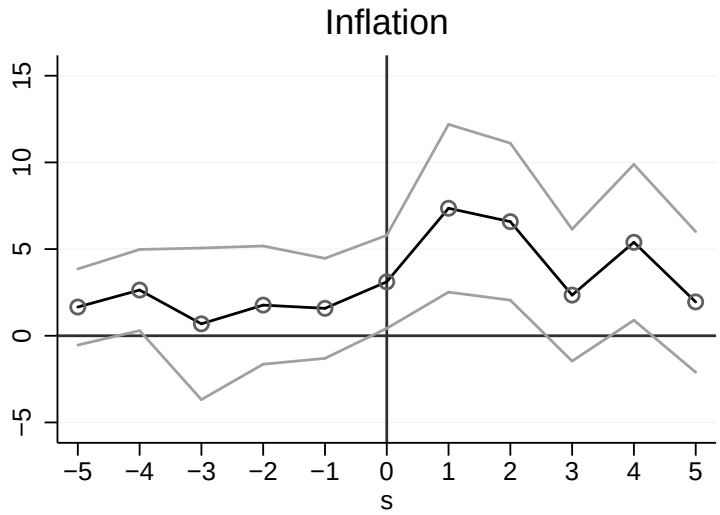
$$x_{it} = \sum_{s=-5}^{5} \delta_{t,\widehat{tb}_1+s}\beta_s + \mu_i + \epsilon_{it}$$

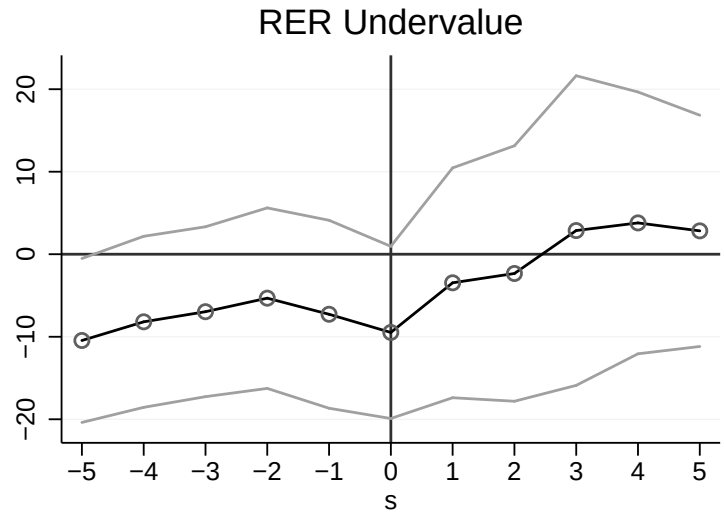
where δ is the Kronecker delta which is equal to one if $t = \widehat{tb}_1 + s$ and zero otherwise, β_s are coefficients, μ_i is an unobserved country effect and ϵ_{it} is an idiosyncratic error term. We have an 11-year window ($s \in [-5, 5]$) around the break date $\widehat{tb}_1$.

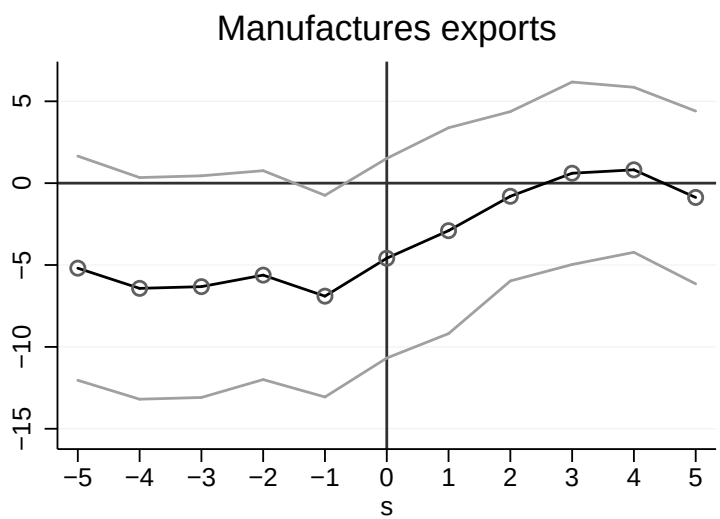
Standard errors are HAC robust *both* across *country clusters and year clusters* (Cameron et al. 2011, Thompson 2011).

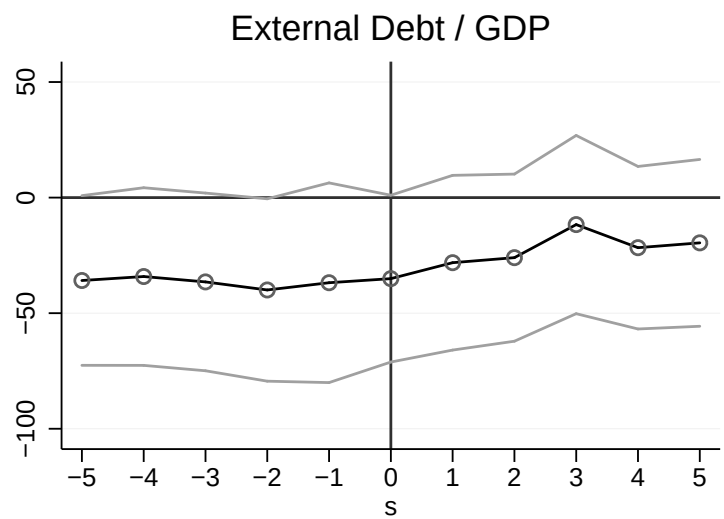
We graph the $\hat{\beta}_s$ (with CI bands) as they are *the conditional expectation of the covariate x_{it} at time s relative to normal times*.

Some highlights (I)

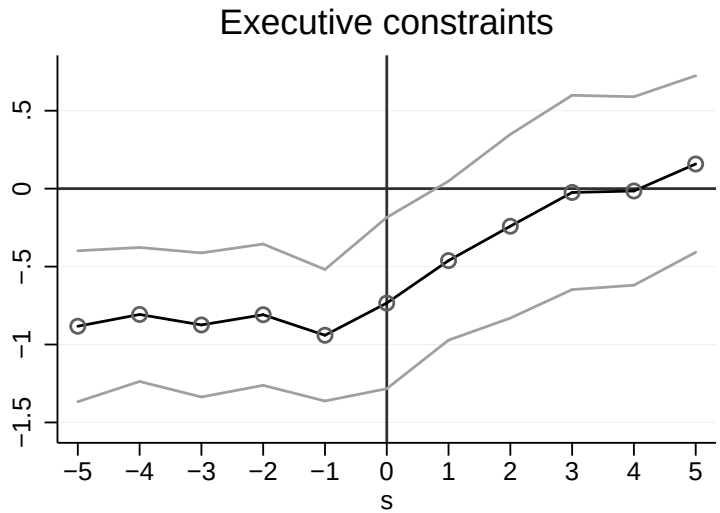


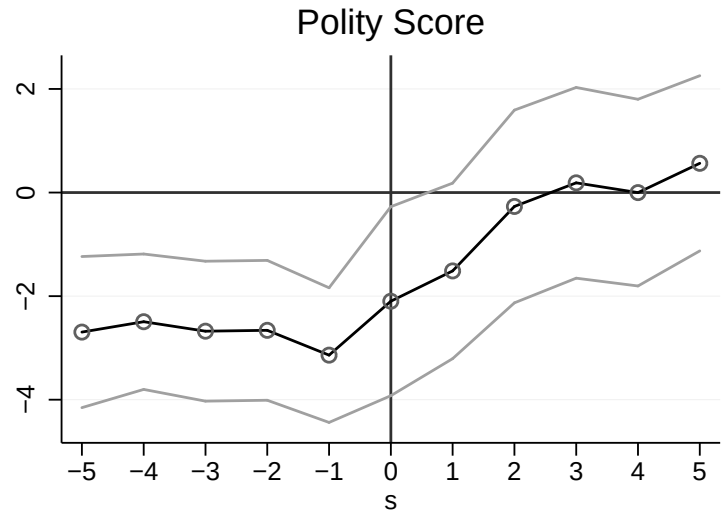


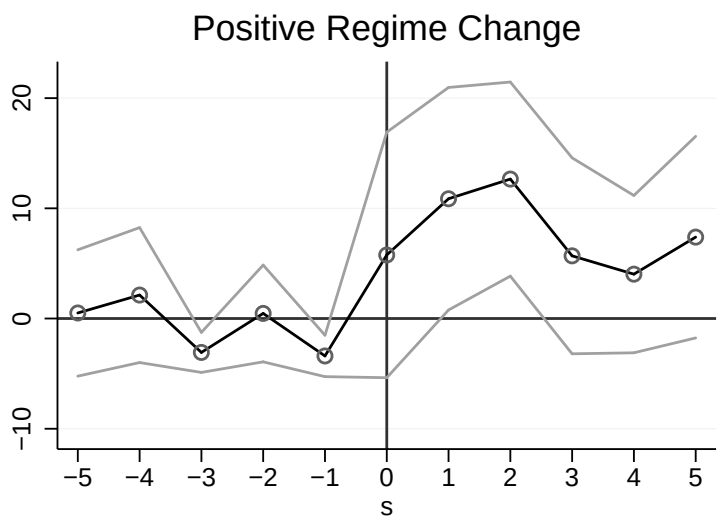


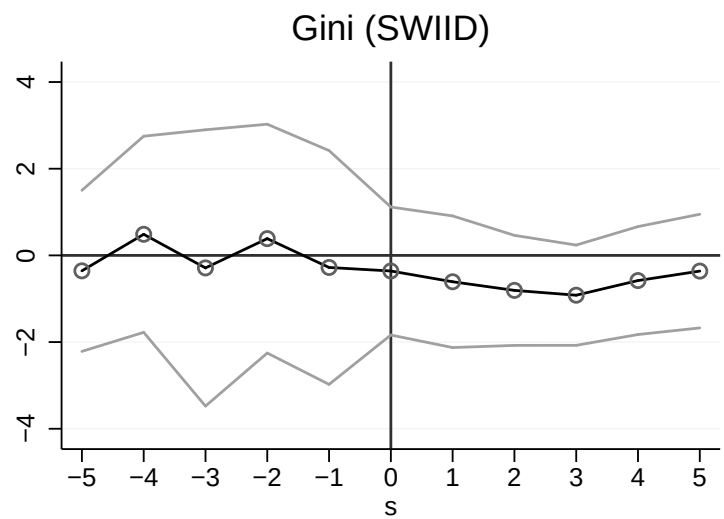


Some highlights (II)









Preliminary evidence

- Long list of things with no significant variation
  - Trade openness (de facto), export sophistication and export diversification
  - Debt to GDP, external Leverage, FDI liabilities, financial development/ integration
  - Inequality, wars, irregular leader exit (assassinations etc.)
- Some factors show an interesting pattern
  - Institutions (on all Polity components)
  - Financial depth and private credit
  - Trade openness (de jure)
- Others show the expected pattern
  - Real exchange rate and inflation
  - Current account balance and manufactured exports

Duration of slumps

Duration method

Log-normal AFT models of duration until exit of the decline phase

$$\ln \tilde{t} \equiv \ln(t - t_0) = \alpha + \beta INS_{t_0} + \mathbf{x}'_{t_0}\boldsymbol{\gamma} + \delta USI_t + \sigma\epsilon_t$$

where INS_{t_0} will be proxied by *Executive Constraints* (from Polity IV), β is the coefficient of interest, $\mathbf{x}_{t_0}$ is a vector of controls, USI_t is the real US interest rate, and $\sigma\epsilon_t$ is distributed $\mathcal{N}(0, \sigma)$.

INS_{t_0} and $\mathbf{x}_{t_0}$ are fixed at $t_0 = \hat{tb}_1$ (last year before slump) in order to avoid endogeneity. SEs are clustered on repeated spells.

Interpretation:

- coefficient > 0 time passes slower –> decelerated exit
- coefficient < 0 time passes faster –> accelerated exit

We have few degrees of freedom, hence we select "winners" from minimal models first and then build summary models.

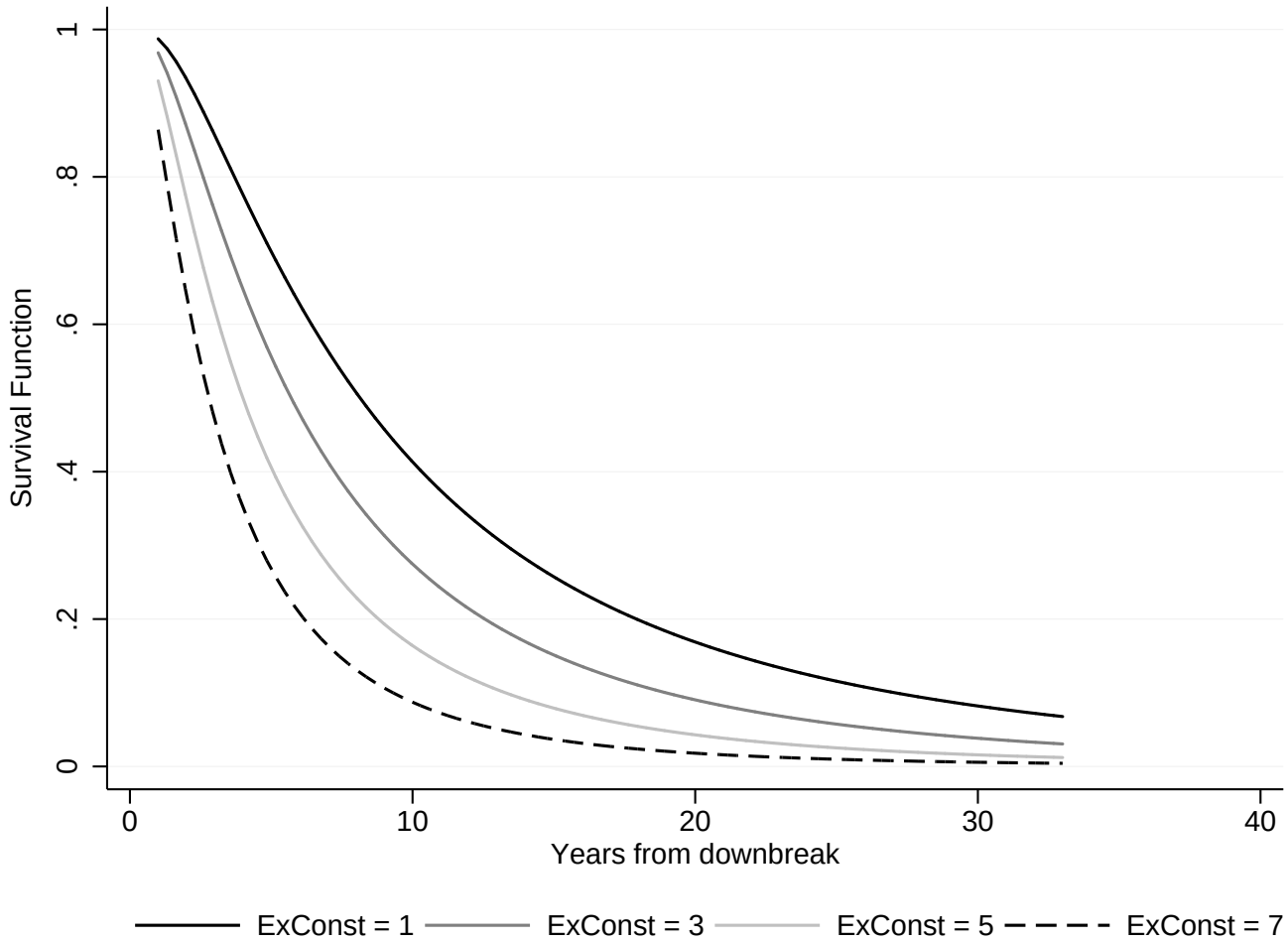
Summary models

VARIABLES	(1)	(2)	(3)	(4)	(5)
Executive Constraints	-0.195***	-0.163**	-0.169**	-0.156**	-0.135*
	(0.068)	(0.071)	(0.074)	(0.078)	(0.081)
Fractionalization (ELF15)	0.014***	0.014***	0.011*	0.011**	0.015***
	(0.005)	(0.005)	(0.006)	(0.005)	(0.004)
Inflation	-0.003	-0.004	-0.003	-0.001	-0.005*
	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)
Initial ln GDP	0.230	0.339**	0.113	0.469***	0.745***
	(0.153)	(0.152)	(0.188)	(0.180)	(0.251)
Real US Interest Rate	0.080	0.082	0.061	0.099*	0.052
	(0.057)	(0.052)	(0.054)	(0.053)	(0.049)
Trade Openness (de jure)		-0.823***			
		(0.313)			
Trade Openness (de facto)			0.009		
			(0.007)		
Years of Schooling				-0.107	
				(0.084)	
Region FE	–	–	–	–	YES
VCE	cluster	cluster	cluster	cluster	cluster
Exits	37	36	37	36	37
Spells	44	42	44	43	44
Years of Decline	232	218	232	212	232
Log-L	-53.908	-49.301	-53.100	-51.143	-44.242
Pseudo-R^2	0.174	0.213	0.186	0.188	0.322

Constant not shown. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

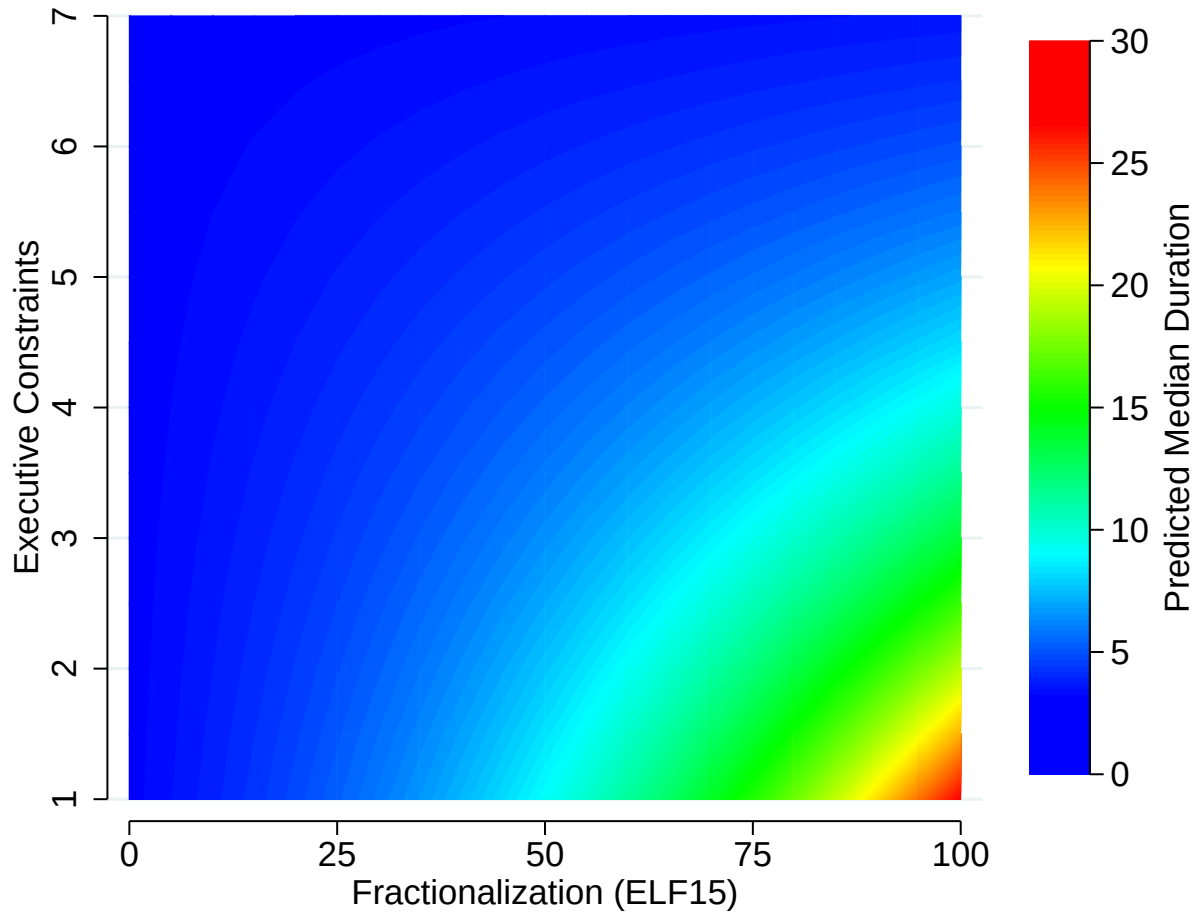
Institutions have a large effect

Figure: Predicted Survivor Curves at Executive Constraints = 1, 3, 5, 7



Institutions and ethnic cleavages

Figure: Exit times – interaction model w/ region FE in $\mathbf{x}_{t_0}$, interpolated



$$\ln \hat{\tilde{t}} = -.217^{**}\widetilde{INS}_{t_0} - .017^{***}\widetilde{ELF}_{t_0} + .003^{**}(\widetilde{INS}_{t_0} \times \widetilde{ELF}_{t_0}) + \mathbf{x}'_{t_0}\hat{\gamma} + .076^{*}USI_t$$

Robustness

- Effect of fractionalization is large & very robust, effect of institutions is also large & robust in most samples but not all
- In interaction model, both effects remain similarly robust
- Preferred model is robust to unobserved heterogeneity (regional & country), different functional forms, dependency of recurrent spells and dropping of influential observations
- Sub-Saharan Africa accounts for high effect of ELF
- Two "troublemakers" during specification search:
  - Too much missing data on covariates, sometimes throws out important variation in institutions
  - Two financial measures (credit & depth) weaken the coefficient on institutions, but they are strongly correlated with institutions and GDP
- An appeal to theory suggests that financial development is in fact an institutional outcome

Concluding remarks

Main findings

- A new way of identifying slumps provides new *stylized facts* on growth
- Institutions play a role in the run up to a slump and we find evidence of *positive institutional change* after a slump hits
- Robust evidence that the time to exit of the decline depends on institutions and ethnic cleavages
- Lends broad support for political economy theories stressing institutions, social conflict, institutions to *overcome* cleavages
- Growth accelerations are ubiquitous but *slumps* are not! Slumps matter for long-run performance.

Many avenues still unexplored:

- Analyzing depth of slumps, nesting breaks, and more . . .
- A model of how institutions and ELF affect slump duration

Bibliography

References (I)

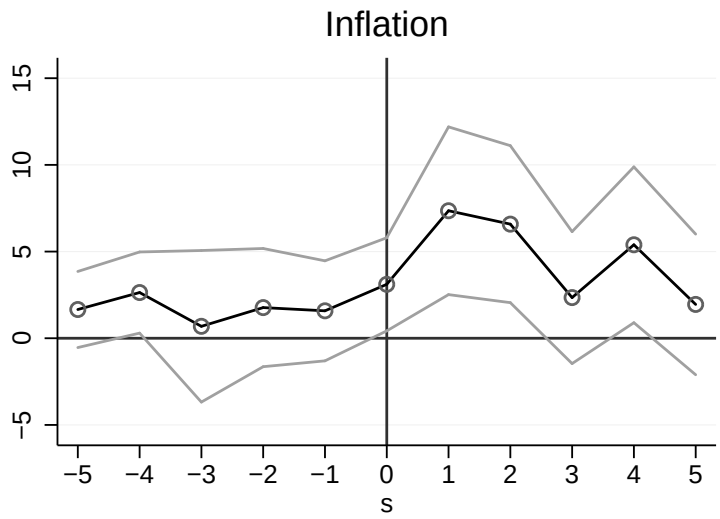
- Acemoglu, D., S. Johnson, J. A. Robinson, and Y. Thaicharoen. 2003. "Institutional causes, macroeconomic symptoms: volatility, crises and growth." *Journal of Monetary Economics*, 50 (1): 49–123.
- Bai, J. 1997. "Estimating multiple breaks one at a time." *Econometric Theory*, 13, 315–352.
- Bai, J. 1999. "Likelihood ratio tests for multiple structural changes." *Journal of Econometrics*, 91 (2): 299–323
- Ben-David, D. and D. H. Papell. 1995. "The great wars, the great crash, and steady state growth: Some new evidence about an old stylized fact." *Journal of Monetary Economics*, 36 (3): 453–475.
- Berg, A., J. D. Ostry, and J. Zettelmeyer. 2012. "What makes growth sustained?" *Journal of Development Economics*, 98 (2): 149–166.
- Diebold, F. X. and C. Chen. 1996. "Testing structural stability with endogenous breakpoint a size comparison of analytic and bootstrap procedures." *Journal of Econometrics*, 70 (1): 221–241
- Cameron, A. C., J. B. Gelbach, and D. L. Miller. 2011. "Robust Inference With Multiway Clustering." *Journal of Business & Economic Statistics*, 29 (2): 238–249.
- Gourinchas, P.-O. and M. Obstfeld. 2012. "Stories of the Twentieth Century for the Twenty-First." *American Economic Journal: Macroeconomics*, 4 (1): 226–265.
- Hausmann, R., F. Rodriguez, and R. Wagner. 2008. "Growth collapses" in C. Reinhart, C. Vegh, and A. Velasco, eds., Money, Crises and Transition, MIT Press, pp. 376–428.

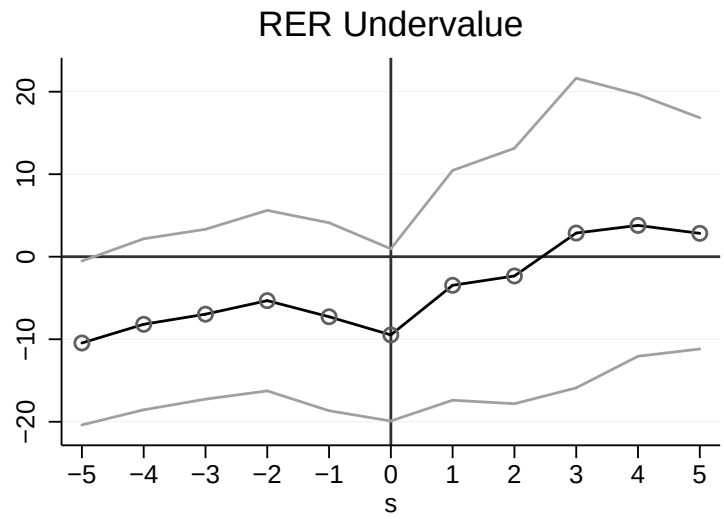
References (II)

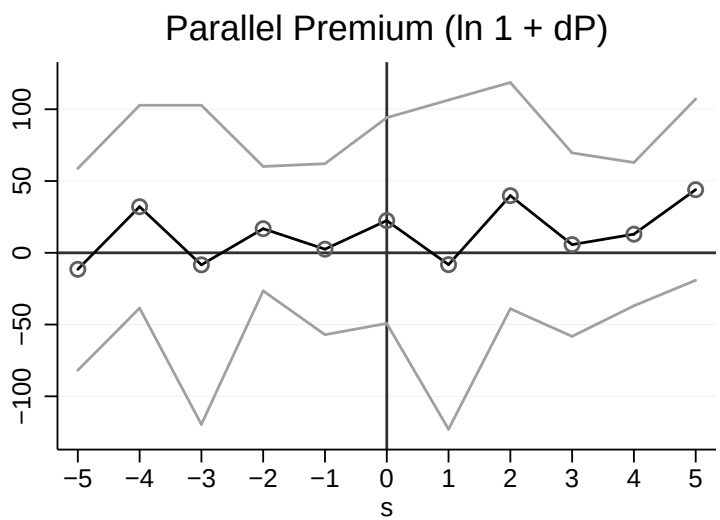
- Hausmann, R., L. Pritchett, and D. Rodrik. 2005. "Growth accelerations." *Journal of Economic Growth*, 10 (4): 303–329.
- Klomp, J. and J. de Haan. 2009. "Political institutions and economic volatility." *European Journal of Political Economy*, 25 (3): 311–326.
- Mobarak, A.M. 2005. "Democracy, volatility, and economic development." *Review of Economics and Statistics*, 87 (2): 348–361.
- North, D. C., J. Wallis, and B. Weingast. 2009. Violence and Social Orders Framework for Interpreting Recorded Human History, Cambridge University Press.
- Papell, D. H. and R. Prodan. 2011a. "The Statistical Behavior of GDP after Financial Crises and Severe Recessions." 56th Econ. Conference, Boston FED.
- Papell, D. H. and R. Prodan. 2011b. "Long-Run Time Series Tests of Constant Steady-State Growth." Manuscript, Univeristy of Houston.
- Pritchett, L. 2000. "Understanding patterns of economic growth: searching for hills among plateaus, mountains, and plains." *The World Bank Economic Review*, 14 (2): 221–250.
- Rodrik, D. 1999. "Where did all the growth go? External shocks, social conflict, and growth collapses." *Journal of Economic Growth*, 4 (4): 385–412.
- Thompson, S. B. 2011. "Simple formulas for standard errors that cluster by both firm and time." *Journal of Financial Economics*, 99 (1): 1–10.
- Zivot, E. and D. W. K Andrews. 1992. "Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis." *Journal of Business & Economic Statistics*, 10 (3): 251–270.

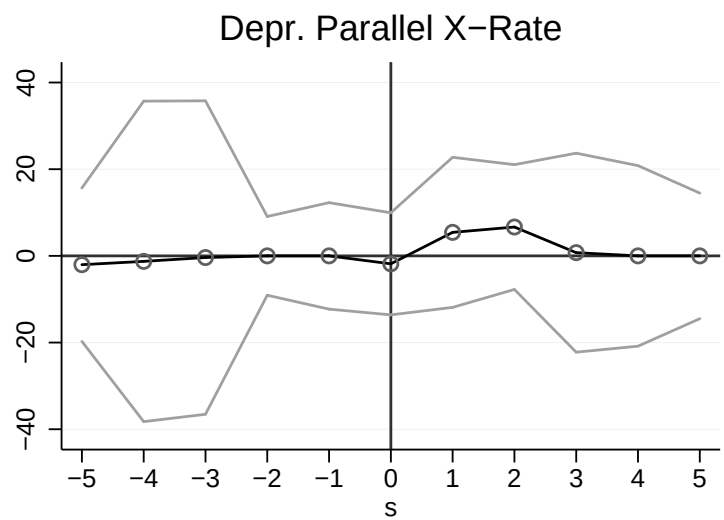
Back-up slides

All graphs (I): Prices and Exchange Rates

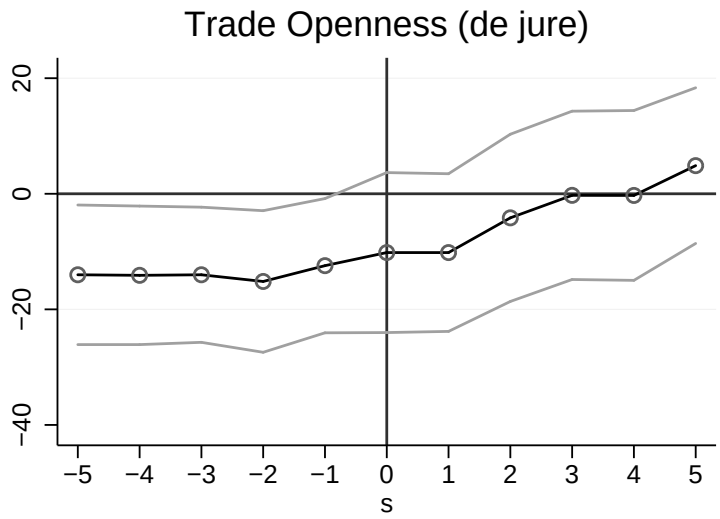


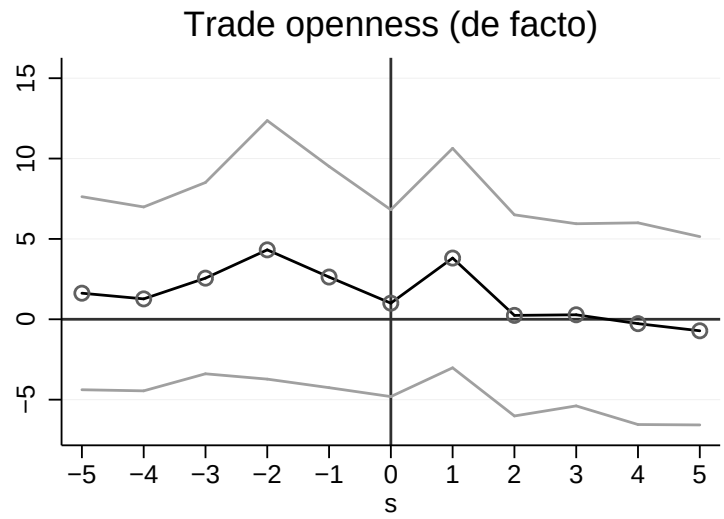


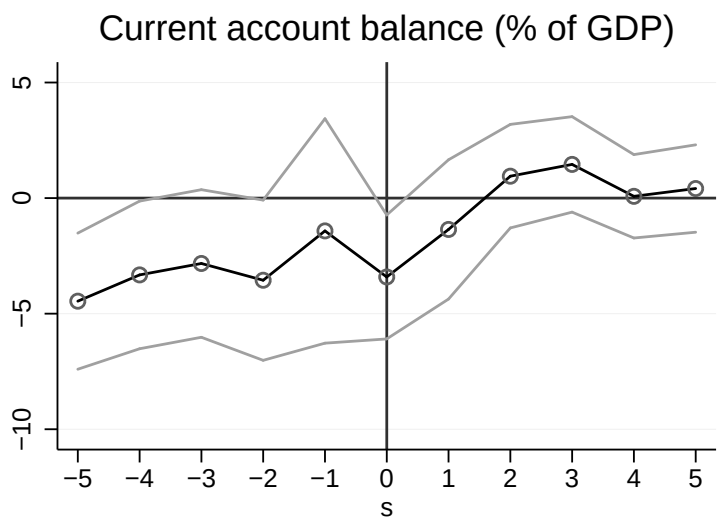


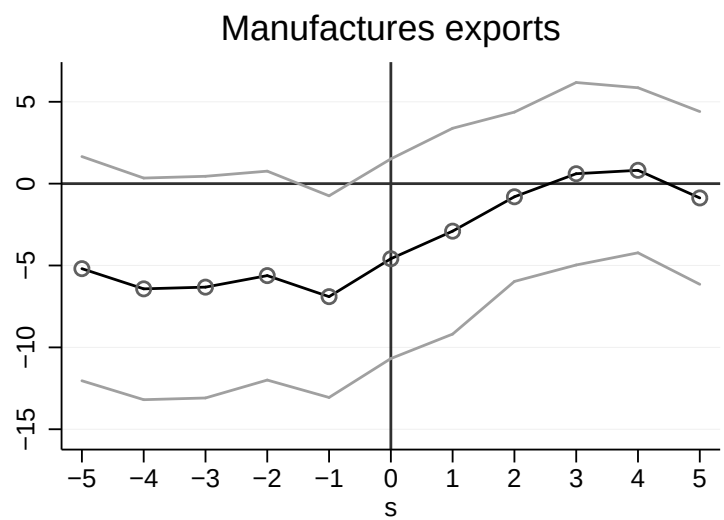


All graphs (II): Trade & Exports (I)

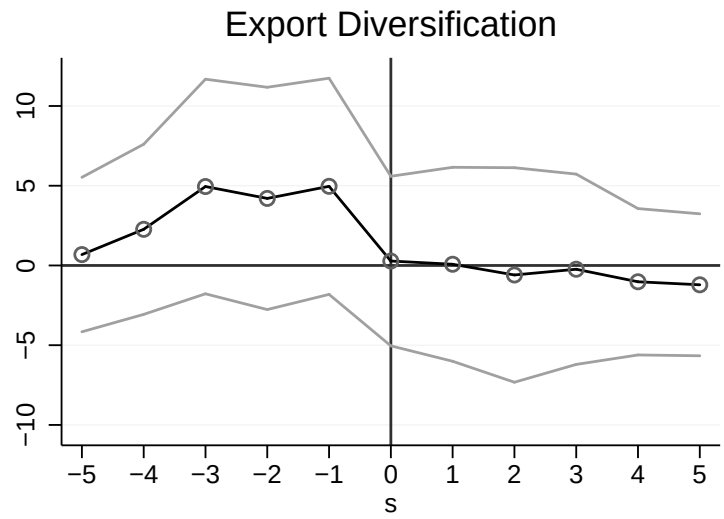


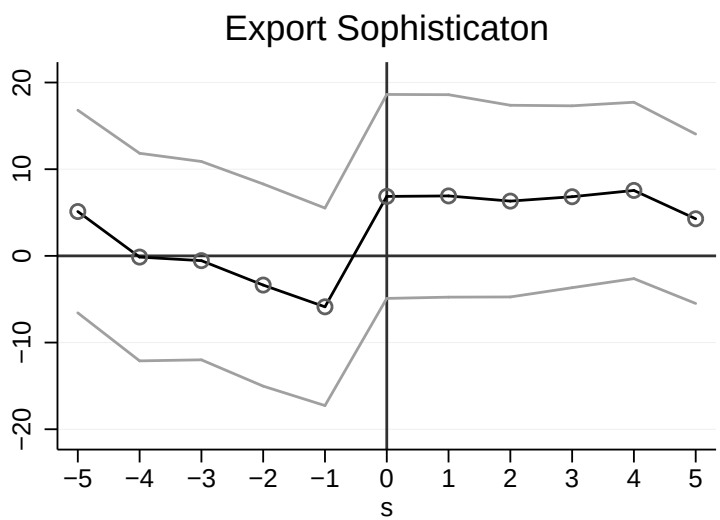


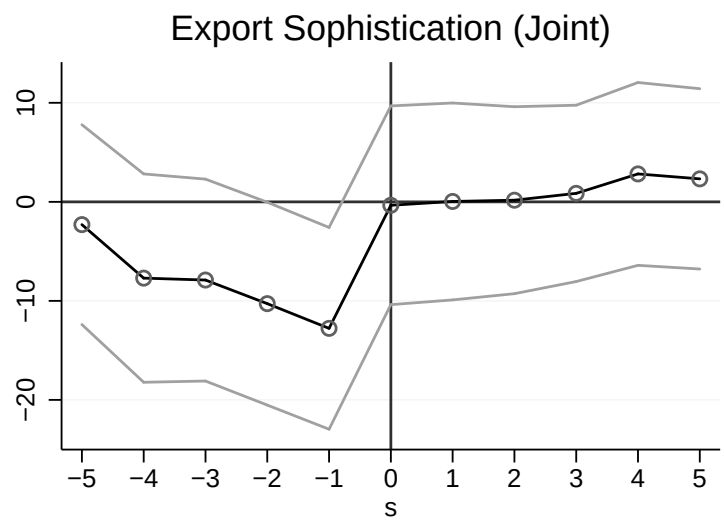




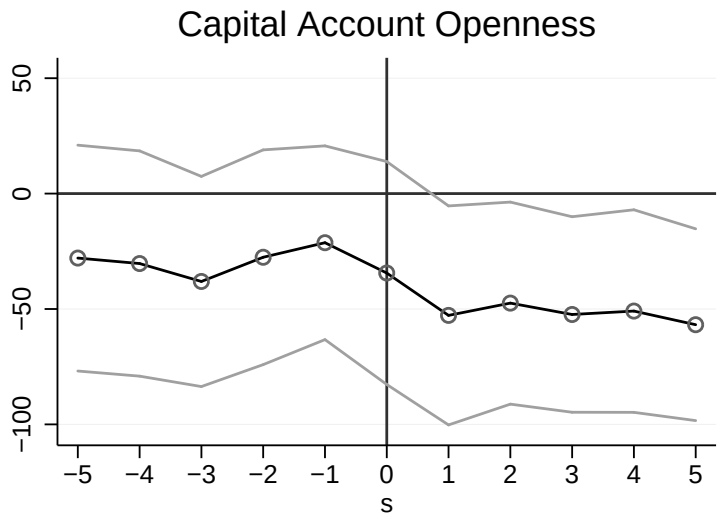
All graphs (III): Trade & Exports (II)

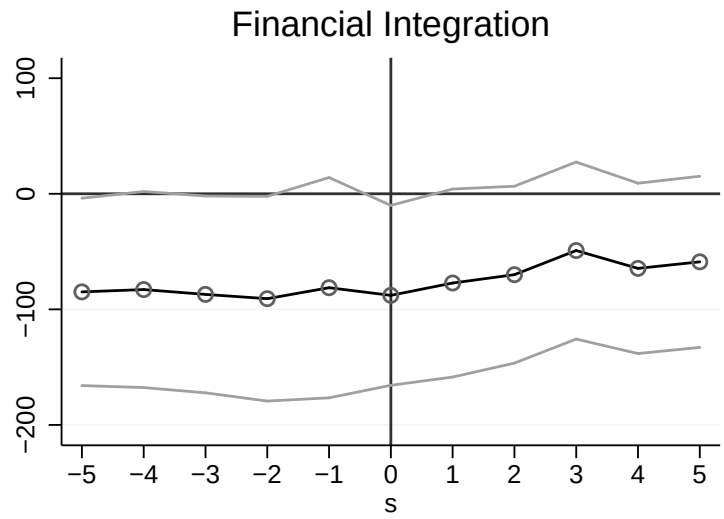


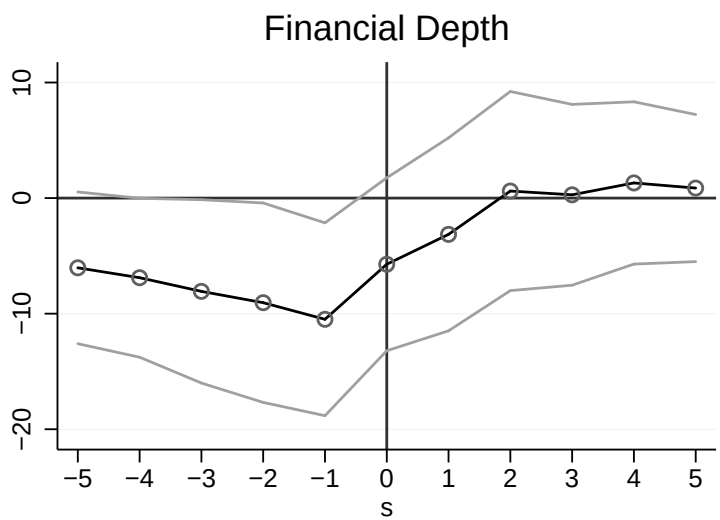


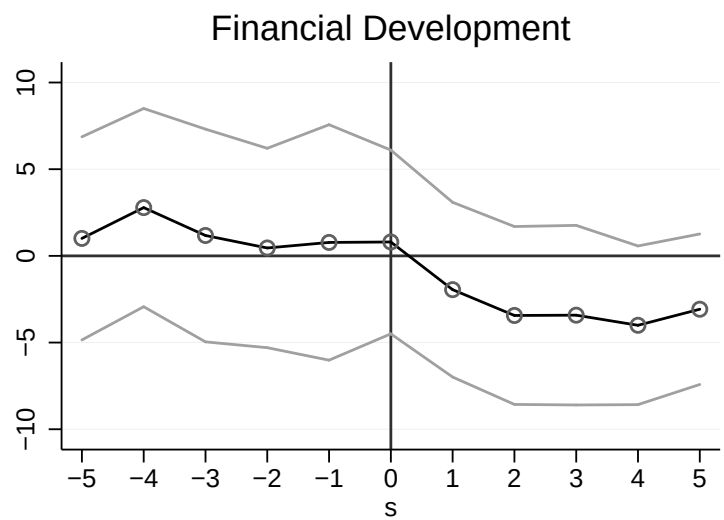


All graphs (IV): Finances (I)

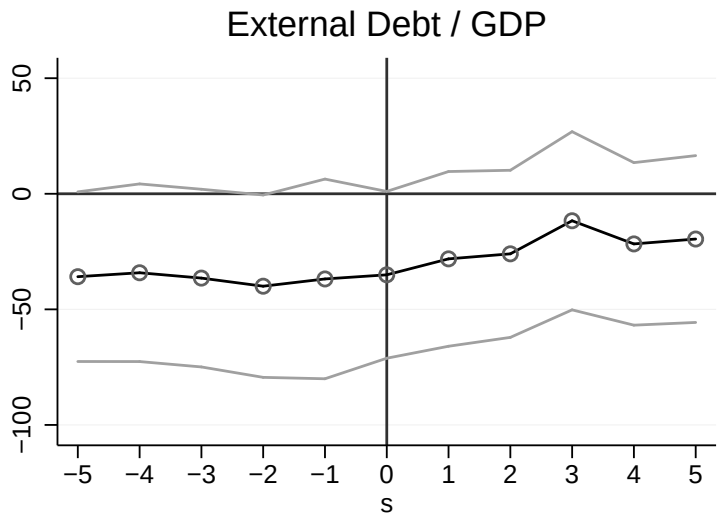


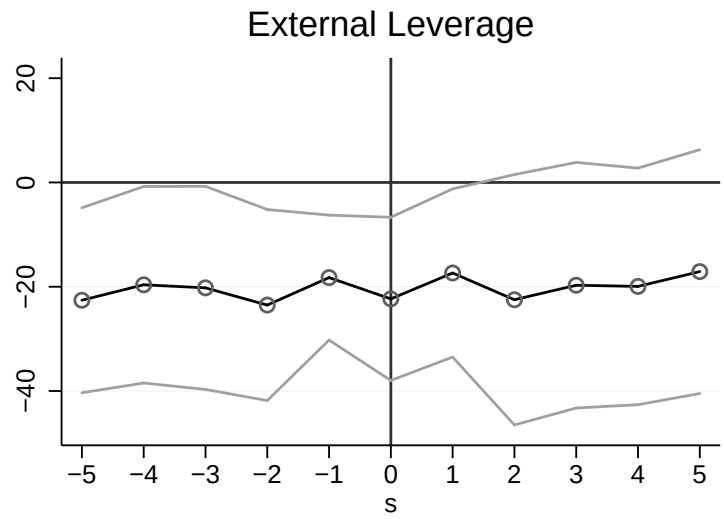


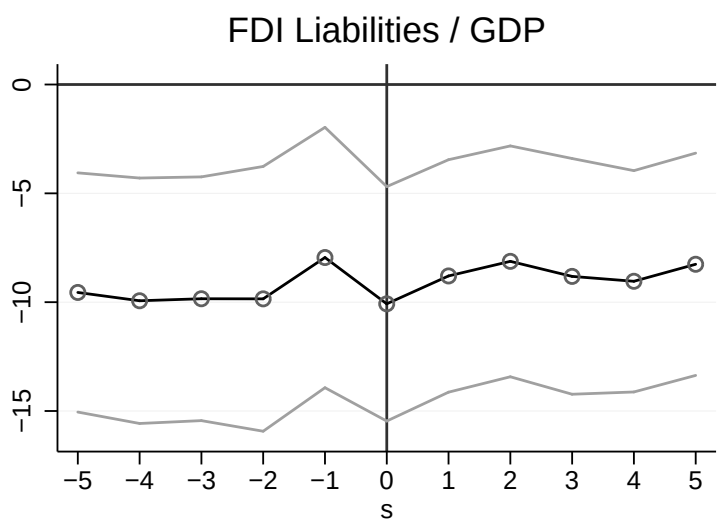


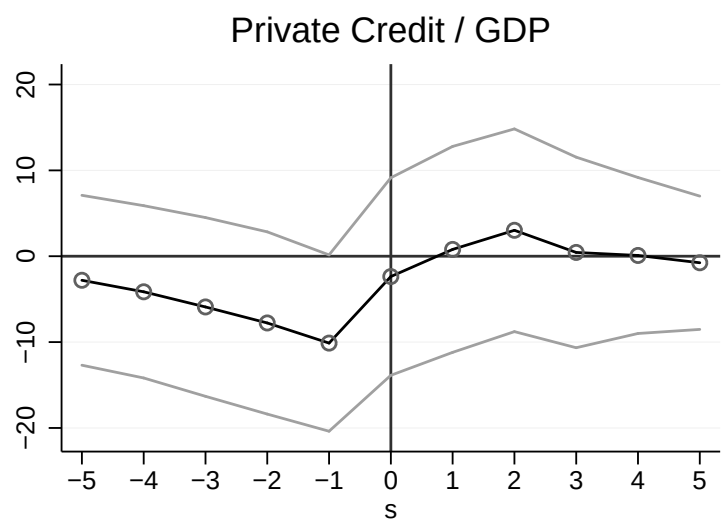


All graphs (V): Finances (II)

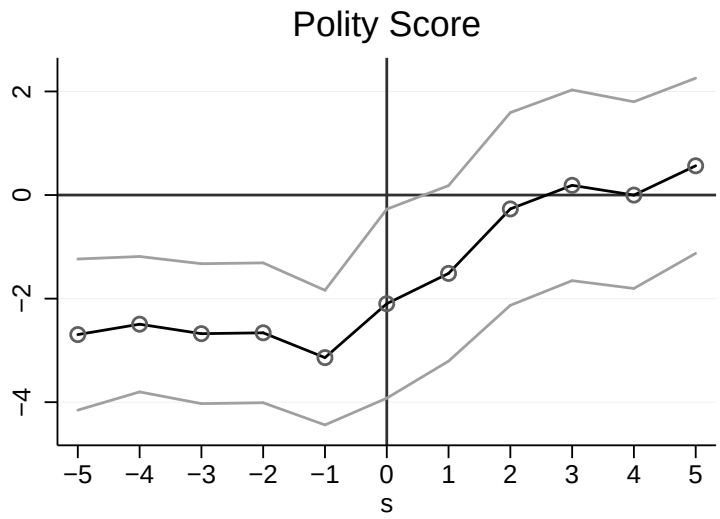


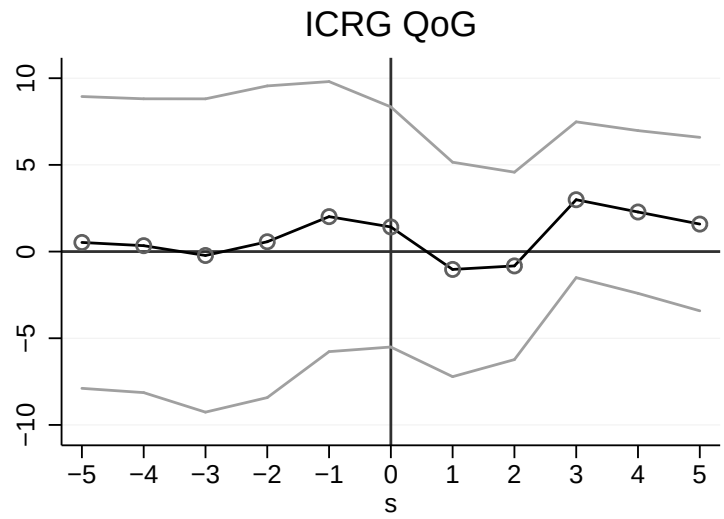


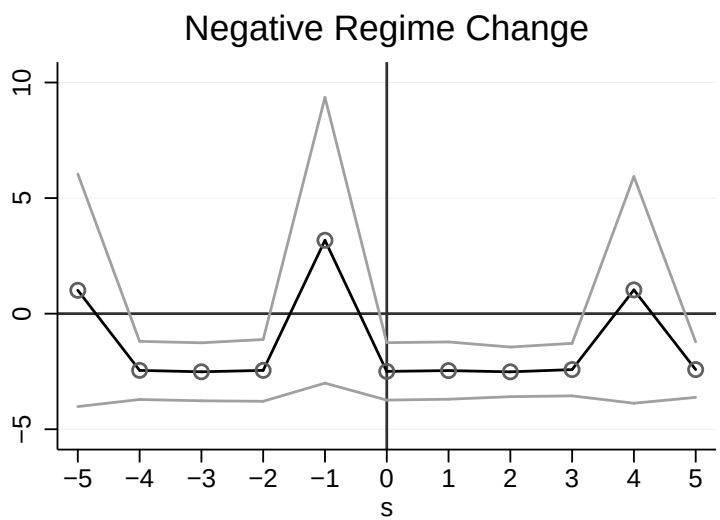


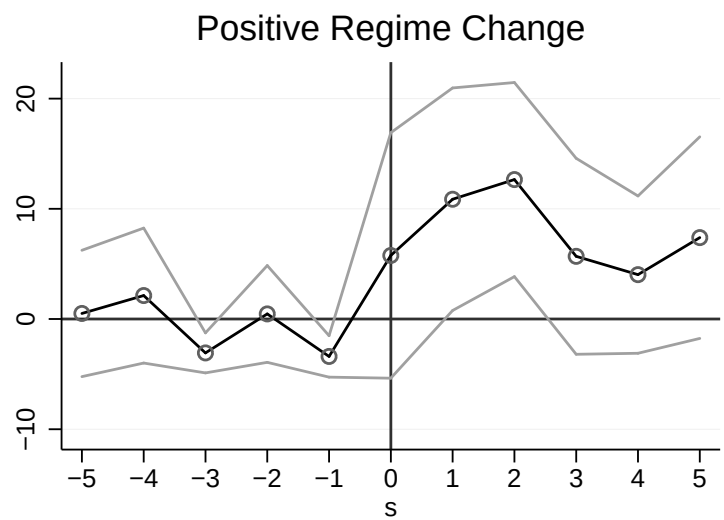


All graphs (VI): Institutions & Politics









All graphs (VII): Social & Political Conflict