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Governance and growth: A panel VAR approach.

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Abstract

In this paper, we explore the dynamic relationship between economic growth and quality of governance across a wide sample of countries. Using a panel vector autoregression (VAR) approach, we show that shocks to governance quality exert a positive and significant impact on economic growth, one that is sustained for more than ten years after the initial shock. Therefore, our results support the institutional view of economic growth, with better governance fostering higher growth. We also present evidence supporting the idea that higher growth leads to better institutions.

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1. Introduction

Since the seminal work of North (1990), the debate about the determinants of long-run growth has acknowledged the important role played by political and economic institutions in the process of economic development. Many scholars believe that differences in institutions constitute one of the fundamental explanations for differences in economic growth across countries – a view that gained popular appeal from contributions such as Acemoglu, Johnson, and Robinson (2001), among others. The institutional view shifts away from the traditional focus on elements such as innovation and capital factor accumulation, and centers on the incentive structures inherent to the way societies are organized.

The governance structure of one nation or society can be defined, in a broad sense, as the traditions and practices carried out by political institutions in the exercise of their authority. Studying the different aspects of governance helps us characterize how good or efficient the public administration of a country is and how influential it can be to the lives of ordinary citizens. The quality of public services, the implementation of sound public policies, the enforcement of property rights and the control of corruption are some examples of measures of good governance. The extent to which these elements relate to economic growth and whether any causal relationship can be established has been a matter of discussion in recent literature (e.g. Kaufmann and Kraay, 2002; Kurtz and Schrank, 2007).

This paper aims to contribute to this debate by exploring the dynamic relationship between governance and economic growth across a wide sample of countries and over time. In particular, we investigate how shocks to governance affect growth performance and vice versa. Our measures of governance quality are taken from Kaufmann et al. (2000), which provides indicators on six dimensions of governance for 214 countries for 25 years. We use a Panel Structural Vector Autoregression (Panel VAR) methodology, which allows us to account for time-invariant characteristics intrinsic to each country in our sample. We implement an identification scheme to recover orthogonal impulse-response functions (IRFs) and assess the dynamic effects of exogenous shocks on each variable in the system.

Our results show that, on average, shocks to governance quality positively impact economic growth and that this effect remains significant for more than ten years thereafter. Hence, our results support the institutional view of economic growth, with better governance fostering higher growth. We also present evidence that higher growth leads to better institutions.

Our findings are related, more directly, to the branch of the literature that investigates the relationship between economic growth and the various aspects that define good governance (e.g. Mauro, 1995; Kaufmann and Kraay, 2002; Gradstein, 2004; Krieger and Meierrieks, 2016). From a methodological point of view, our work relates to the panel VAR literature (e.g. Abrigo et al., 2016; Góes, 2016; Murphy and O'Reilly, 2019).

The remainder of the paper is organized as follows. In section 2, we give the details on the dataset used. In section 3, we present our empirical methodology. Section 4 discusses the results. Finally, conclusions are presented in section 5.

2. Data

Our measures of governance are from the Worldwide Governance Indicators (WGI) project, which provides cross-country composite indicators on six broad dimensions of governance throughout 1996 to 2020.[1] Table B.1 in appendix B presents a description of each variable as provided by the source.

The WGI data is largely perception-based in the sense that it is a combination of different views on the quality of governance from survey respondents and public, private, and non-government organization sector experts, compiled from more than 30 individual data sources. Final estimates for each country are reported in units of a standard normal distribution (with mean zero and standard deviation of one) and run between approximately -2.5 to 2.5, with higher values corresponding to better governance.

We follow Pritchett (2022) and define our measure of governance as the arithmetic average of four indicators: Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. Figure A.1 in appendix A shows fixed-effects OLS plots between our measure of *Governance* and the individual governance variables, revealing a high degree of correlation among them.[2]

Our measure of real income is GDP per capita PPP in constant 2017 international dollars from the World Development Indicators.[3] The final merged data with intersected information on growth and the six measures of governance comprises 4,708 unbalanced observations for 214 countries and 22 years (between 1996 and 2002, the WGI reported its estimates once every two years and from 2003 on, reports are yearly).

3. Methodology

We construct a panel VAR model with Y_{it} as our vector of k endogenous variables for country i at time t. In the baseline specification, $Y_{it} = [\log(GDP)_{it}, Gov_{it}]'$, where $\log(GDP)_{it}$ is the log of real GDP per capita and Gov_{it} is our governance indicator. The reduced form dynamic relationship among our endogenous variables can be described by:

$$Y_{it} = A_{0i} + A(\ell)Y_{t-\ell} + u_{it} \qquad i = 1, ..., N \quad t = 1996, ..., 2019 \tag{1}$$

where A_{0i} is a $k \times 1$ vector of time-invariant country-specific intercepts, $A(\ell)$ are $k \times k$ matrices of lagged coefficients, $A(\ell) \equiv \sum_{j=1}^{p} A_j \ell^{j-1}$, that collects the own- and cross-effects of the ℓth lag of the dependent variable on their current observations. Finally, u_{it}, is a $k \times 1$ vector of idiosyncratic disturbances where $\mathrm{E}(u_{it}) = 0$, $\mathrm{E}(u_{it}u_{it}') = \Sigma_u$ (being Σ_u a nonsingular matrix) and $\mathrm{E}(u_{is}u_{it}') = 0$ for $t \neq s$.

We follow the approach in Arellano and Bover (1995) and rewrite (1) in terms of forward orthogonal deviations to eliminate individual fixed effects and proceed with GMM

[1] Available at `http://info.worldbank.org/governance/wgi/`, retrieved on November 17, 2023.

[2] As Pritchett (2022), we do not use Voice and Accountability, and Political Stability and Absence of Violence to compute our measure of governance. However, in our robustness section, we present the results using these indicators individually.

[3] Available at `http://data.worldbank.org/data-catalog/world-development-indicators`, retrieved on November 23rd, 2023.

estimation. That is, for every element $y_{it} \in Y_{it}$,

$$y_{it}^{*} = (y_{it} - \overline{y_{it}}) \sqrt{\frac{T_{it}}{T_{it}+1}}$$

where T_{it} is the number of available future observations for country i at time t and $\overline{y_{it}}$ is its average.[4] Following Holtz-Eakin, Newey, and Rosen (1988), the list of lagged observations used as instruments is composed by observed realizations only, with missing observations substituted by zero.[5]

To identify structural shocks, we impose two different Cholesky orderings. In the first, real GDP per capita is ordered first, followed by our governance indicator. In this ordering, real GDP per capita is not affected by our governance indicator contemporaneously. In the second formulation, our governance indicator is ordered first, followed by real GDP per capita. In this ordering, our governance indicator is allowed to affect GDP per capita contemporaneously.

Impulse-response functions are recovered from rewriting equation (1) as $B(\ell)Y_{it} = u_{it}$, where $B(\ell) = (I_k - A(\ell))$. If all eigenvalues of $A(\ell)$ have a modulus less than 1, $B(\ell)$ satisfies the stability condition and is invertible. Therefore $B(\ell)^{-1} \equiv \Phi(\ell) = \sum_{j=0}^{\infty} \Phi_j \ell^j$ will be the parameters of the MA representation of our model, $Y_{it} = \Phi(\ell)u_{it}$, where

$$\Phi_j = \begin{cases} I_k, & j = 0 \\ \sum_{j=1}^{i} \Phi_{t-j} A_j, & j = 1, 2, ... \end{cases}$$

By implementing a Cholesky decomposition on $\Sigma_u = P'P$, where P is a lower-triangular matrix, it is possible to orthogonalize disturbances as $P^{-1}u_{it}$ (which will have covariance matrix $P^{-1}\Sigma_u(P^{-1})' = I_k$) and transform the MA parameters into orthogonalized impulse responses, $\Phi_i P$. That way shocks to one variable will independently provoke dynamic responses in the other variables of the system.

4. Results

This section is presented in two parts. First, we show the results for our baseline model using two alternative recursive ordering as discussed in section 3. Then, we discuss some robustness exercises.

4.1. Baseline Model

Our baseline specification consists of a panel VAR model built to evaluate the interaction between economic growth and governance quality for a wide sample of countries. In this model, the vector of endogenous variables is composed by $Y_{it} = [\log(GDP)_{it}, Gov_{it}]'$, where $\log(GDP)$ is the log of real GDP per capita and Gov is our indicator of governance as described in section 2. In choosing our model's optimal lag length, we rely on a set

[4] This transformation has some advantages over simple first-differences. By using deviations from an average instead of from another observation, forward orthogonal deviations reduce data loss and are less hampered by varying gaps between observations, which is the case in unbalanced panels.

[5] These steps were originally structured in Abrigo et al. (2016), who also provides the computational routine we use in this paper.

of consistent moment and model selection criteria proposed by Andrews and Lu (2001). According to those criteria, our model should be estimated using only one lag.[6]

We also check the stability condition and observe whether all the eigenvalues of the matrix of estimated coefficients are strictly less than one. If they are, the panel VAR model has a stable moving average representation.[7] Then, after estimation, we proceed to calculate impulse responses, whose plots are displayed in Figure 1 and 2. The results support the institutional view by showing that shocks to *Gov* incur a positive and statistically significant impact on $Log(GDP)$, remaining so for more than ten years after the shock. We also show that shocks in $Log(GDP)$ carry a positive effect on *Gov*, which remains statistically significant up to ten years after the initial shock in the model when our governance variable is ordered first in the PVAR model. Therefore, our results point to a bidirectional relationship between economic growth and governance, both reinforcing one another.

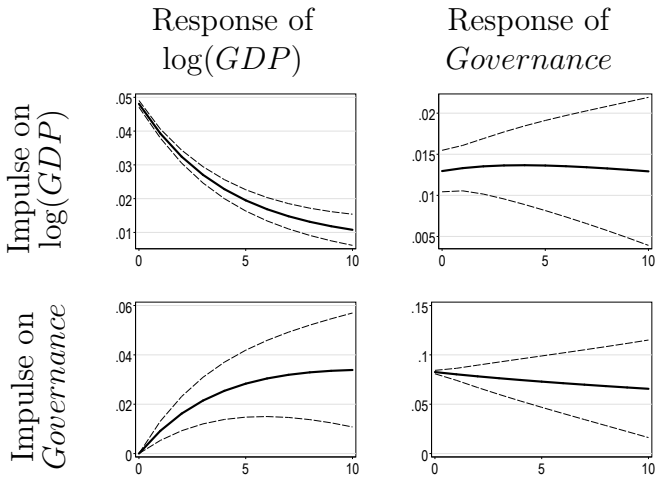

Figure 1: IRF Plots: Baseline Model I. In this model, real GDP per capita is ordered first, followed by our governance indicator. The column on the left contains plots of the responses from $\log(GDP)$ to a shock of one standard deviation in each indicated variable. The column on the right is the response from *Governance* to a shock of one standard deviation in each indicated variable. The solid lines correspond to the responses to the shocks in a ten-period horizon and the dashed lines are 90% confidence interval.

[6]Values by criterion are reported in table B.2, in appendix B. Andrews and Lu's (2001) criteria are based on Hansen's J statistic of over-identifying restrictions and are analogous to various commonly used maximum likelihood-based model selection criteria such as the AIC, the BIC and the HQIC. As an alternative, we also report the overall coefficient of determination (CD) of the model. These criteria and their use for selecting optimal lag orders for panel VARs models are also outlined in, and suggested by, Abrigo et al. (2016).

[7]Figure A.4 in appendix A shows the estimated values of the roots for the companion matrix, which confirm that the model is stable.

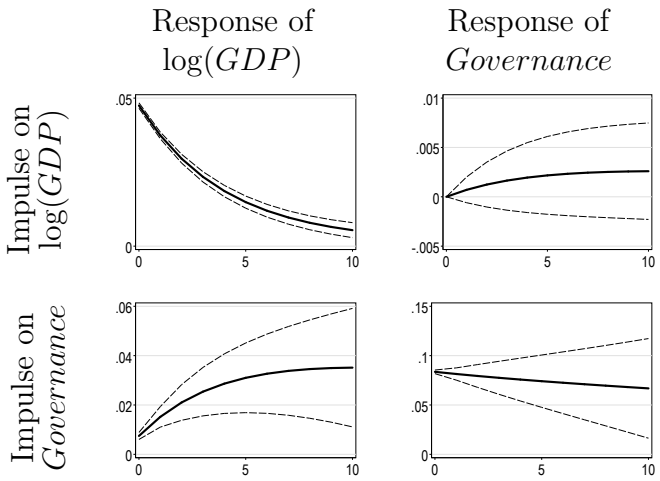

Figure 2: IRF Plots: Baseline Model II. In this model, our governance indicator is ordered first, followed by real GDP per capita. The column on the left presents the responses from $\log(GDP)$ to a shock of one standard deviation in each indicated variable. The column on the right shows the responses from *Governance* to a shock of one standard deviation in each indicated variable. The solid lines correspond to the responses to the shocks in a ten-period horizon and the dashed lines are 90% confidence interval.

4.2. Robustness

We implement a robustness exercise where we replace our measure of governance, Gov_{it}, in the vector of endogenous variables, Y_{it}, with each of the six individual measures of governance (see table B.1) and evaluate how results deviate from the original specifications. We implement two recursive orderings as in the baseline model. In each case, results remain qualitatively unchanged: shocks to both variables exert positive and significant impacts on one another (IRF plots are displayed in the online appendix A).[8]

5. Conclusion

In this paper, we use a comprehensive cross-country dataset with measures of governance quality to study the relationship between governance and economic growth. We rely on a panel VAR approach which accounts for country-specific fixed effects. The results for estimated impulse-response functions show a bidirectional relationship between growth and governance, as a shock to governance positively impacts growth and this effect is long-lasting. Conversely, an income shock leads to better governance. Therefore, our results support the institutional view of economic growth, with better governance fostering higher growth.

[8] As in the baseline model, the effects of shocks in $ln(GDP)$ on each governance indicator are significant only when they are ordered first in the PVAR model.

References

Abrigo, M. R., I. Love, et al. (2016). Estimation of panel vector autoregression in stata. *Stata Journal 16*(3), 778–804.

Acemoglu, D., S. Johnson, and J. Robinson (2001). The colonial origins of comparative development: An empirical investigation. *The American Economic Review 91*(5), 1369–1401.

Andrews, D. and B. Lu (2001). Consistent model and moment selection procedures for gmm estimation with application to dynamic panel data models. *Journal of Econometrics 101*(1), 123–164.

Arellano, M. and O. Bover (1995). Another look at the instrumental variable estimation of error-components models. *Journal of econometrics 68*(1), 29–51.

Gradstein, M. (2004). Governance and growth. *Journal of Developlment Economics 73*(2), 505–518.

Góes, C. (2016). Institutions and growth: a gmm/iv panel var approach. *Economics Letters 138*, 85–91.

Holtz-Eakin, D., W. Newey, and H. Rosen (1988). Estimating vector autoregressions with panel data. *Econometrica 56*(6), 1371–1395.

Kaufmann, D. and A. Kraay (2002). Growth without governance. *Economia 3*(1), 169–229.

Kaufmann, D., A. Kraay, and P. Zoido-Lobatón (2000). Governance matters. *Finance Dev 37*(2), 10.

Krieger, T. and D. Meierrieks (2016). Political capitalism: The interaction between income inequality, economic freedom and democracy. *European Journal of Political Economy 45*, 115–132.

Kurtz, M. and A. Schrank (2007). Growth and governance: Models, measures, and mechanisms. *The Journal of Politics 69*(2), 538–554.

Mauro, P. (1995). Corruption and Growth. *The Quarterly Journal of Economics 110*(3), 681–712.

Murphy, R. H. and C. O'Reilly (2019). Applying panel vector autoregression to institutions, human capital, and output. *Empirical Economics 57*, 1633–1652.

North, D. (1990). *Institutions, Institutional change and Economic Performance*. Cambridge university press.

Pritchett, L. (2022). National development delivers: and how! and how? *Economic Modelling 107*, 105717.

Appendices

A. Additional Figures

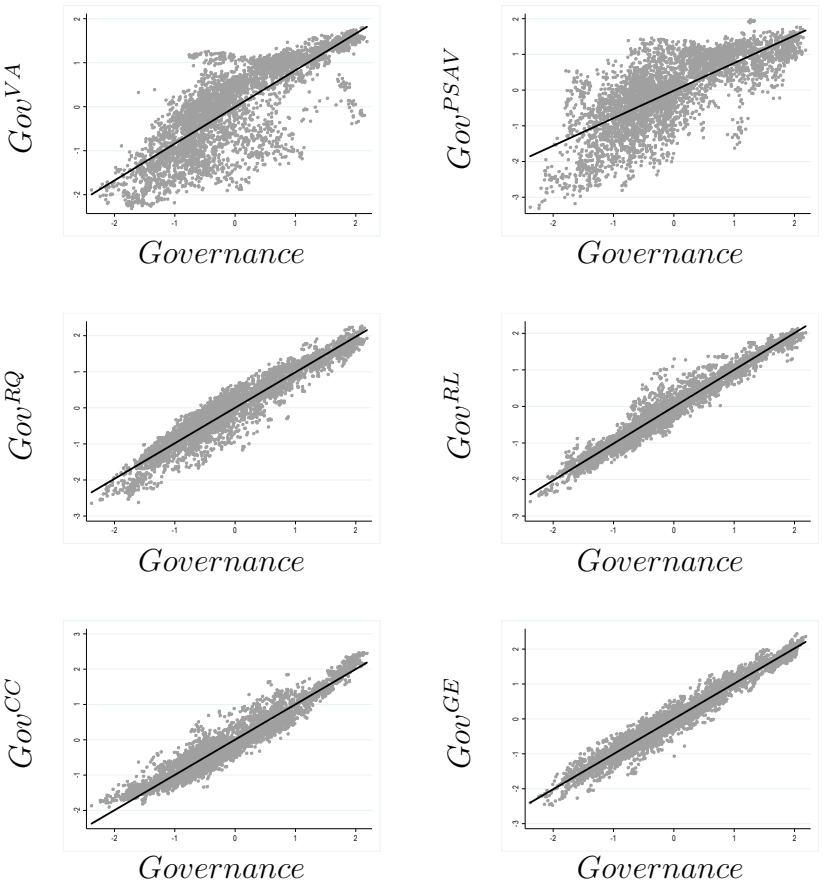

Figure A.1: OLS plots from fixed effects correlations between *Governance*, indicated in the x-axis, and the estimate indicated in the y-axis.

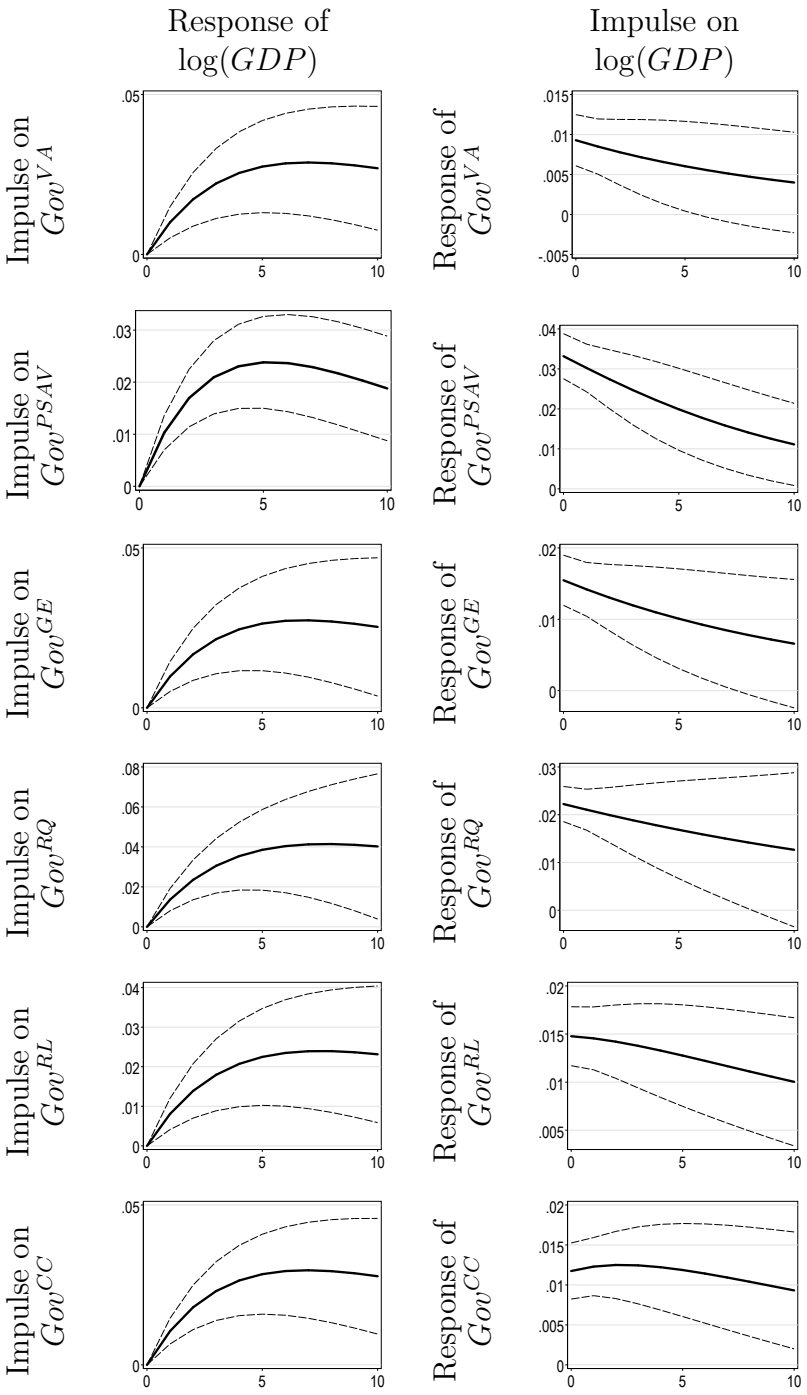

Figure A.2: IRF Plots: Individual indicators I. In this exercise $\log(GDP)$ is ordered first in the PVAR model, followed by the governance indicator. The column on the left contains plots of the responses from $\log(GDP)$ to a shock of one standard deviation in the Gov^{Index} referenced in each row. The column on the right is the responses from each Gov^{Index} to a shock of one standard deviation in $\log(GDP)$. The solid lines correspond to the responses to the shocks in a ten-period horizon and the dashed lines are 90% confidence interval.

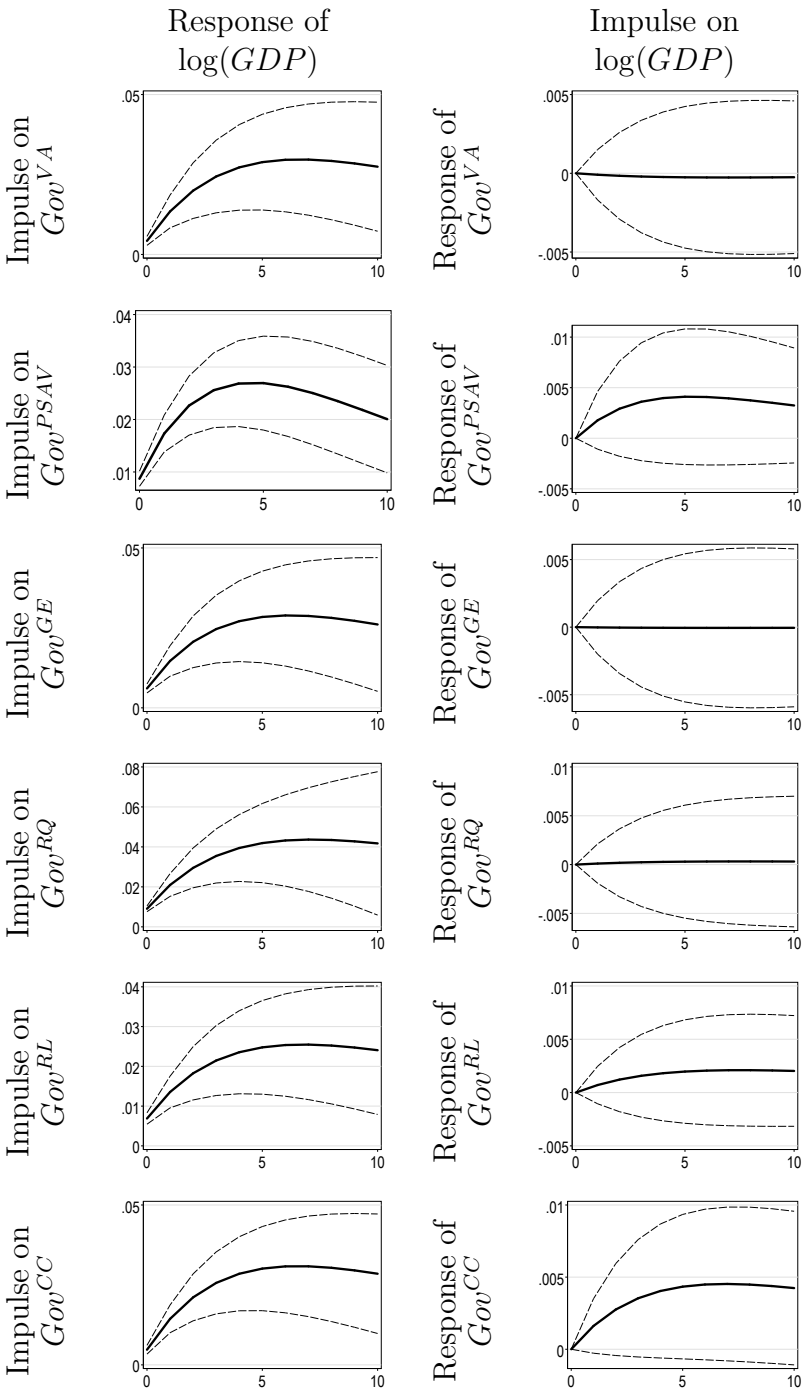

Figure A.3: IRF Plots: Individual indicators II. In this exercise, the governance indicator is ordered first in the PVAR model, followed by $\log(GDP)$. The column on the left contains plots of the responses from $\log(GDP)$ to a shock of one standard deviation in the Gov^{Index} referenced in each row. The column on the right is the responses from each Gov^{Index} to a shock of one standard deviation in $\log(GDP)$. The solid lines correspond to the responses to the shocks in a ten-period horizon and the dashed lines are 90% confidence interval.

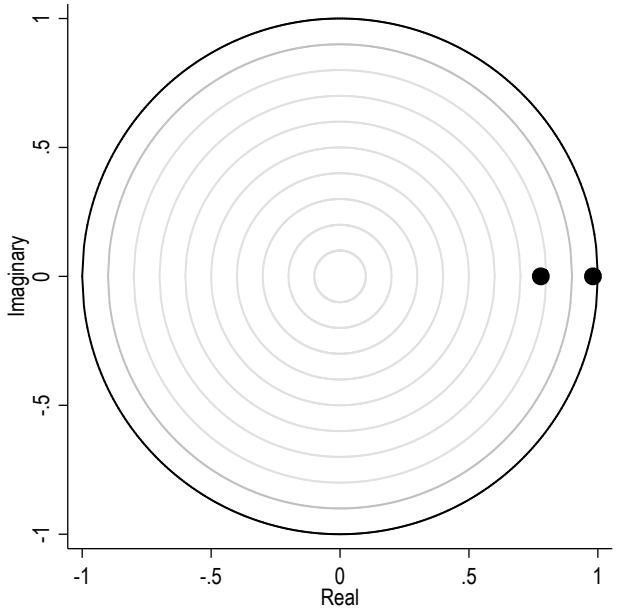

Figure A.4: Roots of the companion matrix

B. Additional Tables

Table B.1: Description of the Governance Variables

Variable Name	Governance Indicator	Description
Gov^{VA}	Voice and Accountability	*"Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media."*
Gov^{PSAV}	Political Stability and Absence of Violence	*"Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism."*
Gov^{GE}	Government Effectiveness	*"Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies."*
Gov^{RQ}	Regulatory Quality	*"Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development."*
Gov^{RL}	Rule of Law	*"Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence."*
Gov^{CC}	Control of Corruption	*"Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests."*

Note: data from Worldwide Governance Indicators. Available at `http://info.worldbank.org/governance/wgi/`.

Table B.2: Criterias for lag order selection

	Lag		
	1	2	3
CD	.999982	.9999756	.9999778
J	17.94342	9.580709	2.159409
J (p-value)	.1174195	.2956957	.706467
MBIC	-71.33834	-49.94046	-27.60118
MAIC	-6.056585	-6.419291	-5.840591
MQIC	-30.22196	-22.52954	-13.89572