

Revisiting the Relationship Between Federal Design and Economic Growth

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ABSTRACT: Federal design matters – but how? Federalism research has addressed the longstanding question whether federalism is linked with economic growth, but with differing results. In this study, I address the possible linkage using measures from the empirically rich Regional Authority Index. Examining federalism over time across ~70 nations, I evaluate the conceptually distinct expectations of self-rule and shared-rule federalism on several measures of economic development. The results fail to find an association between either self-rule or shared-rule and economic development, supporting the argument that the linkage is weak or even non-existent.

How does a federal system of government influence the economic development of a state? The outputs of federal design have long been studied by scholars of American federalism (Peterson 1995), comparative federalism (Bednar 2009), and – more recently – comparative development (Treisman 2007; Beazer 2014). From this research one would expect scholars to have a strong understanding of how federalism influences a country's development. In fact, much of this prior research has identified an association between economic gains and federalism (Weingast 1995; Rodden and Weibbles 2002; Hatfield 2015). Furthermore, studies on this relationship receive considerable attention from political, economic, and policy scholars – with publications receiving a high number of citations and studies being widely read within graduate programs.

However, prior scholarship has been hampered in part by the inability to measure over time change in federal design across countries. Instead, scholars have relied on either case studies of federal countries, typologies, or indirect measures to test theory.

Recently, federalism scholars have begun moving away from the traditional dichotomous or typology measures of federalism. Pioneering scholarship theorized in Elazar (1987) and measured in Hooghe et al. (2016) suggests that federalism is organized along two dimensions: self-rule and shared-rule. Self-rule is where subnational units of government have the authority to control either the administrative, economic, or political subnational processes of the state with little federal level interference. Shared-rule is where subnational units influence the central government of a state to administer aspects of government jointly. Self-rule is often associated with autonomy; shared-rule with participation. The Hooghe et al. measures of regional authority – termed the RAI – are important as they measure these concepts continuously.

Using the RAI, I reevaluate the association between federalism and economic development. I argue and test how the different dimensions of self-rule and shared-rule could be

associated with unique benefits to countries. Self-rule should encourage subnational governments to maximize economic growth at the meso-level. This in turn aggregates up and leads to a higher amount of growth in a country's economy. Conversely, shared-rule may lead to lower levels of economic growth because investments with interjurisdictional spillovers could be underprovided. Estimating a series of empirical models, I fail to find evidence of an association between federalism and economic development.

In this study, I first discuss the expected impact federalism has on a country's economic development—what Weingast (1995) calls market-preserving federalism. I then discuss the measurement of federalism, including recent scholarship from Hooghe et al. (2016) which provides a continuous operationalization of federalism's latent dimensions of self-rule and shared-rule. I expect that self-rule and shared-rule dimensions could have divergent impacts on a country's economic development. I then hypothesize that higher levels of self-rule should be positively associated with greater levels of economic growth and that shared-rule should be associated with a no difference, or even a decrease in economic growth. I use data from the World Bank to test my hypotheses. The results provide a first cut at attempting to disentangle the outputs of federal design using the self-rule/shared-rule continuous data provided by the RAI. While I do not find evidence of the expected linkages, the research hopefully will lead others to examine implications of federalism using these data and continue the search for empirical support for differences in self-rule and shared-rule implications.

WHAT ARE THE EFFECTS OF FEDERAL DESIGN?

The theoretical link between federalism and economic development was first made by Riker (1964) who argued that it is increased economic development that holds federations together after the necessary and sufficient condition of external conflict has subsided. Federations according to Riker have (1) more than one level of government, (2) autonomy of each level of government, and (3) the subnational level must have regulatory authority over its economy. Weingast (1995) builds on Riker's assertion regarding economic development and adds two additional conditions for federalism to support economic development. Weingast argues that states must (4) participate in the common market without trade barriers and (5) cannot have the authority to print money or have unlimited access to credit for federalism to spur economic development—a hard budget constraint. What is important to note is that the Weingast measures comport with the concept of self-rule federalism.

Weingast (1995) posits that the adoption of federal institutions leads to higher future levels of economic development – what he calls market-preserving federalism. The work of these two scholars provides a theoretically appealing reason as to why we should expect a positive linkage between federalism and development – and in fact – some empirical research has provided evidence that federalism aids in economic development (e.g., Rodden and Wibbles 2002; Hartfield 2015). But other research has failed to find evidence of this linkage (e.g. Davoodi and Zou 1998; Rodden 2006; Treisman 2007). Rubin and Feely (1993) provide an explanation, noting that market-federalism relies on the assumption that all sub-state entities want to increase economic output. A summation of a sample of these results is covered in Table 1. The bottom line is that the current results are mixed. The table makes clear that the market-preserving mechanism has yet to be clearly supported in empirical work. It also illustrates one of the problems with the earlier research—the dependent variables (economic development) and the

key independent variable (federalism) differ substantially over the research. Indeed, imprecise measurement of federalism has long plagued longitudinal, cross-national studies.

[Insert Table 1 here]

MEASURING FEDERALISM

The concern about measurement of federalism is widely recognized. Much of the previous research analyzing the outputs of federal design has typically relied on two approaches. Some scholars have undertaken single-state case studies of federal countries (Mueller 2014; Peterson 1995; Weingast 1995; Weissert and Jones 2015). Other studies rely on typological definitions of federalism such as administrative, political, and fiscal federalism (e.g. Watts and Rovinsky 1999; Falleti 2005).¹ Lijphart (2012) and Arzaghi and Henderson (2005) develop general typologies in the 0-4 and 0-5 range. Riker (1964) argued that federalism was a continuum, but finding a continuous measure of federalism has proven difficult.

Elazar (1987) defined federalism as a combination of two continuous dimensions: self-rule and shared-rule. Self-rule is a measure of how much power or autonomy sub-national units of government have within their own borders, as well as their ability to influence the country level of politics (Mueller 2014). A subnational unit which has greater unilateral authority within its jurisdiction or which has institutional checks on national government illustrates self-rule. Autonomy includes institutional duties such as lawmaking, fiscal control, and executive reach.

Shared-rule is the ability of meso-level governments to influence decisions at a higher level (Elazar 1987 and Watts 1998). Auer (2005) argues that shared-rule is probably the most decisive feature of a federation but needs more study. Mueller (2014) points out that shared-rule

includes the activities of actors and the processes they undertake as well as more customary structural measures of territorial representation and use of intergovernmental forums

Hooghe et al. (2016), Marks et al. (2008), Schakel (2008) and Hooghe and Marks (2012) operationalize these measures at the regional level and aggregate them to the country level. The authors construct a dynamic measure of self-rule and shared-rule federalism using annual scores. Self-rule is constructed from five component scores, a region's level of: *institutional depth*, the extent which a regional government is autonomous rather than decentralized; *policy scope*, the range of policies which regional government it responsible for; *fiscal autonomy*, the extent which regional government can independently tax its population; *borrowing autonomy*, the extent which regional government can borrow money; and *representation*, a measure of the independence of a region's executive and legislature.

Shared-rule is also constructed from five component scores assessing: *law making*, the extent which regional representatives help determine national legislation; *executive control*, the extent which regional governments determine national policy in intergovernmental meetings; *fiscal control*, the extent which regional representatives determine distribution of national tax revenues; *borrowing control*, the extent to which regional governments determine borrowing constraints of national and subnational government; and *constitutional reform*, the extent which regional representatives determine constitutional change.

A country where the national legislature controls all aspects of political and policy making will have both low levels of self-rule and shared-rule. These tend to be either small unitary countries (e.g., Luxembourg) or authoritarian regimes (e.g., Chile during the Pinochet regime). Countries that are more confederal will have high levels of self-rule and low levels of

shared-rule. Countries traditionally examined as federal by scholars (e.g., Germany, Switzerland, the United States) have high levels of both self-rule and shared-rule.

SELF-RULE AND SHARED-RULE IMPACTS ON ECONOMIC DEVELOPMENT

The two research avenues described here – federalism’s impact on economic development and definitions of federalism -- have generally operated separately. However, one can argue that we should expect to see differential impacts on economic development from self-rule and shared-rule. The hypotheses below reflect how the variation between each dimension of federalism should lead to unique implications.

Self-rule Federalism

I expect that countries with higher levels of self-rule federalism will experience greater levels of economic development for several reasons.

First, self-rule federalism allows subnational governments to maximize economic growth in their own region. Subnational units can act as policy innovators testing new means of raising revenues and providing services. Subnational units will focus on innovation that increases investment and jobs that can then be adopted by other subnational units. Successful measures can be adopted and adapted across a country, while unsuccessful innovations can be abandoned. Over time, federations that encourage local economic growth will have on average higher aggregate growth.

Second, the adoption of self-rule federalism allows subnational political elites, with better knowledge of the meso-regions, more control in driving economic development. In theory,

regional political actors should be more efficient in implementing local economic goals and producing higher economic growth. This growth should likewise aggregate up and benefit a country. Again, this hypothesis flows from the theoretical arguments developed in Riker (1964) and Weingast (1995).

Hypothesis 1: As a country's level of self-rule increases, economic development within the country should increase *ceteris paribus*.

Shared-rule Federalism

The second dimension of federalism, shared-rule, should be associated with a deceleration in the rate of economic development within a country.² The number of actors who participate in central decision-making is associated with suboptimal decision-making (Tsebelis 2002). As the number of decision-making actors increase, decisions reached by the group are less likely to be efficient. Actors in these configurations are also less likely to opt for painful short-term solutions. Scharpf (1988) documents this behavior – which he terms the joint-decision trap – when examining Germany and European Union integration. In both cases, actors fell into a suboptimal, bargaining style of decision-making as opposed to the more efficient, problem-solving approach.

While explicit predictions on the association between shared-rule and economic development are scarce, comparative development literature is rife with examples of shared responsibility between levels of government hindering the benefits of fiscal decentralization: including Brazil's 1988 reforms (Baiocchi 2006), Bolivia (Inchauste 2009), post-soviet states (Jakubowski and Topinska 2009), and Indonesia (Hofman and Kaiser 2006). Ezcurra and

Rodriguez-Pose (2013) provides a detailed empirical examination of this relationship. Observing the economies of twenty-three OECD countries over time, the authors examine if decentralization negatively affects economic development across a series of political federalism measures – including the RAI. The authors find negative – yet statistically insignificant – relationships between federalism and economic growth. Examining this association across all ten components of regional authority, the authors find that one measure of shared-rule, fiscal control, is negatively associated with growth. While the authors’ prior research focuses only on developed countries over a short period, the research serves as a useful guidepost. Because of these prior empirical findings, I expect that if there is a relationship between shared-rule federalism and economic development the variables will be negatively associated.

Hypothesis 2: As a country’s level of shared-rule increases, economic development within the country should decrease *ceteris paribus*.

DATA AND METHODS

To test the hypotheses, I leverage the RAI data, across countries and over time to examine whether and how self-rule or shared-rule federalism affect economic development. The detail and extent of the RAI allows for the broadest analysis yet of federalism’s impact on this topic. In my analysis, I examine seventy-one countries over a possible forty years (1970-2010) to evaluate my hypotheses. The time-span was chosen since World Bank data used as controls in the models are available for many countries only after 1970. All countries in the Western Hemisphere and western Europe with an average population greater than 150,000 over the forty-year timespan are included in the analysis. In addition, former Eastern Bloc countries are

included in the dataset after the collapse of the Iron Curtain. Developed countries outside of Europe and North America – Australia, Israel, Japan, New Zealand, South Korea and countries in Southeast Asia are also included. A table with all countries and timespans for which data are available is provided in the Supplemental Appendix in Table A1 and Figure A2. In the reported models I average between 2,056-2,646 country-year observations in my dataset.

Dependent Variables

To test the relationship between measures of regional authority and economic growth I leverage three measures of economic health. First, I use the year-over-year economic growth within a country using Gross Domestic Product at Purchasing Power Parity, normalized to 2010 dollars (*GDP (PPP)*). Second, I use the per capita net income within countries, normalized to 2010 dollars (*Per Capita Net Income*). Third, I use the electric power consumption – measured in kilowatt-hours per capita within each country (*Electric Consumption*). These measures correlate with three important aspect of a country’s economic health: economic production, citizen wealth, and development, respectively. The measures of economic growth data were collected from the World Bank. All dependent variables are differenced in the analyses.

Independent Variables

The main independent variables of interest—self and shared-power – are from Hooghe et al. (2016). The Hooghe et al. latent concepts of federalism map onto Weingast’s necessary conditions of federalism and economic development. I expect to find a positive association

between self-rule and economic development and a negative association between shared-rule and economic development.

The self-rule federalism (*Self-rule Federalism*) measure is an index used by Hooghe et al. of the components of institutional depth, policy scope, fiscal autonomy, borrowing autonomy, and representation. Each of these components is summed by regional tier to create an index of self-rule ranging from 0 to 18. Higher scores in each index are associated with a greater level of self-rule within a region. Each regional tier is then aggregated to construct a country-level score. For example, the United States consists of multiple regional tiers – including states, the District of Columbia, Puerto Rico, and Native American tribes. Scores are weighted by population if regional tiers overlap with one another, and the sum of scores across each regional tier determines each country's level of self-rule federalism. The higher the aggregated score, the greater the level of self-rule federalism within the country compared to other countries. Countries in 2010 – the most recent year of measurement – with low levels of self-rule federalism include many geographically small, centralized nations. Luxembourg, Singapore, and Suriname are observed as having no self-rule federalism. Bosnia and Herzegovina, Germany, and Italy are countries with some of the highest observed levels of self-rule.

The shared-rule (*Shared-rule Federalism*) measure is constructed in a similar manner as the self-rule scale. The scale is a measure of indices of law making, executive control, fiscal control, borrowing control, and constitutional reform. Again, each of these components is calculated across regional tiers with a range of 0 to 12 per tier and scores are aggregated to calculate a country-level score. The higher the aggregate score the greater the level of shared-rule within the country. Albania, Chile, and France are examples of countries with low shared-

rule federalism in 2010 – all observed with zero shared-rule federalism. Australia, Belgium, and Spain are examples of countries with observed high levels of shared-rule federalism.

I lag both measures of federalism in the analyses. Substantively, I am estimating federalism's impact in the previous year on each dependent variable on development in the current year. My theory suggests that last year's level of federalism should be a good predictor of this year's level of growth. Additionally, I chose not to disaggregate the self-rule shared-rule scores constructed by Hooghe et. al. as the authors provide evidence that all ten components of federalism load onto either the self-rule or shared-rule dimensions. Disaggregation would thus ignore the theoretically important federal components that the authors have developed.

Controls

I also include a series of control variables in the statistical models. The rents variable (*Rents [percent GDP]*) is measure of the percentage of a country's GDP that is due by to natural resources in each year. This variable is included to account for fact that countries with economic dependence on natural resources are likely to suffer from a resource curse (Sachs and Warner 2001). To control for larger countries having, on average, lower economic growth, I include a log of each country's GDP normalized in 2010 dollars (*Log [GDP]*). I include a measure of a country's level of democracy (*Quality of Democracy*) in the model, using Polity2 measure in the analyses.

As conflict may affect a nation's focus on development, I include two variables to account for this. I include two sets of dichotomous variables indicating if a nation was involved in a civil conflict (*Civil Conflict*) or ethnic conflict (*Ethnic Conflict*) in a particular year. The

variables are mutually exclusive. Data was collected from the Multiple Episodes of Political Violence (MEPV) database.

I also include a trio of demographic variables in the models: a measure of each country's population in thousands (*Population [000s]*), percent annual population growth (*Percent Population Growth*), and population density measured as persons per square kilometer (*Population Density [persons/km]*). Additionally, I include year and region fixed effects in the analyses.

ANALYSIS

[Insert Table 2 here]

Table 2 contains summary statistics of the variables included in the models. Turning attention to the dependent variables, the median annual GDP PPP per country is \$9,135.65 for country-years in the sample. The median per capita net income is \$9,236.21. The median inflation rate is 5.47 percent. The table illustrates the substantial variation along the dimensions of federalism in the data. Countries are more likely to vary along self-rule than shared-rule. The mean country in the data averages over seven points towards self-rule compared to under two points towards greater levels of shared-rule – although some countries report no amount of either shared-rule or self-rule.

To evaluate the relationship between economic development and federalism I begin with a cross-sectional analysis, I estimate three models for each dependent variable across a set of three tables reported in tables 3-5. All models in the table are estimated using Ordinary Least Squares (OLS) regression with year and region fixed effects. The first model in each table

includes only the independent variables of interest, self-rule federalism and shared-rule federalism. The second model in each table includes regional federalism variables and control variables. Models one and two cluster standard errors by country. The third model in each table includes the same variables as model two, but estimates results using country random effects.

Looking first at self-rule federalism in Table 3, I find a negative and significant association between self-rule federalism and a country's GDP in model 1. On average a one-unit increase in self-rule federalism is associated with an \$11 decrease in a country's year-over-year change in GDP. However, this association dissipates once control variables are introduced into the regression.³ The results for shared-rule federalism are similarly unsatisfying. In model 1, shared-rule federalism reports an increase in year-over-year GDP change. In models 2 and 3 shared-rule federalism reports a negative association with a country's GDP – as expected in H2 – yet the reported coefficients are far from reaching conventional levels of statistical significance

Looking at the control variables across models, Rents are positively associated with change in GDP in both models. A country's level of democratization is positively associated with GDP in model 2, yet fails to reach significant associated with a country's GDP in model 3. Both measures of conflict are negatively associated with change in GDP, only in model 2. Countries with larger populations and higher percent population growth are associated with smaller increases in GDP in both models. Finally, increases in population density are associated with increased change GDP in both models.

[Insert Table 3 here]

Tables 4 and 5 find a similar inconsistent association between regional federalism measures on a country's net income and electric consumption, respectively. Starting with Table

4, I find no consistent association between self-rule federalism and income. Self-rule federalism again reports a negative, non-significant, coefficient with respect to change in net income in model 4. The coefficient for self-rule is positive in models 5 and 6 when control variables are added. However, this association fails to reach conventional levels of statistical significance. Likewise, shared-rule federalism reports non-significant coefficients across all models in the table -- positive in model 4 and negative in models 5 and 6.

Turning to Table 5, again there is a lack of significant associations when examining federalism's potential impact on per capita electrical consumption. Self-rule federalism fails to reach statistical significance – and reports negative coefficients – across models 7 through 9. Shared-rule federalism reports a small, positive coefficient across in model 7, and negative coefficient in models 8 and 9, once controls are included. Again, all associations are non-significant.

In both tables 4 and 5, the Rents, Percent Population Growth, and Population Density control variables report significant associations in line with the results reported in Table 3.

[Insert Table 4 here]

[Insert Table 5 here]

Cumulatively, the results from Tables 3 through 5 fail to find consistent support for H1 or H2. Self-rule is not associated with increased economic development – at least across countries using over time data. Likewise, there is no association between shared-rule and a decrease in economic development.

To help validate that the lack of the association between federalism and economic development is not an artifact of autocorrelation – I re-estimate models using pooled error

correction mechanisms (ECMs). In ECMs, the dependent variable is modeled in response to temporary or permanent changes. In short, the dependent variable is seen as having an equilibrium relationship with independent variables – when independent variables change an “error” in the dependent variable is produced – and the model identifies the magnitude of either 1) the scope of the shock if the change was temporary or 2) the new equilibrium if the change was permanent. ECMs are useful as they allow for dynamic patterns in data while remaining simple to estimate and interpret.

A pooled ECM analyzes associations by combining data from all countries in the sample into a single data set and differencing the dependent variable on the left-hand side and including both levels and differencing the dependent independent variables as well as the lagged difference level of the dependent variable on the right. The structure allows me to estimate both short-term and long-term associations while accounting for within and between country variation simultaneously. An introduction to ECMs can be found in (Beck 1991), ECMs for political economy data in (Franzese 2002), and ECMs in federalism scholarship in (Rodden 2003).⁴ The model is estimated as follows:

$$\begin{aligned} \Delta DV = & \beta_0 + \beta_1 DV_{t-1} + \beta_2 \textit{Self rule Federalism}_{t-1} + \beta_3 \Delta \textit{Self rule Federalism}_{t-1} \\ & + \beta_4 \textit{Shared rule Federalism}_{t-1} + \beta_5 \Delta \textit{Shared rule Federalism}_{t-1} \\ & + \beta_6 \textit{Log (GDP)}_{t-1} + \beta_7 \Delta \textit{Log (GDP)}_{t-1} + \beta_8 \textit{Rents}_{t-1} + \beta_9 \Delta \textit{Rents}_{t-1} \\ & + \beta_{10} \textit{Quality of Democracy}_{t-1} + \beta_{11} \Delta \textit{Quality of Democracy}_{t-1} \\ & + \beta_{12} \textit{Civil Conflict}_{t-1} + \beta_{13} \Delta \textit{Civil Conflict}_{t-1} + \beta_{14} \textit{Ethnic Conflict}_{t-1} \\ & + \beta_{15} \Delta \textit{Ethnic Conflict}_{t-1} + \beta_{16} \textit{Population}_{t-1} + \beta_{17} \Delta \textit{Population}_{t-1} \\ & + \beta_{18} \textit{Population Growth}_{t-1} + \beta_{19} \Delta \textit{Population Growth}_{t-1} \\ & + \beta_{20} \textit{Population Density}_{t-1} + \beta_{21} \Delta \textit{Population Density}_{t-1} + \varepsilon \end{aligned}$$

The first two variables – the lagged level and lagged difference of the dependent variable – are the error component of each ECM model. The next four variables are the regional authority variables. The remaining variables are the controls used throughout the study. Because the time series analyzes over-time cross-sectional data, I estimate models with pairwise panel corrected standard errors. The coefficients on the differenced – change variable – are the short-term effects of each variable and can be interpreted in the same manner as a traditional regression coefficient. The coefficient of the lagged levels is used to determine the long-term effects and calculated by dividing the coefficient by the lagged level of the dependent variable (β_1). Results are reported in Table 6. The estimates of the pooled ECMs are similar to the cross-sectional analysis.

Looking across the three measures of economic development, I find no short-term or long-term associations between either self-rule or shared-rule. In fact, the direction of federalism measures is inconsistent across models. Only the short-term measure of self-rule reports a consistently positive -- yet still non-significant – association across models.

Across estimated models, control variables mostly lack meaningful associations with the measures of development. When associations are present, they are inconsistent between models. The Log (GDP) variable is consistently associated with a change in economic development, and even then, it is only associated with increases in economic development in the short-term. Additionally, two long-run demographic measures are associated with development; percent population growth is negatively associated with development and population density is positively associated with measures of development. In totally, these results comport with the previously reported cross-sectional estimations.

[Insert Table 6 here]

DISCUSSION

The results presented in this study fail to find the hypothesized associations for both self-rule and shared-rule federalism on economic development. Federalism's impact on economic development – while theoretically appealing – is simply not evident in this analysis; even using data reflecting two dimensions of federalism over time. Two possible conclusions are that: federalism's impact is too subtle to be reflected on economic development and our search for good measures continues or market federalism is simply wrong.

This analysis is far from the first to struggle to find evidence of the effects of market federalism (Treisman 2007; Rodden 2006; Ezcurra and Rodriguez-Pose 2013). It may be – at the cross-country level – that market federalism is not observed. If this is the case, scholars must think about why countries continue to adopt federal relationships and what other potential economic benefits or tradeoffs may exist. One theory that deserves future consideration is discussed in Rubin and Feeley (1993). The authors suggest that market federalism largely assumes that all regions wish to pursue economic development. This may be true under decentralization, but under federalism some jurisdictions may not be interested in economic efficiency. Future research should explore economic development in subnational regions to assess regional motivations.

It is also possible that cross-country measures of economic development are conservative as inter-state economic development is a slow, long term process. Previous scholarship has noted the importance of economic differences between a country's subnational units in measuring economic development (Peterson 1995). It may be that the cross-country measures of self-rule

simply are not disaggregated enough to fully assess the relationship and instead market federalism's outputs are observed at a municipal level. Future scholarship should attempt to triangulate how variation in self-rule and share-rule federalism impacts economic development *within* a country. It is possible that variation in federalism within countries is what drives economic development, not variation between countries.

Finally, a more extensive cross-country dataset would be beneficial. The current analysis lacks information from Soviet states, Africa, and most of Asia. There could be important variation in federal design in these countries that the current set of data overlook. While there are limitations to the current research, this analysis highlights the continued development of measures federalism conceptually, and that these measures can provide novel evidence about the outputs of government design.

ACKNOWLEDGMENTS

I thank Carol Weissert, Quintin Beazer, Sean Ehrlich, Teresa Cornacchione, and Rachel Tuning, for their helpful suggestions and discussion. Special thanks to four anonymous reviewers and John Dinan. Any remaining errors are my own.

NOTES

¹ Federalism differs from decentralization. Decentralization is described as a managerial concept – the delegation of centralized authority to subordinate units. Decentralization can occur to achieve effective management. An administrator who is relatively close to a subject is likely more knowledgeable and attentive than an administrator in a central office. Federalism on the other hand is characterized subordinate units which possess prescribed areas of jurisdiction that cannot be encroached upon by central authority. Furthermore, subnational units draw their administrative power from sources other than central authority (Rubin and Feeley 1993). Federalism has been previously tied to the concepts of self-rule and shared-rule in Elazar (1987) and Mueller (forthcoming).

² Shared-rule is similar to the coming together terminology introduced in Stepan (1999). Coming together federalism is where countries come together to pool sovereignty while retaining their individual identities.

³ Note that even though the suite of control variables is limited, they aid in explaining a large amount of the variation in the statistical models. With the r-squared increasing from 29 percent of variation explained in model 1 to 34 percent of variation explained in models 2, and 3 when county random effects are specified.

⁴ ECMs have traditionally been used when cointegration is present, which exists when two or more variables have unit roots that determine each other, however ECMs can be used even when unit roots or cointegration is not present (see De Boef and Keele 2004; De Boef and Keele 2008). Again, prior scholarship in Rodden (2003), suggest that measures of federalism are likely stationary in nature.

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Table 1: The Heterogeneity of Market Federalism Research

Author (Year)	Dependent Variable	Measure of Federalism	Findings
Economic Development			
Davoodi and Zou (1998)	Per Capita GDP	Decentralization is the subnational share of total government spending. Higher values are associated with greater fiscal decentralization.	(-) in developing countries (no effect) in developed countries.
Treisman (2007) Chapter 11	Log of Average Inflation (1995-2000)	Percent of revenue raised by subnational government.	(no effect) Greater decentralization locked in with more consistent – either good or bad – inflation rates.
Lessman and Markwardt (2012)	Combined State-Central Deficit/Expenditure and Inflation	Decentralization as the subnational share of total government spending.	(+) Fiscal decentralization can be advantageous with autonomous taxing capacity at the subnational level.
Voight and Blume (2012)	Series of Economic Indicators	A seven variable index of federalism and decentralization with variables capturing electoral, fiscal, and independence of local governments.	The direction of the effect of federalism matters based on the type of federal institution measured.
Ezcurra and Rodriguez-Pose (2013)	Change in GDP and Territorial Inequality	A series of previously deployed decentralization indices (Colomer, Schmidt, Lijphart, Woldendorp et al., Triesman, Bancati, and Hoogue et al.).	(no effect) for GDP measure, (+) Territorial Inequality measure when constrained to certain time ranges.
Hatfield and Kosec (2013)	Average Annual Growth of Income per Employee	Inter-jurisdictional competition – measured as the number of county governments located in a Metropolitan Statistical Area.	(+) doubling the amount of county governments in a metropolitan region leads to a 17 percent increase in employee earnings and a 10 percent increase in employee income.

Adam et al. (2014)	Index of Public Sector Efficiency	An index of sub-national governments' fiscal decision making authority.	(inverted - U) relationship between government efficiency and fiscal decentralization.
Hatfield (2015)	Formal Model - Internal Endowment of Capitol	–	(+) Federal governments will, in equilibrium, maximize economic growth, while centralized governments will not.
Akin et al. (2016)	Formal Model – Private Sector Growth	–	(-) No equilibrium in which fiscal decentralization increases private sector growth.

Table 2: Summary Statistics

Variable	Median	SD	Min	Max	Obvs.
Dependent Variables					
GDP (PPP)	9,135.65	16,553.65	566.46	112,000	2715
Per Capita Net Income	9,236.21	14,143.50	-1,935.05	82,707.57	2184
Electric Consumption (kWh)	4,022.06	4,429.90	12.31	25,590.69	2411
Independent Variables of Interest					
Self-rule	7.11	6.23	0	26	2737
Shared-rule	1.96	3.28	0	15	2737
Controls					
Log (GDP)	25.07	2.07	19.60	30.34	2710
Rents (Percent GDP)	4.81	8.40	0	67.67	2571
Quality of Democracy	6.10	5.70	-10	10	2547
Civil Conflict	0.08	0.27	0	1	2794
Ethnic Conflict	0.15	0.36	0	1	2794
Population (000s)	26,258	46,105	1.47	309,000	2794
Percent Population Growth	1.12	1.04	-5.81	6.02	2781
Population Density (persons/km)	191.67	614.49	1.63	7231	2722

Table 3: Regional Authority Federalism and GDP

	DV: Δ GDP(PPP)		
	(1: Federalism Measures)	(2: Controls)	(3: Country Random Effects)
	b/se	b/se	b/se
Self-rule Federalism	-11.206** (3.576)	-1.045 (3.669)	0.088 (4.795)
Shared-rule Federalism	2.869 (4.364)	-4.504 (4.834)	-5.608 (7.720)
Log (GDP)		18.838 (12.073)	15.092 (22.566)
Rents (Percent GDP)		5.461** (1.752)	9.194** (2.499)
Quality of Democracy		6.071** (1.905)	3.108 (3.191)
Civil Conflict		-82.495** (27.198)	-19.248 (49.909)
Ethnic Conflict		-81.387* (38.290)	7.723 (63.682)
Population (000s)		-0.001* (0.000)	-0.001+ (0.001)
Percent Population Growth		-81.487** (19.136)	-122.752** (21.855)
Population Density (persons/km)		0.164** (0.048)	0.184** (10.036)
Constant	469.752** (55.859)	-1.536 (282.937)	150.004 (535.07)
Region Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
R – squared	0.296	0.344	-
Within R-squared			0.265
Between R-Squared			0.589
Overall R-squared			0.340
N. of Observations	2,414	2,276	2,276
N. of Groups			70

Notes: $p < 0.10$ +, $p < 0.05$ *, $p < 0.01$ **. Standard errors are clustered by country in columns 1 and 2. Country random effects are employed in column 3. All independent variables are lagged by one year.

Table 4: Regional Authority Federalism and Per Capita Income

	DV: Δ Per Capita Net Income		
	(4: Federalism Measures)	(5: Controls)	(6: Country Random Effects)
	b/se	b/se	b/se
Self-rule Federalism	-6.190 (6.518)	1.446 (5.716)	1.446 (5.656)
Shared-rule Federalism	4.091 (5.917)	-2.268 (6.475)	-2.268 (8.426)
Log (GDP)		1.736 (24.237)	1.736 (27.605)
Rents (Percent GDP)		15.347** (4.319)	15.347** (4.054)
Quality of Democracy		6.471* (3.271)	6.471 (5.025)
Civil Conflict		-94.833* (43.432)	-94.833 (76.231)
Ethnic Conflict		21.692 (70.511)	21.692 (83.104)
Population (000s)		-0.001 (0.001)	-0.001 (0.001)
Percent Population Growth		-112.831** (39.828)	-112.831** (32.540)
Population Density (persons/km)		0.172* (0.071)	0.172** (0.035)
Constant	248.206* (101.364)	345.027 (569.323)	345.027 (684.920)
Region Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
R-Squared	0.146	0.167	-
Within R-squared			0.134
Between R-Squared			0.578
Overall R-squared			0.167
N. of Observations	2,074	1,992	1,992
N. of Groups			66

Notes: $p < 0.10$ +, $p < 0.05$ *, $p < 0.01$ **. Standard errors are clustered by country in columns 1 and 2. Country random effects are employed in column 3. All independent variables are lagged by one year.

Table 5: Regional Authority Federalism and Inflation

	DV: Δ Electrical Consumption		
	(7: Federalism Measures)	(8: Controls)	(9: Country Random Effects)
	b/se	b/se	b/se
Self-rule Federalism	-0.746 (1.095)	-1.265 (1.121)	-1.418 (1.709)
Shared-rule Federalism	0.301 (1.565)	-1.292 (1.790)	-1.361 (2.792)
Log (GDP)		9.146* (4.519)	16.362+ (8.812)
Rents (Percent GDP)		2.091** (0.736)	2.436** (0.914)
Quality of Democracy		3.969** (0.613)	5.108** (1.138)
Civil Conflict		-46.355** (7.789)	-22.125 (17.184)
Ethnic Conflict		-23.790* (11.238)	0.069 (22.92)
Population (000s)		0.000 (0.000)	-0.000 (0.000)
Percent Population Growth		-26.098** (6.397)	-38.790** (8.025)
Population Density (persons/km)		0.022** (0.006)	0.026* (0.013)
Constant	238.625** (55.280)	4.443 (107.556)	-153.44 (213.546)
Region Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
R-Squared	0.153	0.193	-
Within R-squared			0.152
Between R-Squared			0.421
Overall R-squared			0.189
N. of Observations	2,342	2,184	2,184
N. of Groups			69

Notes: $p < 0.10$ +, $p < 0.05$ *, $p < 0.01$ **. Standard errors are clustered by country in columns 1 and 2. Country random effects are employed in column 3. All independent variables are lagged by one year.

Table 6: Federalism and economic development: Error-correction models

	Δ GDP (PPP)	Δ Net Income	Δ Electric Consumption
	b/se	b/se	b/se
Dependent Variable	0.014** (0.005)	0.009 (0.012)	0.006 (0.005)
Self-rule Federalism	-0.108 (3.043)	5.536 (5.681)	-1.238 (1.191)
Δ Self-rule Federalism	6.439 (12.667)	20.119 (18.828)	2.184 (5.706)
Shared-rule Federalism	-0.619 (4.531)	-2.308 (8.088)	0.379 (1.787)
Δ Shared-rule Federalism	8.230 (21.984)	-15.739 (30.581)	-2.986 (11.299)
Log (GDP)	5.979 (11.712)	40.062 (29.605)	15.020** (6.335)
Δ Log (GDP)	10091.550** (455.399)	10866.809** (691.636)	1535.859** (176.545)
Rents (Percent GDP)	-0.289 (1.514)	7.963+ (3.951)	0.239 (0.603)
Δ Rents	6.285* (3.188)	7.185 (8.585)	3.215+ (1.680)
Quality of Democracy	3.727 (39.042)	7.190 (5.144)	1.772 (1.053)
Δ Quality of Democracy	5.701 (4.440)	4.432 (7.405)	1.467 (1.531)
Civil Conflict	94.034* (39.042)	-30.114 (77.431)	-11.659 (16.472)
Δ Civil Conflict	177.850** (60.482)	53.888 (100.051)	8.185 (19.186)
Ethnic Conflict	32.072 (41.410)	68.697 (78.750)	-6.634 (16.472)
Δ Ethnic Conflict	2.930 (71.689)	-81.058 (240.142)	7.745 (30.741)
Population (000s)	-0.000 (0.001)	-0.001 (0.001)	-0.000+ (0.000)
Δ Population	-0.028 (0.022)	-0.019 (0.047)	0.001 (0.008)
Percent Population Growth	-108.727** (15.549)	-111.086** (37.603)	-11.967+ (6.401)
Δ Percent Population Growth	-24.998 (33.629)	-62.042 (51.717)	-15.115 (10.146)

Population Density (persons/km)	0.156** (0.307)	0.150* (0.064)	0.026* (0.0122)
Δ Population Density	-3.648* (1.646)	-2.953 (2.783)	-0.645* (0.293)
N. of cases	2,315	2,031	2,183
N. of Groups	71	67	69
R-Squared	0.481	0.209	0.136
Wald χ -squared	558.82	303.06	297.09

Notes: $p < 0.10$ +, $p < 0.05$ *, $p < 0.01$ **. Panel-corrected standard errors in parentheses. Constant not reported.

Supplemental Appendix

Table A1: Country-year Observations

Country	Years	
Albania	1992	2010
Argentina	1970	2010
Australia	1970	2010
Austria	1970	2010
Belgium	2001	2010
Bolivia	1970	2010
Brazil	1982	2010
Bulgaria	1991	2010
Canada	1970	2010
Chile	1970	2010
Colombia	1970	2010
Costa Rica	1970	2010
Croatia	1996	2010
Cuba	1971	2010
Cyprus	1976	2010
Czech Republic	1993	2010
Denmark	1970	2010
Dominican Republic	1970	2010
Ecuador	1970	2010
El Salvador	1970	2010
Estonia	1996	2010
Finland	1970	2010
France	1970	2010
Germany (West Germany prior to 1990)	1971	2010
Greece	1970	2010
Guatemala	1970	2010
Guyana	1970	2010
Haiti	1999	2010
Honduras	1970	2010
Hungary	1992	2010
Indonesia	1970	2010
Ireland	1971	2010
Israel	1970	2010
Italy	1970	2010
Jamaica	1970	2010

Japan	1970	2010
Latvia	1996	2010
Lithuania	1996	2010
Luxemburg	2000	2010
Macedonia	2000	2010
Malaysia	1970	2010
Mexico	1970	2010
Montenegro	2007	2010
Netherlands	1970	2010
New Zealand	1978	2010
Nicaragua	1970	2010
Norway	1970	2010
Panama	1970	2010
Paraguay	1970	2010
Peru	1970	2010
Philippines	1970	2010
Poland	1991	2010
Portugal	1970	2010
Romania	1991	2010
Russia	1993	2010
Serbia	2007	2010
Singapore	1970	2010
Slovakia	1993	2010
Slovenia	1996	2010
South Korea	1970	2010
Spain	1970	2010
Suriname	1976	2010
Sweden	1970	2010
Switzerland	1981	2010
Thailand	1970	2010
Trinidad and Tobago	1970	2010
Turkey	1970	2010
United Kingdom	1970	2010
United States	1970	2010
Uruguay	1970	2010
Venezuela	1970	2010

Figure A2: Map of Countries in Analysis

