Growth Paradigms and Congruent Institutions: Estimating Context-Varying Effects of Political Institutions on Economic Performance

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Abstract

Traditional economic growth regressions are not adequate to identify the role of political institutions because they assume a universal growth paradigm exists. Instead, there are distinct paradigms of investment- and innovation-based growth, and the effects of political institutions vary across them. Using a dataset covering 83 countries from 1965-2008, this study employs a mixture models estimation to identify these paradigms. It finds that state authority is critical for countries engaged in investment-based growth, and competitive political participation tempers the pace of capital accumulation but increases productivity growth. Conversely, where innovation-based growth predominates, state authority has little effect and competitive political participation slows the pace of growth. Constraints on rulers do not support investment in either paradigm.

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The study of why some economies grow while others stagnate faces important puzzle: despite widespread agreement that political institutions matter, there is little consensus on what kinds of institutions matter and how they matter. We have not reached this quandary due to lack of effort. Many trees have been felled to publish the results of cross-country growth regressions with dozens of different variables, institutional and otherwise. Nearly all of this work, however, has something in common: the estimation of a linear model of economic growth that is assumed to be universal across countries and times. We have milked this approach for all that it is worth. We cannot determine what kinds of institutional forms are most critical for fostering growth in particular circumstances by estimating the effects of institutional outputs on average across diverse contexts. [1]

By starting with the premise that there are multiple growth paradigms, this article takes a fundamentally different approach. A paradigm is defined as a pattern or style of economic growth that is associated with a set of technological and social characteristics, and that is supported by particular institutional outputs.[2] Specifically, I argue that the effects of three types of institutional outputs – state authority, constraints on rulers, and political participation rights – differ in the paradigms of investment-based growth and innovation-based growth. Country characteristics determine the extent to which each growth paradigm is applicable, and growth outcomes vary according to whether a country's institutions are congruent with relevant paradigms.

The empirical results from a mixture models estimation support the claim that multiple growth paradigms exist, and subsequent analysis using these estimates reveals that institutional outputs have different effects in these paradigms. For countries that are far

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[2]Institutional "outputs" are a more parsimonious way to think about the effects of particular institutional forms. There is a wide variety of institutional forms – regime types, governmental forms, electoral systems, and so on. It is the effects of these forms, their outputs, that matter for economic performance.

behind the technological frontier, investment-based growth through capital accumulation is engendered by high levels of state authority and high levels of political rights. Additionally, in contrast to predictions from the New Institutional Economics (NIE) that constraints on rulers facilitate investment, I find instead that constraints impede productivity growth in an investment-based growth paradigm. Breaking with the assumption of a universal growth paradigm thus opens unexplored terrain and permits important, fresh insights.

The next section develops the general argument of this article more fully. Section 2 develops general predictions based on this argument. Section 3 explains the empirical approach in this study, in particular how the mixture models estimation method offers a way to identify the presence of different growth paradigms in the cross-national data and estimate the context-dependent effects of political institutions on economic performance. Section 4 presents the findings, and Section 5 concludes.

1 Growth Models and Context Dependence

The core argument of this article is built upon two claims drawn from the existing literature. First, economic growth is not a unitary process. Second, the effects of institutions depend upon context. Together these arguments harken back to Gerschenkron's (1962) notion that the institutional factors that drive growth in "backward" countries are not the same as those that foster growth among countries on the leading edge. The resulting theoretical framework suggests a fundamentally different empirical approach to understand the role of institutions in growth.

Countries differ in many ways that affect how institutions influence growth processes, but we treat these differences as statistical nuisances rather than as contextual factors. Typical empirical tests control for such factors in order to identify the effect of a particular institutional form or output on average across the sample. This average effect may be meaningful if there is a universal style of economic growth that applies to all countries equally, but it has little substantive meaning if there are multiple growth paradigms in which institutions matter differently. Nevertheless, very little work has been devoted to testing the context-dependent effects of broad institutional outputs explicitly. Rodrik, among others, criticizes the common assumption in the empirical literature that "there is a single set of institutions worth emulating" (2007: 162).

Studies have demonstrated the merits of breaking with the assumption of a single linear growth model with either sample-splitting methods (Durlauf and Johnson, 1995; Tan, 2009) or Markov-switching estimation techniques (Bloom et al., 2003; Jerzmanowski, 2006) to identify groupings of observations belonging to the same growth regime (i.e. paradigm). This work leaves the role of institutions in growth largely unexplored, however. The approach in this article differs in three ways. First, its conception of institutions is richer than that employed in these studies.[3] Second, it estimates the effects of institutions within a particular context rather than using an institutional indicator to identify different subsamples. Third, like Przeworski et al. (2000) and Baum and Lake (2003), it recognizes that growth is generated by different factors – productivity growth, investment, and human capital growth – each of which can be affected by different institutional forms in different ways.

1.1 Breaking with a Universal Growth Model

A growing body of work in economic growth theory argues that the growth process is not universal. As Pritchett (2003) contends, a single growth model cannot adequately represent the complexity of the phenomenon we observe as "growth." In Pritchett's framework, the process of growth through industrial transformation differs from the process of steady growth at the technological frontier. Aghion and Howitt (2006) and Acemoglu et al. (2006) similarly describe separate paradigms of investment-based and innovation-based growth. These approaches provide theoretical grounding for the expectation that the kind of institutional outputs that support growth differ across contexts.

In an investment-based growth paradigm, growth is driven by "implementation inno-

[3] Jerzmanowski (2006) uses an index of anti-diversion policies derived from a risk analysis firm and used in Knack and Keefer (1995). Tan (2009) uses similar data

vations" and consists of sustained, high levels of capital investment and local adoption of technologies developed elsewhere. This paradigm is most suitable when countries are far behind leading-edge countries on the technology ladder and when levels of human capital are low. For countries in these circumstances, establishing the foundation for economic development is a necessity. This foundation includes the maintenance of social order, the construction of infrastructure, and the provision of other basic public goods such as education and public health services. Implementation innovations are fostered by raising the level of elementary and secondary education and by creating a stable climate for investment (Aghion and Howitt, 2006).

For countries in this paradigm, private investment capital typically is scarce, market mechanisms to provide coordination of complementary investments are weak, and the presence of established competitors in the world market makes industrialization a challenge. In these circumstances, investing in new technologies and learning new production methods is risky. States can thus promote productivity growth by subsidizing investment in new technologies, by seeking to attract foreign investment, and by shielding firms from competition from more established competitors. The danger of state involvement is that anticompetitive policies create entrenched political constituencies and become hard to withdraw.

In an innovation-based growth paradigm, by contrast, growth consists of "leading edge innovations" that develop new technologies and push the frontier outward (Aghion and Howitt, 2006). Since no economic roadmap exists, the kind of policies that work well for investment-based growth are no longer effective. Picking winners and losers by state planners is much more difficult when it comes to identifying key technologies of the future. Additionally, driving up rates of capital investment and sheltering firms from competition become increasingly inefficient the more that growth depends upon leading-edge innovation. Instead, growth is founded on high levels of human capital and inventive activity. Policies that promote a competitive domestic market, with easy entry and exit of firms, will more likely support higher rates of innovation and will more easily adjust to changes in the world economy.

Given the differences in these two forms of growth, the kinds of institutions that support growth are different as well. As Acemoglu et al. argue, "Institutions that are appropriate for early stages of development therefore become inappropriate for an economy close to the frontier"(2006: 64). Since institutional outputs contain inherent trade-offs for for economic policymaking, it is not surprising that context matters in this way.

1.2 Institutional Outputs and their Trade-offs

The institutional outputs examined in this article – state authority, constraints on rulers, and political participation rights – capture conceptually distinct institutional properties. State authority refers to the degree to which a state maintains a monopoly of administrative/military control over a territory and has the ability to implement public policies. Constraints on rulers, by contrast, are institutional structures that impose checks upon rulers and restrict their ability to change policy unilaterally by separating power across a number of rulers (Tsebelis, 2002). Finally, political rights are defined as the ability of citizens to participate in politics, express policy preferences, and choose their rulers. Full political rights thus assume political contestation.

These institutional outputs are usually studied in isolation. The empirical literature in the NIE, for example, focuses on constraints on rulers as the key institutional characteristic that fosters economic growth. The presence of multiple veto actors is theorized to reduce the ability of rulers to engage in opportunistic behavior and make arbitrary changes in policy (North and Weingast, 1989). Political constraints are thus expected to increase investor certainty and protect property rights, thus promoting economic growth through greater private investment (Henisz, 2000; Stasavage, 2002; Weymouth, 2010; Nooruddin, 2011). On the other hand, separating powers across multiple actors produces a trade-off between "state indecisiveness and irresoluteness" (Cox and McCubbins, 2001). When economic reforms are necessary, policy stability means stagnation.

The role of the state is similarly contingent upon context. Several studies focus on the essential role of state capacity in creating the conditions for economic growth to occur

(Chibber, 2003; Fukuyama, 2004; Kohli, 2004; Bates, 2006). For these authors, the NIE's emphasis on constraining rulers seems inappropriate or misplaced. Instead, state weakness lies at the core of the most severe problems in the developing world, and building the capacity of the state is an important priority. As Evans argues, strength at the center of the political-economic system is needed to provide the foundation for predictable policies that facilitate private investment, such as public investment in infrastructure and human capital, as well as enforcement of contracts (1992: 151). The record of states as agents of development, however, is mixed at best. States appear especially ill-equipped when it comes to picking the "winners and losers" of the future for countries at the technological frontier of the world economy. The need for states to solve coordination failures and supply investment capital also declines as economies become more developed.

Likewise, the role of democratic political competition in creating the conditions for economic growth is ambiguous. In theory, political participation rights give citizens greater ability to hold rulers accountable for poor performance and induce rulers to provide higher levels of public goods (Lake and Baum, 2001). On the other hand, they can create pressures for inefficient redistribution, prevent the adoption of policies that squeeze consumption in order to fund capital investment, and provide avenues for vested interests to block policy changes. Unsurprisingly, then, reviews of the many studies of the relationship between democracy and growth produce no definitive conclusions (Przeworski and Limongi, 1993; Almeida and Ferreira, 2002). A meta-analysis by Doucouliagos and Ulubaşoğlu (2008) confirms the lack of direct relationship between democracy and growth, while finding that democracy may affect growth indirectly by increasing levels of human capital and by providing a policy environment more conducive to growth.

In short, each of these institutional outputs presents trade-offs that make it difficult to believe that their effects on economic growth will be consistent across countries that lie in very different circumstances. To the extent that processes of economic growth differ for countries at different positions in the global economy, we should expect that the kinds of institutional outputs most conducive to growth also differ.

2 Predictions: Institutions in Investment- and Innovation-Based Growth

Altogether, this analysis suggests that there should be two distinct growth paradigms in the cross-national data and that the effects of political institutions differ in these paradigms. We should thus expect investment-based growth to be the dominant paradigm where the gap between a country and the world's leading economies is high, its inventive capacity is low, and its level of human capital is low. We should find that the growth rate of capital stock per worker is considerably faster for countries engaged in investment-based growth than for those engaged in innovation-based growth. By contrast, growth will be driven to a greater extent by human capital and productivity improvements for countries in an innovation-based growth paradigm.

2.1 Investment-Based Growth

For the reasons outlined above, state capacity creates the foundation for investment-based growth by supporting public investment, expansion of access to education, development of transportation infrastructure, and the maintenance of an attractive climate for foreign investment. The state can play an active role in economic planning, solve collective action problems, provide access to capital, and nurture infant firms to increase industrial capacity. The gains from sheltering firms from competition, at least initially, outweigh the potential negative consequences of reducing innovative activity by new entrants.

Conversely, states that lack authority, such as the neo-patrimonial states described by Kohli (2004), do not provide rulers with the capacity or legitimacy to pursue policies of economic transformation and deliver public goods effectively. Typically, these states become a vehicle for particularistic interests to secure rents, and polices to foster investment-led growth end up in failure due to misuse of resources and administrative bungling. The absence of a competent national bureaucracy makes the state an ineffective agent of development even when rulers pursue it. State authority, as Khan (2000b) notes, is required to manage subsidies efficiently, since bureaucrats need to power to withdraw subsidies to make them effective. Where states are weak, foreign investors shy away.

The effects of political rights in an investment-based growth paradigm are more nuanced since they work through the factors of capital stock and productivity growth differently. On the one hand, broad political rights may lead to slower growth of capital stock because they reduce the ability of the state to mobilize capital by squeezing consumption or extracting resources from agriculture. Political pressure for redistribution may also reduce capital for private investment, shifting the composition of growth away from capital accumulation.

On the other hand, broad political rights can enhance prospects for productivity growth in various ways. First, they may create greater accountability of rulers to citizens, leading to greater provision of public goods such as education and public health (Baum and Lake, 2003). Second, as argued in Acemoglu and Robinson (2012), inclusive political institutions prevent the capture of the state by narrow economic interests that would use political power to enrich themselves to the detriment of broader society. A similar argument appears in Khan (2000a), who contends democratic institutions hold down rent-seeking costs by expanding the level of information about government policies and breaking the grip of entrenched interests, especially when states are weak. Overall, then, political rights are more likely to facilitate improvements in productivity rather than support rapid growth of capital stock.

Political constraints on rulers in the form of the separation of powers, however, are not expected to enhance investment-based growth. Constraints are neither necessary to facilitate growth of capital stock nor are they likely to produce policies that provide greater public goods and build human capital. The conventional logic from the NIE empirical literature is that constraints on rulers facilitate investment by protecting property rights. This logic, however, is oriented toward explaining the behavior of private investors and ignores the role of the state as an important agent for mobilization of capital for countries far behind the technological frontier. History provides several examples in which rapid capital mobilization has come when rulers of centralized states used their power for this purpose, as exemplified in the East Asian developmental states and, at the extreme, in the Soviet Union.

2.2 Innovation-Based Growth

The institutional mix that supports innovation-based growth is different. Basic state authority is unlikely to explain a country's degree of success at innovation-based growth. First, countries that reach this degree of economic development generally have states sufficiently capable of providing the foundation of a modern economy. We are unlikely to see relevant variation in state authority for countries at the frontier of the world economy, at least as compared to the degree of variation in low-income countries. Second, the effectiveness of markets for providing capital, coordinating investments, and selecting winners is much greater. States become less necessary as agents of economic development.

Economic performance is weaker, moreover, when the power of the state is used to protect vested interests from the entry of new competition based upon new methods and technologies. At the technological frontier of the economy, firms face threats from unanticipated, disruptive technologies and new competitors. They can either adjust to this new competition or seek protection from it. To the extent that vested interests are able to use political power to block entry of these new competitors, productivity growth will falter. Acemoglu et al. (2006) argue that political institutions, such as the separation of powers, that impede the ability of vested interests to use the policymaking process to block competition will be advantageous. Crucially, the central effect of political constraints is thus to support growth in productivity rather than capital stock, in contrast with the predictions of the NIE.

Finally, at the frontier of world economy, the positive effect of political rights on public goods provision may be less potent since scarcity of public goods is not a key constraint on growth for most countries in these circumstances. On the other hand, it is plausible to expect that the tendency of politicians to shy away from policies that require economic sacrifices from the population will remain. Promises that sacrifices will produce future gains may not be credible, and it may be easier to mobilize opposition than support when the sacrifices are well-specified but the benefits are diffuse. For example, it may be difficult to enact polices that would reform labor market policies in order to facilitate more flexibility in hiring at the expense of job security. On balance, then, the kind of vigorous political competition associated with high levels of political rights may slow the rate of innovation-based growth.

2.3 Summary

Overall, the institutional outputs that matter for economic growth depend upon the style of growth that is most suitable. Catch-up growth, driven by capital accumulation and public goods provision, is more strongly linked to basic state authority and political rights than to political constraints on rulers. State authority provides the basic foundation for investment-based growth, while constraints on rulers have little effect. Greater political rights, on the other hand, curtail the potential for rapid capital stock growth by preventing the suppression of consumption, but they facilitate growth in total factor productivity by inducing greater provision of public goods.

Table 1: Predicted Effects of Institutional Outputs

		Investment-Based Growth	Innovation-Based Growth
State Authority	GDP per capita growth	+	0
	Capital stock growth	+	0
	TFP growth	+	0
Political Constraints	GDP per capita growth	0	+/0
	Capital stock growth	0	0
	TFP growth	0	+
Participation Rights	GDP per capita growth	0	-
	Capital stock growth	-	-
	TFP growth	+	-

Conversely, innovation-based growth, driven by technological innovation and productivity enhancements, functions most effectively when political leaders are constrained from interfering in the allocation of investment capital and firm survival. Rapid and unanticipated technological changes render state planning difficult, and multiple veto gates make it difficult for vested interests to use the political system to shield themselves from unforeseen competitors. Political constraints thus support productivity growth in an innovation-based growth paradigm, while the level of state authority is not a key determinant of the rate of growth. Finally, the political pressures that arise from competitive political participation may hinder economic reforms that require short-term sacrifices.

3 Description of the Empirical Approach

The empirical approach taken in this study consists of two steps. The first step uses a finite mixture model (Titterington et al., 1985; McLachlan and Peel, 2000) to identify the theorized growth paradigms, and the second employs these results in a more familiar growth regression analysis. Mixture models are increasingly used as an estimation tool in situations when the population contains latent clusters and there are at least some unobserved factors that produce these clusters. Other, known factors can help identify the clusters probabilistically.

In this case, the accumulation of growth factors – such as TFP, capital stock, and human capital – occurs heterogeneously in the population of country-years due to the presence of different growth paradigms. The discussion above argues that two such paradigms exist and creates the theoretical expectation for what kinds of clusters may be present in the observed data. Within each paradigm, growth in GDP per capita is assumed to be distributed normally and is described by linear models in which the key components of growth matter differently. The method simultaneously estimates the coefficients on these explanatory variables for each paradigm while using country characteristics to estimate the extent to which each observation is described by the model for each paradigm.

3.1 A Mixture of Normal Models

In linear regression, the dependent variable y is a random draw from a single population conditional upon the linear predictor $x\beta$ and a disturbance with variance σ^2. The conditional value of y is thus normally distributed.

$$\phi\left(y|x,\beta,\sigma^2\right)=\frac{1}{\sigma\sqrt{2\pi}}\exp\left(-\frac{(y-x\beta)^2}{2\sigma^2}\right) \tag{1}$$

In using mixture models, we assume instead that the population contains S components in which the data generation process for y differs. In terms of the substance of this article, a component is a growth paradigm. The proportion of the population that belongs to component $s \in S$ is referred to as p_s, where $\sum_{s=1}^{S} p_s = 1$ and $p_s \geq 0, \forall s$. We do not know with certainty from which component a particular observation was generated, but we can estimate these origins probabilistically using a vector of observed characteristics z and associated parameters λ_s. The weighting function $p_s(z,\lambda_s)$ takes the form of a multinomial logit.

$$p_s(z,\lambda_s)=\frac{\exp(z\lambda_s)}{\sum_{k=1}^{S}\exp(z\lambda_k)}, \quad \lambda_s \neq \lambda_S = 0 \tag{2}$$

In this weighting function, the parameter vector for paradigm S, labeled as λ_S, is constrained to equal zero for purposes of identification.

The observed y's are thus a mixture of draws from S multivariate normal densities.

$$h(y|x,z,\theta)=\sum_{s=1}^{S} p_s(z,\lambda_s)\phi_s(y|x,\beta_s,\sigma_s^2) \tag{3}$$

In Equation 3, θ is the vector of all parameters: $\theta = (\lambda_1,\ldots,\lambda_S,\beta_1,\ldots,\beta_S,\sigma_1^2,\ldots,\sigma_S^2)'$. For the linear predictor in each paradigm, there is a set of coefficients (β_s), making S sets in all. Leaving aside the constrained λ_S, there are $S-1$ sets of coefficients (λ_s) for the weighting function. The parameters are estimated through maximum likelihood using the FMM package for Stata by Deb (2007). The estimation procedure iterates between estimating the probabilities with which each observation belongs to each component s and maximizing the log-likelihood for each component using these probabilities as weights.

In this presentation, y represents growth in GDP per capita and there are two components (i.e. $S = 2$) to represent the two growth paradigms. The explanatory variables, x, are growth in capital stock per worker ($\dot{k}$), growth in human capital per worker ($\dot{h}$), and geographical and social factors that may affect the growth rate.[4] The variables describing country characteristics that determine the extent to which each component is appropriate are identified as z. These contextual variables provide an estimate of how likely it is that a particular observation comes from each paradigm.

The mixture models approach provides two important sets of findings. First, the coefficients (β_s) on the explanatory variables for each component, provide a description of the respective growth paradigms. To the extent that the factors that comprise economic growth, such as growth of capital stock per worker, differ across these paradigms in the expected manner, we should be more confident that this approach permits a fuller understanding of the growth process. Second, the estimated weights (p_s) on each component identify the probability with which a country is identified with each growth paradigm during each year.

3.2 Time-Series-Cross-Sectional Estimation

In the second phase of the analysis, the estimated weights from the mixture models estimation become an independent variable in more traditional linear regression analysis for time-series-cross-sectional data. Specifically, this weight variable (referred to as *Comp1*) is interacted with indicators of the three main institutional characteristics of interest.[5] To the extent that these interactions are statistically significant, the evidence will support the conclusion that the effects of institutions depend upon the degree to which Component 1, rather than Component 2, is the appropriate growth paradigm during that year. A second critical issue is whether these estimated institutional effects are consistent with the theoretical expectations regarding the roles of these factors in investment- and innovation-based growth.

Two sets of regression techniques are employed. The first is a random effects regression model with panel-corrected AR(1) standard errors. Since the institutional variables are ei-

[4] In growth accounting, TFP growth is a residual, the portion of growth per worker that is neither attributable to growth in capital stock per worker nor to improvements in human capital. Accordingly, including it the mixture models estimation would produce a perfect fit of the data. TFP growth is, however, employed as a dependent variable in the second phase of the analysis

[5] The weight on Component 2, accordingly, is 1-Comp1.

ther invariant or slow-moving, fixed effects analysis is not appropriate. We should expect, moreover, that cross-sectional variation in institutions is more important than within-country variation for explaining economic performance. To account for unobserved fixed differences across countries, however, the second method employs the Fixed-Effects Vector Decomposition (FEVD) procedure described in Plümper and Troeger (2007) as updated to version 4.0. This procedure decomposes fixed effects into portions explained and unexplained by the invariant independent variables in the analysis. Due to space limitations, these results are reported in the online appendix.

3.3 Data

Data were obtained from a variety of sources to construct a dataset covering the period 1965-2008 with annual observations on up to 83 countries each year. The variables are discussed in three categories: economic variables, institutional variables, and country characteristics.

3.3.1 Economic Variables

To decompose growth in GDP per capita into its main factors, this article follows procedures similar to those outlined in Bosworth and Collins (2003) and Caselli (2005). Starting with a Cobb-Douglas function, the growth rate of output per worker is separated into the TFP growth rate ($\dot{A}$), the growth rate of capital stock per worker ($\dot{k}$), and the growth rate of human capital per worker ($\dot{h}$). TFP growth is a residual factor that is not measured directly. Algebraically, it is portion of growth in output per worker that remains after accounting for $\dot{k}$ and $\dot{h}$.

Data on the level of capital stock per worker come from Bosworth and Collins (2003), extended to 2008 by the author. The level of human capital, h_t, is based on the estimated earning power per worker resulting from the average number of years of education across all workers. For data on the average number years of education per worker (*YearsEduc*), I use the most recent data from Barro and Lee (2010) and fill missing cases from Cohen and Soto (2007). I use these figures and apply the piecewise linear Mincerian formula that appears in

Caselli (2005).[6] Each of these annual growth rates is expressed in percentage terms.

3.3.2 Institutional Variables

An ideal measure of state authority would capture, over time, a state's control over its territory and its capacity to devise and implement public policies. No such measure exists for a broad sample of countries. Most attempts to measure state capacity are proxies of the "rule of law" or "bureaucratic quality" based upon observed policy outcomes or the perceptions of investors as determined by risk analysis services. As Rodrik (2007) argues, these perceptions are strongly affected by observed economic performance and not only the outputs of institutions themselves. Another commonly-used measure is the level of revenue collection, which is a proxy for the state's extractive capacity, one component of state authority. Yet, tax revenues are also strongly affected by policy preferences and country wealth.

With these shortcomings in mind, this article adopts the measure of state antiquity (*StateHist*), developed by Bockstette et al. (2002) and updated in 2005, as the proxy of state authority. StateHist is a 0-1 index that increases in the following factors: the amount of time a government existed above the tribal level during the years 1 to 1950 CE, the amount of time this government was locally-based rather than foreign-based, and the percentage of territory of the modern country, based upon its borders in 1950, that was ruled by this government. The assumption is that states become more institutionalized, and thus more authoritative, the longer they are in existence and maintain sovereignty.[7]

StateHist has three important features. First, it is exogenous to the period of time covered in this study, a feature that is lacking with many variables that measure institutional quality. Second, since StateHist is not based on subjective assessments of institutional

[6]The formula is $h = e^{\phi(\text{YearsEduc})}$, where $\phi(\text{YearsEduc})$ is piecewise linear with slope 0.13 for YearsEduc ≤ 4, .10 for $4 <$ YearsEduc ≤ 8, and .07 for YearsEduc > 8.

[7]Specifically, I use version 3 of the statehistn05 index. Construct validity tests from Bockstette et al. (2002) indicate that StateHist is correlated in the expected manner with the measure of bureaucratic quality from Howell (2011). Robustness tests using this latter index are reported in the online appendix.

quality, the potential for observed economic performance to bias the measure is mitigated. Third, StateHist incorporates both pre- and post-colonial history more fully than the settler mortality measure developed in Acemoglu et al. (2001), and it has much broader country coverage.[8] StateHist ranges from .028 for Kenya to .963 for Ethiopia.[9] The median value of StateHist is .47, and its standard deviation is .26. A one standard deviation change in the index thus corresponds roughly to the difference between Botswana (.30) and Ireland (.57) or Guyana (.16) and Mexico (.42).

The measure of political constraints (*Checks*) comes from the 2010 version of the Database of Political Institutions (Beck et al., 2001; Keefer and Stasavage, 2003).[10] Checks counts the number of veto actors in a polity. The variable is incremented by one for an independently-elected chief executive, for each chamber of the legislature,[11] if an opposition party controls the legislature, for each party in the governing coalition needed to maintain a parliamentary majority, and for each party allied with the president/government that is closer to the opposition on a right-left ideological spectrum. As coded originally, Checks runs from 1 to 18. Since it is unlikely that the effect of checks is linear across this range, the logged value of Checks is used in this analysis. On the log scale, Checks ranges from 0 to 2.89, with a median value of 1.1 and a standard deviation of .64. An increase of one standard deviation in Checks thus corresponds roughly to the difference in the year 2000 between Egypt (.69) and Costa Rica (1.39).

The concept of political rights is represented by the index of the competitiveness of political participation (*ParComp*) from the 2010 version of the Polity IV dataset Marshall and Jaggers (2009). This variable ranges from 0-5, with higher values indicating a greater

[8]See Bardhan (2005) for a discussion of the advantages of the StateHist measure versus the settler mortality measure.

[9]This high value for Ethiopia may be surprising, but it is a unique case where there is a centralized state with deep roots. This state, however, has generally not been employed for developmental purposes.

[10]Robustness tests using the *PolCon* variable from Henisz (2000) as updated in 2010 are included in the online appendix.

[11]Unless the lower house is controlled by the president's party and there is a closed list system.

extent to which "alternative preferences for policy and leadership can be pursued in the political arena."[12] The mean value of ParComp is 3.4, and its standard deviation is 1.4.

3.3.3 Country Characteristics

Four variables are used as predictors in the weighting equations of the mixture models estimation. The first, *Patents*, is derived from data on the number of patents filed in the United States by country of origin for each year since 1965 from the United States Patent and Trademark Office. Specifically, Patents is the log of the number of patents filed per million people.[13] Countries with higher levels of patent applications are expected to be more technologically advanced. Second, the variable *YearsEduc*, which measures the average years of education in the working-age population, captures the level of education. The third variable is *Gap*, which is a proxy for technological distance based on the level of a country's real GDP per worker (*rgdpwok*) from the Penn World Table (Heston et al., 2009). Gap is the natural log of the ratio of the GDP per worker of the United States to that of the country in question. Finally, to account for the possibility that the effect of Gap changes as the technology frontier moves outward, the model includes the interaction of Gap with the variable *Year*, which serves as a general indicator of the level of technology.

In the linear regression analysis, three country characteristics are included as control variables. For the level of ethnic fractionalization (*EthnicFrac*), I use the measure from Alesina et al. (2003). The advantage of this index is that it assumes group identities might be based either on racial or linguistic characteristics depending on the country in question. The last two variables are *TropicArea*, the proportion of a country's land area that lies in the tropics, and *Landlocked*, a 0-1 indicator that equals 1 if a country has no seaports (Gallup et al., 2001). These variables provide indicators of geographical conditions that might affect the attractiveness of a country for investment.

[12] Robustness tests in the online appendix use *PolRights*, the level of political rights as measured by the Gastil index maintained by Freedom House.

[13] The natural log of the number of patents filed is used due to the expectation that the impact of each additional patent filing is not equal (i.e. not linear).

4 Discussion of Findings

The mixture models technique demonstrates that there indeed are two distinct paradigms present in the cross-national data. The coefficients on the key explanatory variables for each paradigm are presented in Table 2, where they are labeled Component 1 and Component 2 respectively. In comparing the two sets of coefficients, it evident that the effect of growth in capital stock per worker on overall growth in GDP per capita is much stronger in Component 1 (coefficient is 0.7) than in Component 2 (coefficient is 0.4). These coefficients are different from each with over 99% confidence. Conversely, growth in human capital has a positive effect in Component 2 but not in Component 1, though these estimates do not differ from each other with high statistical confidence ($p < .91$). Overall, then, the chief difference between these two paradigms in terms of core growth factors is the degree to which growth in capital stock is central.

The components differ in two other important ways. First, ethnic fractionalization is associated with a strong and positive effect on the growth rate of GDP per capita in Component 2 but not in Component 1.[14] Where EthnicFrac is one standard deviation higher (.26), the annual per capita growth rate is .2 percentage points faster on average. In Component 1, by contrast, the effect of EthnicFrac cannot be distinguished from zero. Second, the positive and significant coefficient on the lagged value of the dependent variable ($\dot{y}_{t-1}$) in Component 2 suggests that this growth paradigm enjoys a steadier rate of growth. Unlike in Component 1, last year's growth rate helps explain this year's growth rate.

To better understand whether these paradigms match the descriptions of investment- and innovation-based growth, we can examine the coefficients on the weighting variables to determine which types of countries are best described by each paradigm. Of these variables, Patents, is the strongest determinant. The coefficient on Patents of -.48 indicates that the higher the level of patent filings in the United States, the more likely it is that a country's

[14]This finding is consistent with that in Alesina and La Ferrara (2005) that ethnic diversity has positive effects in developed economies.

Table 2: Identification of Growth Paradigms

		Component 1	*Component 2*
Components	$\dot{k}$	0.70**	0.40**
		(0.05)	(0.05)
	$\dot{h}$	−0.19	0.16^
		(0.24)	(0.09)
	TropicArea	−0.76	0.11
		(0.63)	(0.20)
	EthnicFrac	−0.22	0.77**
		(0.90)	(0.24)
	Landlock	0.27	0.14
		(0.64)	(0.21)
	$\dot{y}_{t-1}$	0.00	0.28**
		(0.04)	(0.06)
Weights	Patents	−0.48**	
		(0.14)	
	YearsEduc	−0.09	
		(0.12)	
	Gap	11.33	
		(16.81)	
	Year	−0.02	
		(0.02)	
	Year·Gap	−0.01	
		(0.01)	
	Constant	47.29	
		(40.12)	
	Component size	998	2490
	Log-likelihood	-9292.13	

^ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Mixture of normal models estimated via maximum likelihood using the EM Algorithm. Standard errors in parentheses.

growth data are generated by Component 2. If one assumes that all other variables in the weighting equations are held constant at their median values, raising the level of Patents by one standard deviation (from zero to 1.58) increases the probability weight on Component 2 from .45 to .64. When Patents reaches its highest value of 6.55, the weight on Component 1 rises to .95. This finding is consistent with a scenario in which Component 2 represents a paradigm for countries which grow through innovation.

Component 2 is also associated with countries that have higher levels of education, but the degree of statistical confidence in this estimate is low. Where YearsEduc is one standard deviation below the median and all other variables are set to their median values, the probability weight on Component 1 is .73. This weight decreases to .42 when YearsEduc is increased to one standard deviation above the median. Finally, the effect of Gap turns out to be negligible once the interaction with Year is taken into consideration.

The countries with a strong weight on Component 1 (Comp1>.5) are almost exclusively low- and middle-income countries that are less industrialized. Among these countries, the mean percentage of GDP coming from agriculture is 28% and the mean percentage of the population that lives in rural areas is 67%. Geographically, they are concentrated in Africa, South Asia, and South America.[15] By contrast, for countries with a strong weight on Comp2, the mean percentage of GDP coming from agriculture 12% of GDP and the mean percentage of the population living in rural areas is 41%.

Countries with a very strong weight on Component 2 (Comp2>.8), in fact, consist almost exclusively of OECD countries for most of the 1965-2008 time period. They are highly industrialized, with agriculture contributing only 4.5% of GDP on average and with 25% of the population living in rural areas. Some non-OECD countries, such as Argentina, Costa Rica, Malaysia, South Africa, and Thailand join this group in the late 1990s and early 2000s due to relatively high levels of education and patenting activity. On the whole, however, the countries in this group appear to represent the paradigm of innovation-based growth quite

[15] For a full list, see the online appendix.

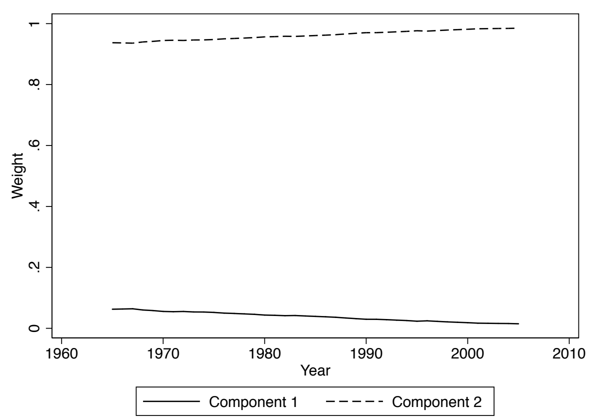
well.

Another way to illustrate the predictions of the weighting equation is to look at the evolution of the estimated weights over time in particular countries. Figure 2(a) presents these values for the United States, for which the weight on Component 2 never falls below .936 throughout the time period covered by this sample. In the corresponding figure for South Korea (Figure 2(b)), however, the picture is one of economic transformation in which the country moves rapidly away from Component 1 during the 1980s. This change reflects South Korea's shift to an innovation-based growth paradigm at the technological frontier of the world economy. The level of Patents climbed from 0 in 1965 to 4.81 in 2000, putting the country in the 90th percentile in terms of (logged) patents filed per million people.

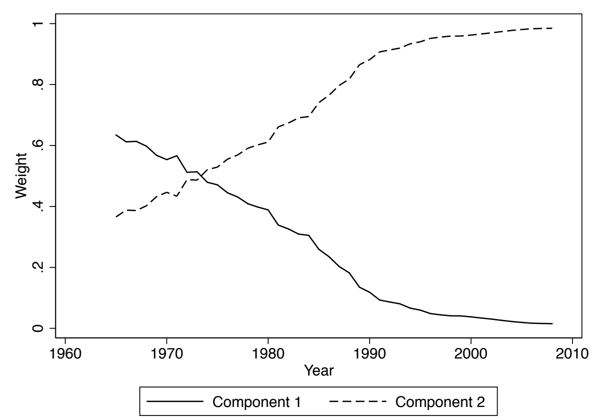
For Brazil, by contrast, the story is one of a more gradual transformation to a situation in which Component 2 gets a relatively high weight of .8. See Figure 2(c). This change is driven both by rising levels of patenting, for which Brazil crosses the 75th percentile in 2006, and by increasing levels of education in the population. The mean number of years of education grew from 3.0 in 1960 to 7.6 in 2008. In Nigeria, the transformation is slower still. Component 1 receives greater weight than Component 2 until 1988, and the weight on Component 2 reaches only .68 by 2008. In Nigeria's case, the change is driven principally by rising levels of education, which increase from an average of 1.2 years in 1965 to 4.0 years by 2008.

Overall, the two components identified in the mixture models estimation resemble the paradigms of investment- and innovation-based growth described above. Component 1, where growth in capital stock is the primary engine of GDP growth, applies most strongly to the least-industrialized countries in the developing world. They do not grow steadily, as is evidenced by the coefficient of zero on the previous year's growth rate. Component 2 contains a more diverse set of countries, but the countries that consistently get the strongest weight on this component indeed represent those that we would expect to be engaged in innovation-based growth.

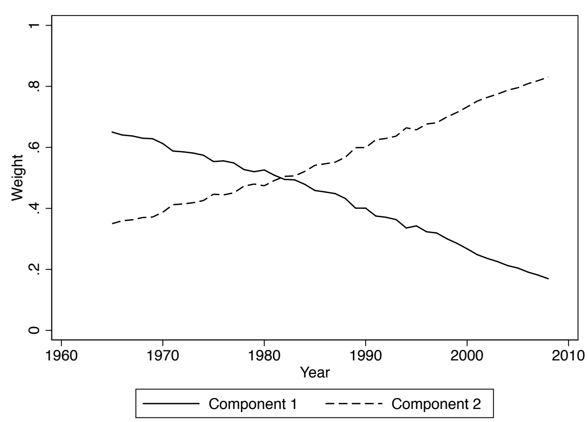
Figure 1: Component Weights for Example Countries



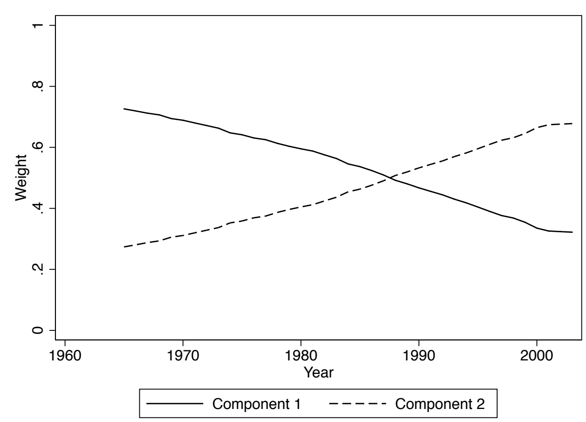
(a) United States



(b) South Korea



(c) Brazil



(d) Nigeria

4.1 Regression Results

The second stage of the empirical analysis builds upon the mixture models estimation to test whether the effects of the institutional outputs that matter for growth differ across the growth paradigms as predicted. The weights for each country-year serve as an indicator of the extent to which the institutional effects should flow in particular directions. The greater is the weight on Component 1, for example, the stronger is the expected positive role of state authority in supporting growth in GDP per capita in general and capital stock per worker in particular. Conversely, constraints on rulers should have a more positive effect on TFP growth when the weight on Component 1 is low. The weights, in other words, lend themselves to use in interaction terms.

This approach brings an important advancement over traditional growth regressions in which the dependent variable is the growth rate of GDP per capita. Since growth is driven by different mixes of capital stock and TFP growth for countries in different growth paradigms, the component weights serve as a way to identify heterogeneity inside the sample that otherwise is ignored. To the extent that institutional outputs act differently on these growth factors, and to the extent that these factors themselves accumulate differently for countries in engaged in different styles of growth, traditional growth regressions miss the nuances of the relationships between institutions and growth.

The first set of regression models is displayed on Table 3. The tests assume that differences across country units are random after accounting for the set of regressors, which contains slow-moving and invariant measures of country institutional, geographic, and social characteristics. Panel-corrected AR(1) standard errors are employed due to heterogeneity across countries and serial correlation of the errors. In the first two models, the dependent variable is growth in GDP per worker. The latter two models focus on the specific growth factors of growth in capital stock per worker and TFP.

Model 1, which does not include the weight on Component 1, serves as a baseline for comparison. The coefficients on the three institutional variables represent their “average”

Table 3: Growth Regressions with Growth Paradigms

	(1) *GDP*	(2) *GDP*	(3) *Capital Stock*	(4) *TFP*
StateHist	1.68**	−0.17	−0.27	−0.72
	(0.43)	(0.53)	(0.39)	(0.50)
StateHist·Comp1		6.75**	4.13**	5.28**
		(1.82)	(1.44)	(1.73)
ParComp	−0.11	−0.73**	−0.19	−0.40^
	(0.13)	(0.24)	(0.19)	(0.22)
ParComp·Comp1		1.68**	−0.20	1.52**
		(0.62)	(0.51)	(0.57)
Checks	0.25	0.87^	0.32	0.59
	(0.21)	(0.45)	(0.29)	(0.41)
Checks·Comp1		−2.62*	−0.67	−2.23*
		(1.22)	(0.80)	(1.10)
Comp1		−9.91**	−1.22	−9.57**
		(2.10)	(1.78)	(1.94)
TropicArea	−0.13	−0.03	0.19	−0.18
	(0.31)	(0.34)	(0.24)	(0.31)
EthnicFrac	−0.50	−0.67^	−0.42	−0.08
	(0.47)	(0.39)	(0.29)	(0.36)
Landlock	−0.51	−0.43	−0.02	0.07
	(0.36)	(0.29)	(0.33)	(0.27)
GDP/cap	−0.07	−0.25^	0.03	−0.34**
	(0.12)	(0.13)	(0.10)	(0.12)
DV_{t-1}	0.20**	0.25**	0.64**	0.22**
	(0.03)	(0.02)	(0.02)	(0.02)
Constant	1.35	6.42**	1.14	5.61**
	(1.09)	(1.49)	(1.15)	(1.35)
N	2679	2540	2540	2540
Countries	83	81	81	81
R^2	0.07	0.11	0.41	0.08

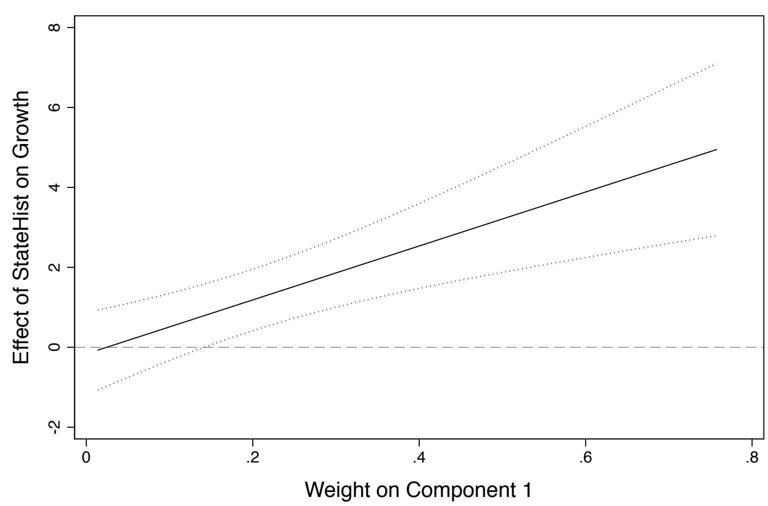
^ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$

Table 2. Random effects regression models with panel-corrected AR(1) standard errors in parentheses. DV_{t-1} is the one-period lag of the dependent variable in each model.

effects on growth in GDP per worker. Of the three, only StateHist is found to have an effect that is statistically different from zero with high confidence. According to the estimated coefficient of 1.68, a one-standard deviation increase in StateHist (.26), roughly the change from Angola to Ireland, is associated with an annual growth rate in GDP per capita that is a bit under one-half of a percentage point faster on average. Neither ParComp nor Checks is found to have a statistically discernible effect on overall growth in GDP per capita.

Adding to the analysis Comp1, the variable that indicates the extent to which an investment-based growth paradigm is applicable, brings considerable changes to the estimates. The effect of StateHist is indistinguishable from zero for countries that are the most strongly associated with innovation-based growth (i.e. Comp1 is near 0). When the weight on Comp1 is strong (.65), however, StateHist is linked to much faster growth in GDP per capita. In this scenario, the predicted effect of a one-standard deviation increase in StateHist is that the growth rate of GDP per capita will be 1.2 percentage points faster. Figure 2 displays this marginal effect and the associated 95% confidence interval.

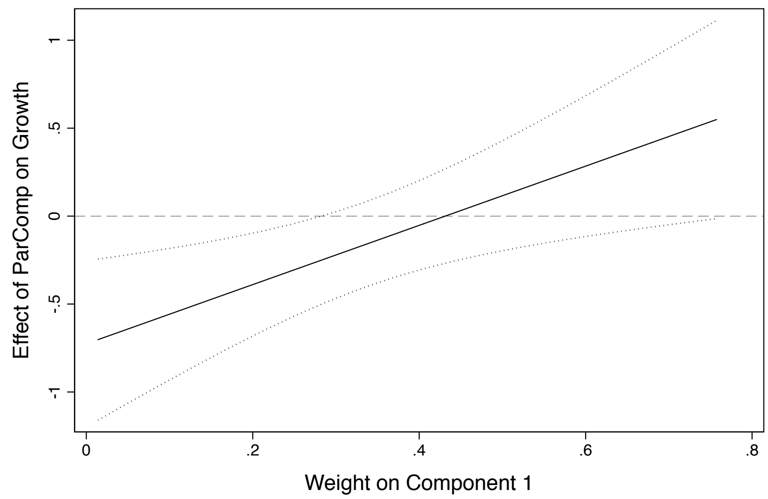
Figure 2: Marginal Effect of StateHist on Growth in GDP per Capita



Predicted marginal effect of StateHist on growth in GDP per capita, with 95% confidence interval, across range of Comp1. Constructed using the estimates from Table 3, Model 2.

The effects of the two remaining institutional variables also are influenced by the weight on Comp1. ParComp is estimated to have a substantively large, positive effect on growth in GDP per capita for countries that are strongly associated with an investment-based growth paradigm, but the effect is negative for countries that are strongly associated with innovation-based growth. For Checks, however, the predicted effects lie in the opposite direction. Constraints on rulers are associated with slower rates of growth for countries in the investment-based growth paradigm.

Figure 3: Marginal Effect of ParComp on Growth in GDP per Capita



Predicted effect of one-unit increase in ParComp on growth in GDP per capita, with 95% confidence interval, across range of Comp1. Constructed using the estimates from Table 3, Model 2.

Figure 3 depicts the marginal effect of ParComp as a function of the weight on Component 1. When that weight is close to zero, an increase in ParComp by one unit, which is equivalent to the difference between South Korea and Sweden in the year 2000, is predicted to decrease the growth rate of GDP per worker by about three-quarters of one percentage point. Where the weight on Component 1 is high, however, the same-sized increase in ParComp is expected to produce an increase in the growth rate by about one-half a percentage point. Both of these predictions are significant at the 95% level of confidence.

Constraints on rulers, as measured by Checks, appear to have a negative effect on the overall growth rate for countries most strongly associated with an investment-based growth paradigm. Where the weight on Component 1 reaches the top of its range, increasing the level of Checks by one standard deviation (.64) is expected to reduce the overall growth rate by about two-thirds a percentage point. This prediction is significant at the .1 level.[16]

Models 3 and 4 on Table 3 focus on the growth factors of capital stock per worker and TFP. Using these factors as dependent variables facilitates investigation of the pathways through which institutions matter for growth. The overall picture is very clear. State authority, as measured by StateHist, is associated with growth in both factors for countries in an investment-based growth paradigm. Where the weight on Component 1 is small, by contrast, StateHist is found to have no systematic effect. Sustained growth starts with a capable state.

The effects of constraints on rulers are quite different from most accounts in the NIE theoretical literature,[17] but they are consistent with the argument above that the state is often an important agent of capital mobilization for investment-based growth. First, as can be seen in Model 3, there is no robust effect of Checks on the growth rate of capital stock per worker. Countries with higher levels of Checks do not achieve faster growth of capital stock overall. Even if constraints on rulers were to facilitate private investment by protecting the property rights of investors, they may have the opposite effect on the state's ability to serve as an agent for providing capital. State mobilization of capital typically involves the extraction of revenue from agriculture or labor, and logic suggests that it becomes more difficult to implement policies of this kind when there are more veto actors in the polity.[18]

Instead, to the extent that constraints matter, they do so through the pathway of productivity growth. As can be seen in Model 4, the effect of Checks on TFP growth is negative for

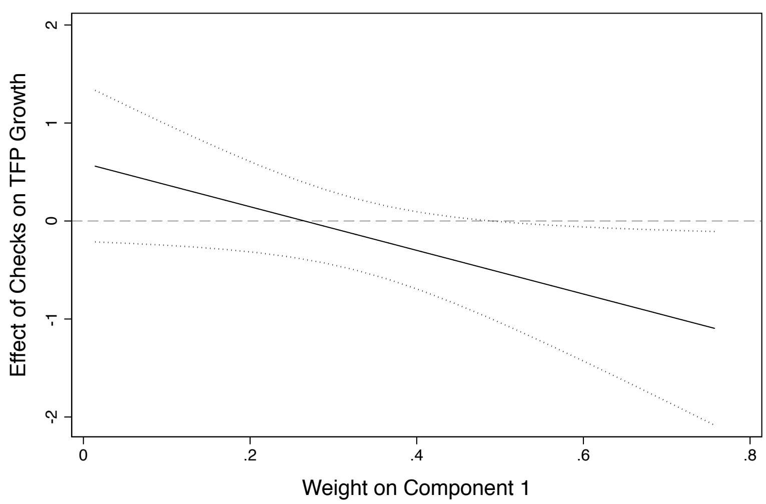
[16]See online appendix for a figure depicting the marginal effect.

[17]For another perspective, see Nooruddin (2011), who considers the different forms constraints may take. Parliamentary minority and coalition governments differ from divided presidential governments in that veto actors have stronger incentives to compromise. The tests here focus on the number of veto actors and thus do not investigate that question.

[18]Robustness tests in the online appendix show that Checks do not support higher rates of foreign-direct investment (FDI) either, but higher levels of ParComp are associated with higher FDI for countries in Component 1.

countries strongly associated with the investment-based growth paradigm (see also Figure 4). On the one hand, constraints on rulers are linked to greater policy stability. While stability may be beneficial when the policies of the status quo are desirable, the process of economic transformation through industrialization typically brings significant social changes that require flexible policy responses. Greater barriers to policy change can impede the industrial transformation. The findings, however, did not provide statistically significant evidence to support the expectation that constraints have a positive effect on productivity growth in an innovation-based growth paradigm.

Figure 4: Marginal Effect of Checks on Growth in Productivity



Predicted effect of one-unit increase in Checks on TFP growth rate, with 95% confidence interval, across range of Comp1. Constructed using the estimates from Table 3, Model 4.

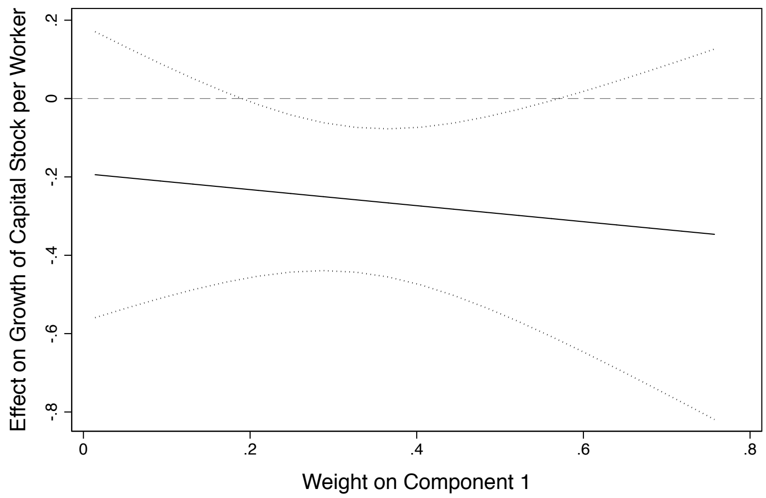
Notably, competitiveness of political participation has quite different effects on growth in capital stock per worker and productivity. In general, higher levels of ParComp are associated with slower growth of capital stock per worker (Model 3). Although the individual coefficients on ParComp and its interaction with Comp1 are not different from zero with high confidence, their combined effect is statistically significant for most of the range of Comp1 (see Figure 5). Where ParComp is one standard deviation (1.4) higher, the annual rate of growth of capital stock per worker is about one-quarter to one-half percentage point slower. This finding is consistent with the idea that greater political participation can slow the accumulation of capital stock either through greater taxation of capital to fund public spending or by making it more difficult for the state to extract resources to fund capital investment.

When it comes to TFP growth, however, the effects of ParComp strongly depend upon the growth paradigm in question. For countries in an investment-based growth paradigm (i.e. the weight on Component 1 is at its maximum), higher levels of ParComp are associated with faster productivity growth. Raising ParComp by one unit would raise the annual TFP growth rate by about 0.8 percentage points. The opposite is true, however, for countries engaged in innovation-based growth. Where the weight on Comp1 is near zero, a one-unit increase in ParComp is associated with a decline in productivity growth by about 0.5 percentage points.

This finding is consistent with the argument developed above. Namely, political pressures on rulers that arise from mass participation are a double-edged sword: they encourage rulers to do things like provide public goods, but they also make it hard for rulers to implement more painful reforms. Where public goods provision has been scarce, the dominant effect of these pressures is economically beneficial for productivity. In societies where these basic services are already provided, the aggregate effect of mass participation on productivity growth turns negative as governments become less capable of decisive action to fix problems.

Results from using the FEVD method to account for fixed differences across countries, while permitting the invariant and slow-moving variables in the analysis to help explain these fixed differences, are presented in the online appendix. These estimates are strongly consistent with those using random effects. The positive effects of state authority, as measured by StateHist, are again found to be much stronger for countries associated with the investment-based growth paradigm than those engaged in innovation-based growth. The coefficients on the variables associated with ParComp, the competitiveness of political participation, generally are stronger in magnitude and are different from zero with greater statistical confidence as well. For Checks, however, the FEVD analysis produces coefficients that are weaker in

Figure 5: Marginal Effect of ParComp on Growth in Capital Stock per Worker



Predicted effect of one-unit increase in ParComp on growth rate of capital stock per worker, with 95% confidence interval, across range of Comp1. Constructed using the estimates from Table 3, Model 3.

magnitude and indistinguishable from zero with high confidence. Whereas the first set of results indicated that Checks was associated with slower productivity growth among countries in an investment-based growth paradigm, we are unable to draw the same conclusion with high confidence after accounting for fixed differences between countries.

4.2 Robustness Checks

A potential concern with these findings is that the institutional variables themselves are contextual factors that help define which growth paradigm is more applicable to a country at a particular time. In other words, does the development of certain institutional characteristics cause a growth paradigm to become more relevant? To test whether the institutional factors are relevant for identifying the growth paradigms, I included them as variables in the weighting equation of a mixture models estimation. The results, which are reported in the online appendix, show that only ParComp is statistically significant. Countries where political participation is higher are more likely to be associated with Component 2 (innovation-based growth).

In one sense, this result is unsurprising. Countries at the technological frontier tend to be democracies with high political participation. ParComp may only serve as an indicator, in other words, to help sort country-years probabilistically. If the relationship is instead causal, we have an interesting puzzle. If high political participation causes innovation-based growth to become more applicable, why do the growth regressions both in Table 3 and the online appendix show that high values of ParComp are associated with slower overall growth in Component 2, with the additional finding that this effect is due to slower productivity growth in particular? The theory presented here provides an explanation. High political participation is a double-edged sword, the benefits of which are felt when public goods are needed most desperately and the costs of which come from hindering the economic adjustments that maintain leading-edge growth.

A second concern may be that institutional choice is endogenous to development due to the distributional effects of economic development. To test whether distributional pressures may alter which growth paradigm is most applicable, and thus the effect of institutions on growth, I included the measure market income inequality (Gini coefficient) from Solt (2009) as a contextual variable in the weighting equation of a mixture models estimation. The results, again reported in the online appendix, reveal that inequality is not a relevant weighting factor. Additionally, the growth regressions based upon the resulting component weights are fully consistent with hypothesized expectations.[19]

4.3 Discussion

In previous work in the New Institutional Economics, a common precept has been that countries can grow rapidly if they just can get the institutions "right." Typically, this meant that institutions in low-income countries should look more like those in the advanced economies. The present study provides evidence consistent with a different perspective: the institutional prescriptions for "catch-up" growth differ from those that sustain growth of technologically-

[19]In fact, since ParComp was found, as hypothesized, to have a negative and statistically significant effect on capital stock growth in the investment-based growth paradigm, the results in one respect support theoretical expectations more strongly.

advanced economies. These findings emerge when we break with the assumption that there is one universal growth paradigm.

A strategy of investment-based growth in which countries draw from a menu of existing technologies to sustain capital investment can be successful if states are sufficiently authoritative to facilitate this process. Competent states provide the foundation for both productivity improvements and capital investment, whether domestic or foreign in origin, either by creating conditions in which private investment is attractive or through direct provision of capital. High levels of political participation rights temper the accumulation of capital stock, raising the overall rate of growth while increasing the share of growth driven by productivity. Constraints on rulers in the form of institutional separation of powers, on the other hand, slows productivity growth.

This analysis suggests two variants of catch-up growth: one that produces rapid growth driven by intensive state-led capital investment in a climate of restricted political rights and another that leads to more balanced growth in a more open, contested political environment. The East Asian capitalist developmental states exemplify the former type, while India serves as an example of the latter. Either variant depends upon basic state authority, and high levels of constraints on rulers serve to constrain productivity growth in both types.

Among countries that reach the technological frontier, productivity growth becomes relatively more important. The level of state authority no longer explains variation in growth rates, and political constraints have, if anything, a positive productivity growth. This finding is consistent with the expectation that constraints hinder the ability of vested interests to use the political system to block competition that arises from unanticipated technological shifts. For these countries, higher levels political rights are found to have a slight negative effect on the rate of productivity growth. The implication is that, as countries reach the stage of innovation-based growth, the economically beneficial effects of competitive political participation for promoting provision of public goods begin to be outweighed by the economic efficiency costs of broad voter demands.

5 Summary

The estimation procedure presented in this article demonstrates that we can attain a richer understanding of the interrelationships between political institutions and economic performance if we part with the assumption that a single linear growth model is sufficient to represent all countries and times. The findings strongly support the expectation that different growth paradigms exist and that political institutions have very different effects in these different paradigms. There is no single style of growth supported by an ideal institutional mixture. Analyzing the main factors of economic growth separately also reveals important nuances. The institutional outputs that generate rapid growth in one factor may not be helpful for supporting growth in another factor.

One key finding is the importance of basic state authority for countries at bottom-end of the world economy. For these countries, state authority is linked with both faster TFP and capital stock growth. The neo-liberal claim that the state is the source of economic decay is far too simple. State policies can distort economies, but a weak state cannot provide the conditions for steady economic development.

Second, this study challenges the claims from the empirical literature in the New Institutional Economics that constraints on rulers are the key to growth by creating the conditions in which private investment will flourish. Instead, constraints in the form of the separation of powers were found to have their strongest impact on productivity growth. Constraints were not associated with higher growth rates of capital stock per worker in any test. Instead, constraints impede productivity growth in an investment-based growth paradigm.

Third, the effects of political participation rights are context-dependent and operate differently through different growth factors. Among low-to-moderate income countries that lag behind the technological frontier, political rights lead to faster productivity growth but slower rates of capital accumulation. Among advanced economies, however, high levels of political rights can temper the rate of TFP growth. This finding helps explain the ambiguous effects of democracy in the broader empirical literature, which examines the effect of democracy on average across all countries.

Finally, an important implication of these findings is that we need not abandon the quest to understand the broad-level interrelationships between political institutions and economic performance. Growing frustration with the lack of robust findings in growth regressions has caused some researchers to move to the other extreme, searching instead for country-specific growth recipes that outline particular policy adjustments. While this approach certainly can certainly prove beneficial at the individual country level, there remains a fertile middle ground that is relatively unexplored with econometric analysis. Broad institutional features have consequences that are desirable in some contexts but not others.

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