Economic development as a matter of political geography

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Abstract: We start out from the hypothesis that limited government leads to low uncertainty and low transaction costs. If political institutions affect the degree of uncertainty and transaction costs, we formally show they should affect the steady state level of income per capita. The impact of uncertainty and transaction costs on income per capita is formalized in a simple capital market model with credit constraints. Empirically, we find increases in political constraints precede economic growth, which is in line with the idea that economic development is driven by political development. Furthermore, only when there are high political constraints is polity persistence positively related to income per capita. We interpret these findings in the sense that limited government is the path towards economic development, being a pre-condition for poor countries to converge towards rich countries

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> "Democracy and aristocracy are not free states by their nature. Political liberty is found only in moderate governments ... So that one cannot abuse power, power must check power by the arrangement of things." Montesquieu, *The Spirit of the Laws*, Book 11.

0. Introduction

Political uncertainty has been repeatedly related to growth. Besides a host of empirical studies, this is also the standard treatment in textbooks such as Barro and Sala-i-Martin (1995).[1] Instead, we argue that one can expect a simple link between political uncertainty and income per capita.

It is easy to state our point in a nutshell in terms of an old discussion in macro: interest rates determine the desired capital stock, not investment.[2] Our formulation is even closer to a point made in international economics: interest rate differentials affect portfolio allocations, not capital flows.[3] In the context of economic development, higher political uncertainty raises interest rates through higher sovereign risk. A country with higher political uncertainty should thus have a lower capital stock and lower income per capita.

Following North (1981, 1990), in Section I we link low political uncertainty to limited government. However, the literature on economic history shows that transaction costs are an additional channel by which basic political institutions affect development. North (1981) points out how property rights lead to greater efficiency, reducing transaction costs. These property rights are created under limited government. The transaction cost channel complements the

[1] Cf. the recent survey in Aron (2000) on diverse institutional measures and growth. Drelichman (2000) and Henisz (2000) specifically look at political constraints (the measure we use here) and growth.
[2] The early Tinbergen investment equations gave way to Jorgenson-style cost-of-capital investment equations due to the econometric specification problems.
[3] Kenen (1985) describes how portfolio-balance models succeeded the view of capital flows as a response to interest rate differentials.

uncertainty channel, and provides a fundamental link between limited government and economic development. Thus, our starting hypothesis is that limited government is the source of low uncertainty and low transaction costs.

In Section II, we analyze how uncertainty and transaction costs affect the steady state level of income per capita in a simple framework, a capital market with credit constraints. Higher uncertainty is modeled as a larger dispersion of the returns of projects. Higher transaction costs are modeled as a reduction in average returns. In the model, lower uncertainty and lower transaction costs imply lower interest rates, a larger capital market, and higher per-capita income.

Putting the initial hypothesis in Section I and the model in Section II together, the implication is that limited government leads to higher income per capita. Section III explores this relation empirically. As empirical measure of limited government, we use a variable that reflects political constraints (Henisz, 2000).

Given the high persistence of both the log of income per capita and of political constraints, we first look at these variables in differences. The present framework implies that changes in political constraints should lead to growth. The data is consistent with this view that political development drives economic development, since changes in political constraints precede growth.

We then look at the relation between political constraints and economic development using a cross-section of data from a different angle. Since the process by which limited government influences economic development should take time, we introduce a measure of polity persistence. Polity persistence has a high positive correlation with income per capita. However, the positive correlation between polity persistence and income per capita breaks down if there are low political constraints. This points in the same direction as the Granger causality

tests: if limited government were the result of economic development, there would be no reason to expect more developed countries to be countries that have had limited government for longer.

I. Basic political institutions

Because of the scope of political institutions, societies can be divided according to national borders. The marked influence of political institutions on economic development is very vivid in the contrasts between East and West Germany, or North and South Korea (Olson, 1996). Despite a common heritage, these countries had tremendously different economic performances. In both cases, the key difference was a political frontier.

Within a country, the basic political institutions are those that determine the organization of political power at a constitutional level. The idea of institutions as the rules of the game is useful (North 1981). The rules of the game in principle determine what is allowed and what not. Typically, rules do this not by limiting the choice set, but rather by affecting the payoffs of the alternative choices faced by individuals.

Basic political institutions are the rules on how rules that govern property rights are changed. The degree of separation of powers is the basic rule that limits the actions of the agenda setter. This rule will be represented below by the political constraints variable constructed by Henisz (2000).

Though specific legislation and regulation are important because the legal system determines the exact content of property rights, we restrict the focus of our present analysis to basic political institutions. Basic political institutions are related in an indirect way to property rights: they determine the legal system that regulates property rights. That politics is at the bottom of property rights has a long history. Smith (1776) viewed the protection of private property as the reason for civil government. North (1981) elaborated this point in terms of the

crucial need of a state with a comparative advantage in violence to define and enforce property rights.

Though property rights inherently rest on the decisions of political power, these political foundations can be very flimsy. In all political systems there is inherently some discretion in political decisions, but larger political constraints can be expected to limit the arbitrary use of that discretional power. The weaker the separation of powers, the easier it is for the assets of individuals to be subject to the whims or caprice of the government. An extreme case that illustrates the problem of arbitrariness is despotism, where no one but the despot has any property rights. In Book 5, Montesquieu (1759) wrote, with the Ottoman Empire in mind where most of the goods were held in precarium,

> Of all despotic governments, none is more oppressive to itself than the one whose prince declares himself the owner of all the land and heir to all his subjects. This always results in abandoning the cultivation of the land and, if the prince is a merchant, in ruining every kind of industry.
>
> In these states, nothing is repaired, nothing improved. Houses are only built for a lifetime; one digs no ditches, plants no trees; one draws all from the land, and returns nothing to it; all is fallow, all is deserted.

Montesquieu hints at a problem of moral hazard: anybody with absolute power will feel entitled to seize anything that she or he wishes. This can also be seen as a problem of adverse selection: an absolute ruler may be a madman or an illustrated despot. Under asymmetric information, if basic rules set no constraints on the executive power, individuals face the highest

degree of uncertainty about the outcomes of their actions. Higher political constraints limit uncertainty.[4]

Our starting point was the effect of limited government on uncertainty, but in the literature on economic history there is another channel by which basic political institutions affect the economy. Montesquieu pointed out that individual rights where the creature of limited government. He considered that the separation of powers was required to assure property rights, as well as all other types of rights of individuals. North has gone on to show how clearly defined property rights lead to lower transaction costs, giving historical content to the implications outlined in Coase (1960).

For instance, North (1981) not only contrasts the arbitrary taxation power of the kings in France and Spain to the lower uncertainty in Netherlands and England, where the General Courts and the Parliament had to give their assent to the taxes proposed by the sovereign. In North's historical account, limited government also leads to reduced transaction costs. Elaborating on North and Thomas (1973), who show that a political system gives the right incentives to economic development only when the rents from innovation are appropriated by innovators, North points out that in the Netherlands and England in the XVIIth century more efficient property rights appeared.

We now explore formally the consequences of the hypothesis that limited government leads to low transaction costs and to low uncertainty.

II. A model of the capital market

[4] In Akerlof (1970), institutions were offered as a solution to adverse selection problems in markets. The same applies to political questions: modern democracies establish constitutional restrictions to the actions of political leaders to avoid problems of adverse selection.

To model the effect of uncertainty and transaction costs on steady state income per capita, we focus on the channel of financial development due to its importance in the process of development. Olson (2000) has gone so far as to mark the difference between development and underdevelopment as the difference between the existence or not of a well-developed capital market. Olson has also emphasized that developed capital markets require an effective legal system to ensure that non-spot transactions and contracts are enforceable.

The legal system depends on the system of government, so one can go further down. North and Weingast (1989) did exactly this: they showed how specific basic political institutions underlie effective legal systems, linking the development of the capital market in England to the elimination after the 1688 Revolution of the arbitrary and confiscatory power of the English Crown. Instead of a case approach, we will apply this insight to a cross-section of countries in Section III, after elaborating the link analytically in this Section.

We describe the effects of transaction costs and uncertainty in a model with imperfect information and credit rationing based on Williamson (1987).[5] We add more structure to the production sector, to see how the equilibrium in the credit market affects the level of income per capita.

A. *Interest rate*

There are two sets of participants in the economy, firms and investors. Both sets of agents are assumed to be risk neutral.

Firm i receives a random return p_i on its investment project. It is common knowledge that the returns of each firm are independent and identically distributed according to a probability

[5] This model is simpler than Stiglitz and Weiss (1981), since there is no adverse selection nor ex-ante moral hazard (there is ex-post moral hazard: firms underreport their returns in case of bankruptcy, forcing investors to monitor).

density function $f(p_i)$. For analytical simplicity, we assume p_i is uniformly distributed over the interval $(\mu - \beta, \mu + \beta)$, where μ is the expected return of a project and β measures the degree of uncertainty.[6] Greater uncertainty is a mean-preserving spread in the returns of investment projects, i.e. a larger β. Transaction costs τ affect the average return of undertaking investment projects, so average returns are given by $\mu - \tau$.

As in the costly state verification model (Townsend, 1979; Gale and Hellwig, 1985), we assume there is a monitoring cost $\gamma > 0$ for an investor. The cost γ can be interpreted as the cost incurred by the investor in case the firm declares it is bankrupt. A contract between a borrower and a lender will be a function that specifies the payment transfer from the borrower to the lender. Firms are assumed to have limited liability. In this type of setting, Williamson (1987) established that the optimal contract is a standard debt contract which specifies the borrower shall pay the lender a fixed amount r^* at the end of the period, unless the borrower defaults on the debt. The amount r^* represents principal plus interest charges, and can be interpreted as the (gross) interest rate if the size of each project is normalized to one. The firm will default on the debt when π_i, the realization of return p_i, does not allow to cover the interest rate: $\pi_i < r^*$. In that case, the investor will receive the entire return of the project, after paying the monitoring cost γ.

We assume each borrower is assigned to one lender, and the lender has all the bargaining power. The expected profit ρ for an investor in a project of firm i is a function of interest rate r:

(1) $$\rho(r) = r\int_{r}^{\mu+\beta} f(p_i)dp_i + \int_{\mu-\beta}^{r}(p_i - \gamma)f(p_i)dp_i - \tau$$

Freixas and Rochet (1998) consider that an advantage of the Williamson model is that, unlike Stiglitz and Weiss, it does not require special assumptions about the distributions of the returns to derive equilibrium credit rationing.

[6] This allows to derive a simple analytical solution (Druck and Garibaldi, 2000).

where the first term is the revenue when the loan is repaid, weighted by the probability of repayment, the second term is the expected value of the project net of the monitoring costs when the firm defaults, weighted by the probability of default, and the last term are transaction costs.

Plugging the assumption about a uniform distribution in equation (1), an investor's profit function for $\beta>0$ can be rewritten as

$$\textbf{(2)}\quad \rho(r) = r\frac{\mu+\beta-r}{2\beta} + \frac{r^2-(\mu-\beta)^2}{4\beta} - \gamma\frac{r-(\mu-\beta)}{2\beta} - \tau$$

Maximizing profit equation (2) with respect to r yields the optimal interest r^*:

$$\textbf{(3)}\quad r^* = \mu+\beta-\gamma$$

for the interval $\gamma\in[0,\ 2\beta]$, where $r\in[\mu-\beta,\mu+\beta]$ as assumed in equation (1).

For $\gamma> 2\beta$, monitoring costs are so high that the lender cannot expect to recover more than $\mu-\beta$. The solution for $\gamma> 2\beta$ is instead

$$\textbf{(4)}\quad r^* = \mu-\beta$$

Alternatively, the equilibrium may be described either by (3) for high levels of uncertainty β, or (4) for low levels of uncertainty β.

The model implies credit rationing: though all projects are identical, some are funded and others are not. A firm that does not receive funds and offers to pay a higher interest rate will be rejected.[7]

B. *Portfolio allocation*

In what follows, we will assume that investors can lend money either to firms in risky country *R* or in safe country *S*. We assume that $\beta_R\geq\beta_S$, so uncertainty in the safe country *S* is weakly lower. We also assume that $\beta_S\geq\gamma/2$, so interest rates are determined by equation (3).[8]

Investors have access to investment in the safe country S with an expected return $\mu_S - \tau_S$, while investment in risky country R has expected return $\mu_R - \tau_R$. Transactions costs are assumed to be weakly lower in safe country S: $\tau_R \geq \tau_S \geq 0$.

The investor will be indifferent between investing in the marginal projects in countries R and S when:

(5) $\rho(r_R^*) = \rho(r_S^*)$

Equation (3) can be used to replace optimal interest rate r_i^* in equation (2) for $i=R,S$:

(6) $\rho(r_i^*) = \frac{\gamma^2}{4\beta_i} - \gamma + (\mu_i - \tau_i)$

Plugging (6) for $i=R,S$ into equation (5), one can derive the equilibrium condition for investors:

(7) $\mu_R = \mu_S + (\tau_R - \tau_S) + \frac{\gamma^2}{4}\left(\frac{1}{\beta_S} - \frac{1}{\beta_R}\right)$

If the sum of the second and third terms in (7) is positive, $\mu_R > \mu_S$ will be required in equilibrium. The average returns will be determined endogenously by the capital stock sunk in each country.

C. *Capital stock*

We now model the average return of the project of each firm. The individual return will be assumed to be a decreasing function of the capital stock in each economy.

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[7] This is also known as type 2 credit rationing (type 1 is when a firm cannot borrow as much as it likes at the going interest rate, see e.g. Freixas and Rochet, 1998).

[8] If $\beta_S < \gamma/2$, interest rates in S would be determined by (4), something that would not change the qualitative results of the model. If, additionally, $\beta_R < \gamma/2$, interest rates in R would also be determined by (4), leading to the counterintuitive result that interest rates would be lower in the risky country. The assumption in the text discards either case, which imply that in equilibrium there is no default on debt.

We assume that income per capita $y \equiv Y/L$ is a function of the capital stock per capita $k \equiv K/L$. The marginal productivity of capital is positive, and there are decreasing marginal returns to capital, so

(8) $y = f(k), \quad f'(k) > 0, \quad f''(k) < 0$

The return on investment projects will be determined by the marginal productivity of economy-wide capital K_i in $i=R,S$ according to the condition

(9) $\mu_i = f'(k_i)$

In this setting, the capital stock per capita will be equalized in both countries if both have the same uncertainty and transaction costs: by (7) $\mu_R=\mu_S$, so need $f'(k_R)=f'(k_S)$ and $k_R=k_S$. That in turn will imply by (8) that income per capita is equalized across both countries.[9]

We depict the equilibrium in Figure 1, where the total capital stock K can be invested either in K_R (from the left) or in K_S (from the right). The marginal productivity of capital $f(k_i)$ is decreasing in K_i for a constant level of labor L_i, so by (6) the average return of investors $\rho_i \equiv \rho(r_i^*(K_i))$ slopes downward as K_i increases and more investment projects are carried out in the economy. The equilibrium is at the point where returns in both countries are equalized.

< insert Figure 1>

If either risk or transaction costs are larger in country R, $k_D=k_U$ cannot be an equilibrium since investors would prefer to switch to the safe country.

D. *Comparative statics*

[9] The model has a Knightian flavor. If there were no risk ($\beta=0$), by equation (4) the interest rate on loans would equal the marginal productivity of capital. In that case, all the factors of production would be remunerated according to their marginal product, and the expected profit of firms would be zero. Under risk, the expected profit of firms is positive. Given interest rates defined in equations (3) and (4), equation (1) implies that firms get nothing when they default, but they have a positive residual profit when the loan is repaid.

We now describe how changes in transaction costs and in uncertainty affect the steady state equilibrium in the capital markets.[10]

If transaction costs τ_R increase in country R, by (6) the ρ_R schedule would shift downwards by the amount $\Delta\tau_R$ of that increase.

< insert Figure 2>

In equilibrium, the shift of the ρ_R schedule will make K_R fall and K_S rise. The fall in the capital stock K_R will lead per capita income in R to fall by equation (8), that shows that income per capita is increasing in the capital stock. The fall of K_R will raise the marginal product of capital in country R, pushing interest rates up in country R (and lowering them in country S), as equation (3) shows.

Likewise, an increase in risk β_R leads to a downward shift of the ρ_R schedule equal to $(\gamma/\beta_R^0)(\Delta\beta_R/\beta_R)$. This shift leads to a reduction in the capital stock K_R. As before, per capita income in R falls by equation (8). The shift will also raise the interest rate in country S: an increase in β_R will increase interest rate r_R^* both indirectly, through a smaller equilibrium K_R that raises the marginal product of capital, and directly through higher uncertainty, as one can verify using equation (3).

In summary, a country with either higher transaction costs or higher uncertainty will have higher interest rates, a smaller capital market and a smaller per-capita income.

III. Empirical evidence

We put together the implications of our framework to see how political development affects economic development. Section I spelled out the hypothesis of how limited government leads to low uncertainty and low transaction costs. Section II modeled how low uncertainty and low

[10] In related work, Avila (2000) models the influence of country risk on steady-state income per capita.

transaction costs lead to a high steady-state income per capita. This framework implies that limited government should lead to higher income per capita.

Another empirical implication of this framework is that limited government leads to a larger capital market and lower interest rates. This is exactly what North and Weingast (1989) found after the installation of limited government in England in 1688. Saiegh (1996) found the same pattern in Argentina after the 1853 constitution established republican government. We do not explore this empirical implication here.

A. *Data set*

The data on income per capita covers the period 1960-1990 and are taken from the Penn World Tables. The data set on political institutions is taken from Henisz (2000).[11] He constructs a very nice measure of political constraints to reflect the degree of limited government.

Political constraints are 0 when there is only an executive power without any kind of limit, while the values approach 1 if there is a legislative power, a federal structure and a judicial system. Divided government and an independent judicial system count as a larger degree of political constraints.

B. *Causality tests*

According to modernization theory, popular in political science, democracy is an endogenous consequence of economic development.[12] The approach in this paper turns the issue on its head. Moderate government, and constitutional democracies, are expected to lead to economic development.

[11] Cf. http://www-management.wharton.upenn.edu/henisz/ for the political constraints index and http://www.colorado.edu/IBS/GAD/spacetime/data/Polity.html for the polity database.

[12] Preworski and Limongi (1997) point out, contrary to modernization theory, that the positive association between democracy and economic development can be due to an exogenous explanation: even though democracies are established independently of economic development, they are more likely to survive in developed countries. They do not explore the causality from political development to economic development.

To address the problem that political institutions can depend endogenously on economic development, we first look at the causality between political constraints and income per capita. Political constraints and income per capita are statistically persistent variables, so we first difference both. Our hypothesis implies, in first differences, that changes in political institutions drive economic growth. The data set is divided in two periods, 1960-1975 and 1975-1990, to carry out Granger causality tests. We took the reduced sample of 62 countries available over the whole 1960-1990 period in the Penn World Tables.[13]

The changes in political constraints (polcon) in response to changes in income per capita are shown in Table 1.

<insert Table 1>

Growth does not precede changes in political constraints in the sample period.

Table 2 shows the inverse relationship, how economic growth responds to changes in political constraints.

<insert Table 2>

Changes in political constraints are significant in the regression. Our Granger causality tests point in the direction that political development precedes economic development. These results are intended as a first step, and they could be integrated into a more standard analysis of the determinants of growth.

However, they are interesting in themselves because they run counter to common political science, and Marxist, views. In the line of Montesquieu and North, they point in the direction that political development drives economic development.

C. *Polity persistence and economic development*

[13] The countries in the reduced sample are described in the Appendix.

We now turn to the relation in levels between political constraints and income per capita, in order to get a different perspective on the steady state relationship between limited government and economic development.

If limited government indeed leads to economic development, one would expect this process to take time to unveil itself. The variable polity persistence measures the number of years that a political structure lasts over time, so this gives us the needed time dimension.[14]

Polity persistence occurs when there is no change in the political regime. Examples of changes are the transition from democracy to dictatorship, or from a unitary to a federal system, the exclusion of significant groups from the political process, and the establishment of a legislature to limit the power of the executive.

Political constraints has a strong positive correlation with income per capita in the data.[15] Figure 3 shows a scatter diagram with the positive association of economic development and political constraints in 1960.[16] The size of the bubbles represents the years of polity persistence.

<Figure 3>

When there are no political constraints at all, there is usually no apparent pattern. For instance, in 1960 Ethiopia is among the countries with no political constraints. Until the 1974

[14] Polity persistence does not give us the history before the current political system, though. This might matter in unstable environments.

[15] The coefficients of correlation between political constraints and the log of income per capita are 0.72 in 1960, 0.73 in 1975 and 0.77 in 1990. In this respect, Gaviria et al. (1999) point out that the Henisz variable is more in line with the relative income per capita of the different regions than other measures of institutional development in the literature, such as the ICRG indexes used by Burki and Perry (1998) that reflect opinions on the protection of property rights and on corruption.

[16] The figure is adapted from Streb (2000), and is representative of other years. He treats political constraints and polity persistence as two dimensions of political uncertainty, relating low political uncertainty to economic development.

coup, Ethiopia had one of the most persistent political regimes. It was also one of the poorest nation in the Penn World Tables.[17]

On the other hand, when there are positive political constraints, larger bubbles seem to drift up. This is the pattern we were looking for: if political constraints were the product of economic development, it is not clear at all why one should expect political stability to matter. On the other hand, if it takes time for limited government to have a positive influence of income per capita, this time dimension makes perfect sense.

To test non-parametrically if there is a positive influence of polity persistence on economic development once limited government is in place, we stratified the data each year into two groups, low and high political constraints. We used the median of the sample, unless more than half the countries had zero political constraints. We then created a contingency table, ranking the countries within each group according to their income per capita and their degree of polity persistence. Table 3 shows the result of using a chi-square test to see whether, within each group, polity persistence and income per capita are independent (Rice, 1995).

<insert Table 3>

As Table 3 shows, in most years of the sample there is no relation at all between polity persistence and income per capita when there are low political constraints. The relationship between polity persistence and economic development is robust only when high political constraints exist.

Since we are focusing on long run relationships, we calculated the averages of income per capita, political constraints and polity persistence for the reduced sample of 62 countries

[17] Note that countries at civil war might not even appear in international statistics. As Olson (2000) stresses, continuous instability is detrimental to economic activity. Anarchy can be worse than the Leviathan.

available over the whole 1960-1990 period. Carrying out the chi-square test, we derived exactly the same result:

<insert Table 4>

Our results on polity persistence and political constraints can be compared to Clague et al. (1996). They established that there is a strong relationship between the length of time a democratic system has lasted and the security of property and contract rights in a society.[18] They also found that, in autocracies, the longer the tenure of an autocrat, the better the contract and property rights. One can think of political stability as giving a track record of the system that reduces uncertainty about what rules actually apply.

However, there is a fundamental difference between autocracy and limited government. In an autocracy, men govern without institutions, so over the longer term uncertainty will be recreated with each successor. According to our framework, the key variable that drives economic development is limited government. In short, we expect polity persistence to have a beneficial effect on economic development once the correct political framework is in place, i.e. in countries with political constraints. Like growing wiser with age, you have to be on the right track first.

IV. Conclusions

Unlike the prevailing approach in the empirical literature that concentrates on the relationship of uncertainty with economic growth, this paper is motivated by the link between political uncertainty and the level of economic development. The intuition for this link is that the political uncertainty translates to higher interest rates through sovereign risk. High interest rates should in

[18] However, political constraints do not merely refer to the difference between dictatorship and democracy. Not every democracy satisfies the characterization of limited government. Rather, a constitutional, or liberal, democracy that observes certain basic rights is required (see e.g. Nino, 1996).

turn reduce both the capital stock and income per capita. This approach implies that economic growth is related to changes in political uncertainty.

We draw on the economic history to link low political uncertainty to limited government. This literature also suggests that limited government affects development through the channel of lower transaction costs. Taking this as our starting hypothesis, we show how low uncertainty and low transaction costs lead to high income per capita in a capital market model with credit constraints. In this framework, economic development is the consequence of limited government.

In the empirical part, we carry out Granger causality tests to check if there is a relation between changes in political constraints and economic growth. There is, and it points in the direction that political development drives economic development.

We also test non-parametrically the steady state relationship between basic political institutions and economic development using cross-section data. Polity persistence does not have a robust relation to development, unless there are high political constraints. This result supports the Granger causality tests: why would it matter for how long countries have had limited government, if limited government were the consequence of economic development?

The results, in terms of contemporary experience, point in the direction of limited government as the condition for economic convergence. This puts the perspective of Marxism, modernization theory, and many others, upside down, suggesting that a system of government that does not limit in a substantial way the power of the executive will not achieve economic development. The results are in the line opened by Douglass North, that historically limited government was the path to economic development.

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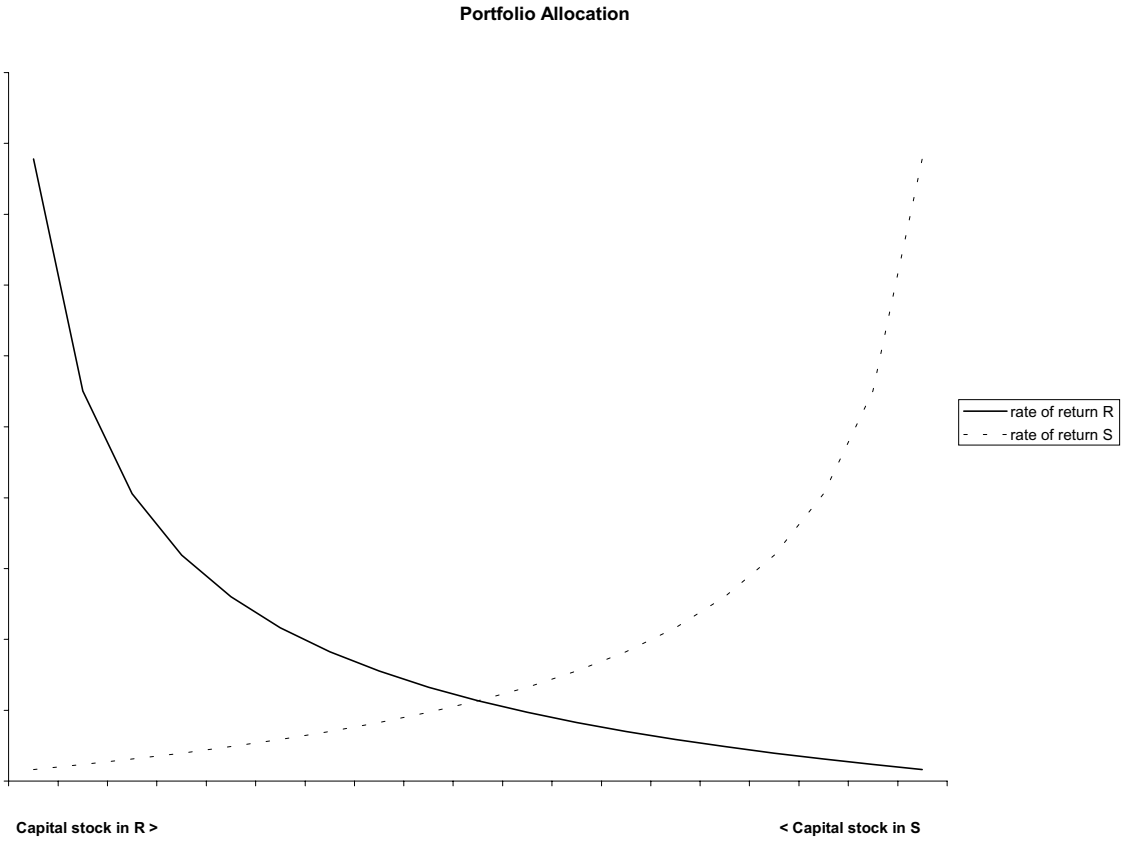
Portfolio Allocation
rate of return R
rate of return S
Capital stock in R >
< Capital stock in S

Figure 1

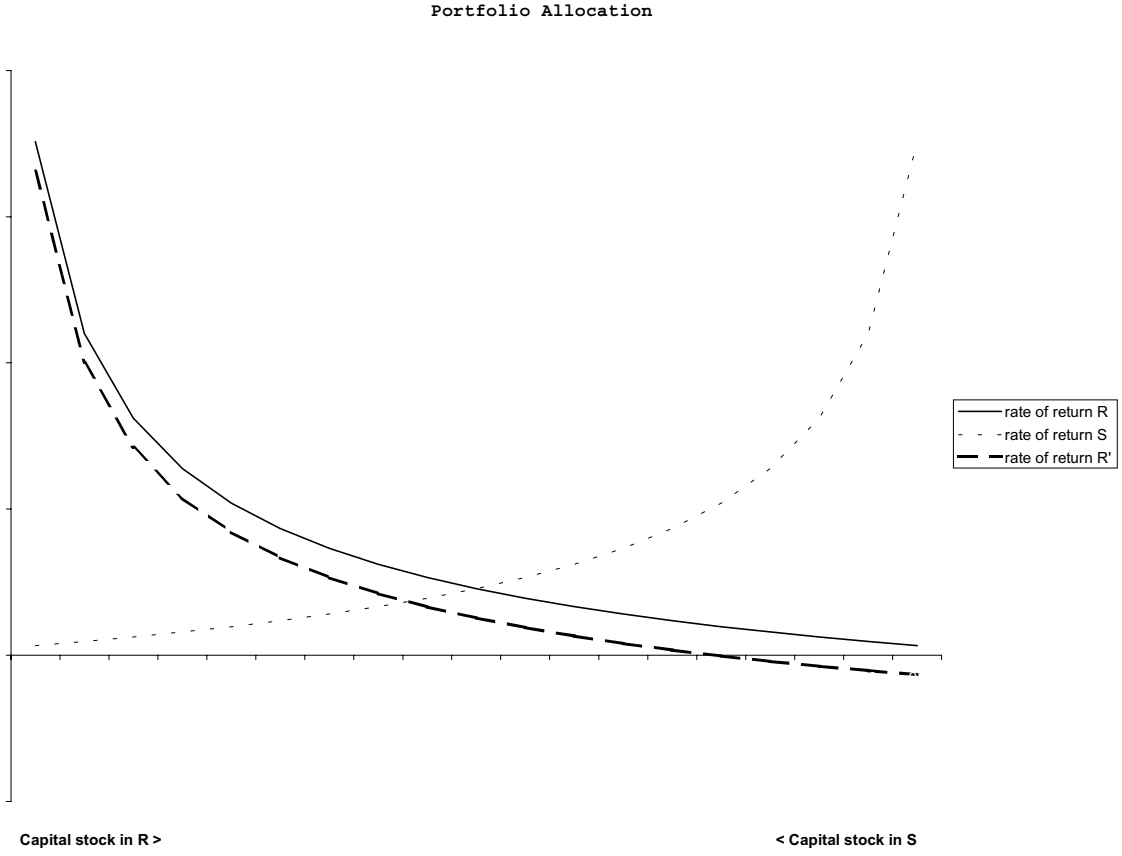
Portfolio Allocation
rate of return R
rate of return S
rate of return R'
Capital stock in R >
< Capital stock in S

Figure 2

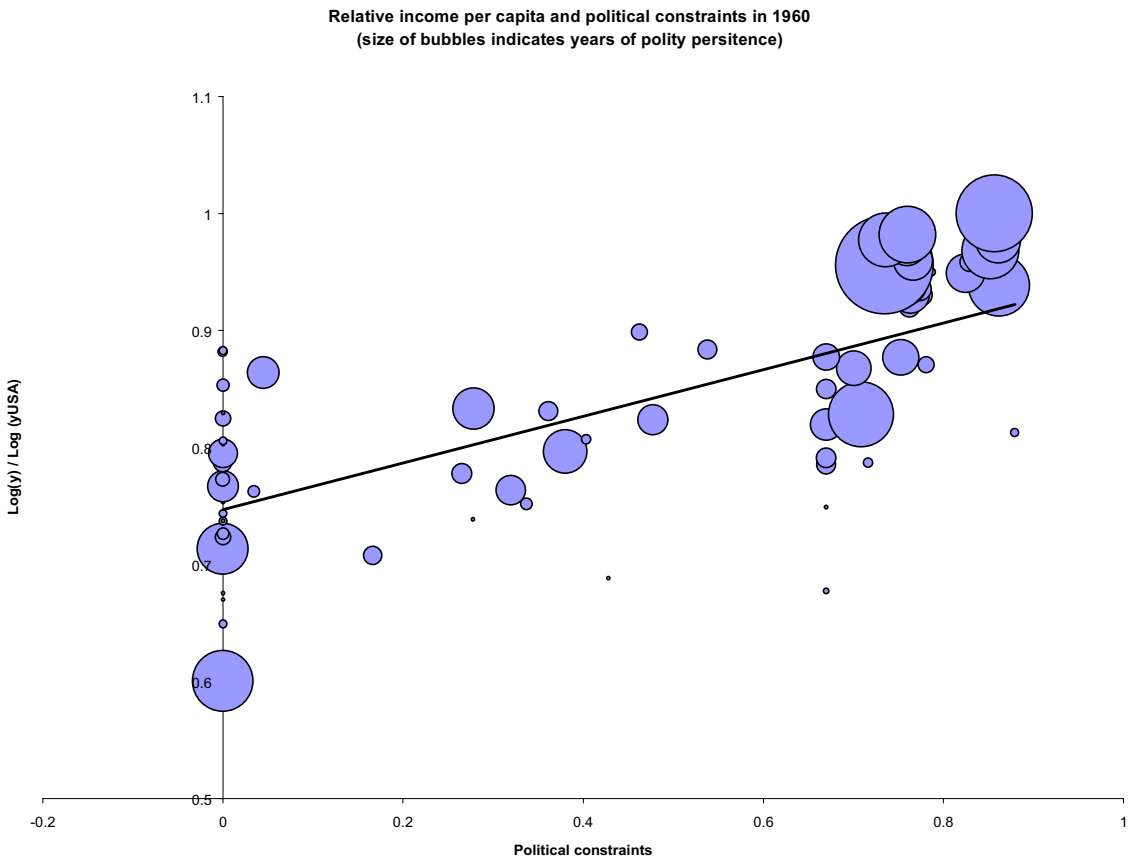
Relative income per capita and political constraints in 1960
(size of bubbles indicates years of polity persitence)
Log(y) / Log (yUSA)
Political constraints
1.1
1
0.9
0.8
0.7
0.6
0.5
-0.2
0
0.2
0.4
0.6
0.8
1

Figure 3

Table 1

Granger Causality Test
Δpolcon75-90

	Test 1	Test 2
Δln(Y/L)60-75	-0.0621 (-0.791)	-0.0478 (-0.632)
Δpolcon60-75		-0.3148 (-2.462)**
Constant	0.1158 (2.817)**	0.1013 (2.538)**
Adjusted R^2	-0.0062	0.0721
F value	0.625	3.37**
Observations	62	62

Note: t-statistics in parenthesis. One, two and three asterisks indicate significance at 10%, 5% or 1%.

Table 2

Granger Causality test
Δln(Y/L)75-90

	Test 1	Test 2
Δpolcon60-75	0.6440 (2.808)***	0.6159 (2.713)***
Δln(Y/L)60-75		0.2163 (1.612)
Constant	0.2534 (7.779)***	0.1516 (2.139)**
Adjusted R^2	0.1014	0.1247
F value	7.89***	5.35***
Observations	62	62

Note: t-statistics in parenthesis. One, two and three asterisks indicate significance at 10%, 5% or 1%.

Table 3

Polity Persistence and income per capita
Chi-square test of independence
Total sample for years 1960-1990

Year	Cut-off value of polcon	Number of Countries			Test for high polcon	Test for low polcon
		Total	Low polcon	High polcon		
1960	37%	76	38	38	0.0231 **	0.1049
1961	26%	85	43	42	0.0231 **	0.1049
1962	26%	91	46	45	0.0231 **	0.1049
1963	25%	93	45	48	0.0093 ***	0.1715
1964	25%	94	46	48	0.0015 ***	0.0404 **
1965	25%	98	49	49	0.0010 ***	0.4708
1966	25%	102	51	51	0.0033 ***	0.8875
1967	26%	103	52	51	0.0032 ***	0.3929
1968	27%	105	53	52	0.0009 ***	0.3247
1969	26%	105	53	52	0.0009 ***	0.8415
1970	27%	109	55	54	0.0011 ***	0.4839
1971	16%	110	55	55	0.0003 ***	0.5023
1972	0%	111	58	53	0.0002 ***	0.2835
1973	0%	111	59	52	0.0009 ***	0.2921
1974	0%	112	59	53	0.0002 ***	0.3566
1975	0%	114	61	53	0.0016 ***	0.2401
1976	0%	116	62	54	0.0004 ***	0.1738
1977	0%	115	60	55	0.0003 ***	0.2031
1978	0%	116	61	55	0.0003 ***	0.0538
1979	0%	116	62	54	0.0004 ***	0.1738
1980	0%	116	59	57	0.0001 ***	0.4795
1981	0%	117	60	57	0.0001 ***	0.2560
1982	0%	117	59	58	0.0001 ***	0.2367
1983	0%	117	60	57	0.0009 ***	0.1670
1984	0%	119	61	58	0.0001 ***	0.0783*
1985	0%	126	65	61	0.0014 ***	0.0248 **
1986	21%	124	62	62	0.0001 ***	0.0222 **
1987	23%	122	60	62	0.0001 ***	0.0213 **
1988	34%	118	59	59	0.0002 ***	0.0134 **
1989	32%	116	58	58	0.0000 ***	0.0660*
1990	38%	96	47	49	0.0000 ***	0.4463

Note: One, two and three asterisks indicate that null hypothesis of independence is rejected at 10%, 5% or 1% probability value.

Table 4

Polity Persistence and income per capita
Chi-square test of independence
1960-1990 average for reduced sample of 62 countries

Cut – off value of polcon	Test for high polcon	Test for Low Polcon
59%	0.0006 ***	0.8625

Note: One, two and three asterisks indicate that null hypothesis of independence is rejected at 10%, 5% or 1% probability value.

Appendix: Summary statistics of countries

Table 5

Reduced sample and total in 1986

Averages of	GDP per capita			Polity Persistence			Political Constraints		
	Total	Low polcon	High polcon	Total	Low Polcon	High polcon	Total	Low polcon	High polcon
Reduced sample	6345	2776	9913	44	18	71	0.49	0.21	0.77
Total	4470	1958	6983	32	18	45	0.32	0.01	0.63
Reduced/total	142%	142%	142%	140%	98%	157%	153%	2404%	122%

Table 6

Countries in 1986 by geographic region

Region	North America	Europe	Oceania	Latin America	Sub-Sah. Africa	Carib-bean	NE Asia	SE Asia	Middle East &N Africa	Total
Reduced sample	2	21	2	16	6	1	2	5	7	62
Total	2	25	2	18	42	4	6	8	17	124
Reduced/Total	100%	84%	100%	89%	14%	25%	33%	63%	41%	50%

Note: for reduced sample, NE Asia is Japan and Taiwan; SE Asia is India, Indonesia, Malaysia, Philippines and Thailand; and Middle East & N. Africa is Egypt, Israel, Jordan, Morocco, Pakistan, Tunisia and Turkey. This classification is based on http://www.worldbank.org/aidsecon/arv/floyd/whoarv-webp12.htm.

Table 7

Reduced sample of countries
Averages for 1960-1990 period

GDP per capita			Polity persistence			Political constraints		
Total	Low polcon	High polcon	Total	Low polcon	High polcon	Total	Low polcon	High polcon
5135	2309	7960	38	14	62	0.45	0.14	0.77