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Does Education Promote Stable Property Rights?*

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Abstract

This paper sets out to establish an empirical link between education and property rights. The analysis is based on a new index of property rights derived from a set of commonly used indicators. As expected, education has a generally positive impact on property rights. But the relationship is not linear. The effect also depends on level of income. More education might not always be good for property rights in low-income countries. Instrumental variable estimation demonstrates that the schooling of the least educated 60 percent population is better identified to measure the impact of human capital on property rights than mean years of schooling. The dynamic panel estimation of the relationship reveals that it takes some time before an increase in the human capital of the least educated 60 percent population bears a positive impact on property right institutions. The independent influence of education on property rights is found to be stronger than that of income in most specifications.

Key words: Property rights, education, composite index

JEL classification: O10, P16

1 Introduction

There is a natural tendency to automatically associate education with positive socioeconomic transformation. The fact that two of the eight Millennium Development Goals (MDGs) are related to education is a testament to this tendency prevailing among national and international policy circles. When Lipset (1960) argued that educated people are more likely to build fairly robust political institutions, the argument had been taken for granted that it was not exposed to empirical scrutiny until recently. When the empirical examinations are finally initiated, they focused on the link between education and democratic institutions, leaving aside the presumably crucial relationship between education and

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economic institutions such as property rights (Barro (1999), Acemoglu et al. (2005), Castello-Climet (2008)). The closest attempt to examine the impact of human capital on economic institutions came in Glaeser et al (2004). But they eventually dropped risk of expropriation, which is the presumed indicator for property rights, on the ground that it was an outcome indicator conceptually unfit to measure institutions. On a more general level, the empirical scrutiny of the relationship between human capital and economic institutions is overshadowed by the painstaking interest on the direction of causality between institutions and level of development ((Acemoglu et al. (2001), Rodrik et al. (2004), Olson et al. (2000), Knack and Keefer (1995)). Education, lumped together with other indicators of development and proxied by per capita income, usually falls out of the picture.

This paper attempts to explicitly introduce human capital in the empirical analysis of the determinants of property right institutions. Unlike cruder representations of modernization theory that tend to mix up the roles of income and human capital for institutional development, specific attention is given to separate the independent and interacting effects of the two factors. This paper also tries to tackle one of the problems that have pestered the empirical analysis of property rights, i.e. measurement of property rights, by proposing a new composite index built on a widely used set of indicators. In constructing the index, a fairly inclusive conceptualization of property rights that cuts across normative definitions is applied. As an alternative to the new index built on perception-based indicators, an entirely objective proxy for property rights is adopted from Clague et al (1999), measuring the contract intensiveness of the financial sector.

In the theoretical literature, the transmission mechanism between education and property right institutions is not well defined and clearly articulated. In most political economy models, education is treated as an endogenous outcome that would be determined as part of the political equilibrium rather than as a predetermined factor that affects political and economic institutions (see for example, Perotti (1993), Bourguignon and Verdier (2000), Grossman and Kim (2003), Galor and Moav (2006)). The only rigorous work that I am aware of which attempts to formally analyze the impact of education on an institutional feature closely related to property rights is Eicher et al. (2009). Although they still treat education as endogenous to institutional structures, Eicher et al. (2009) predict that the level of education has a non-monotonic relationship with corruption. They argue that "economies with intermediate levels of education remain in a poverty trap since the level of skills creates sufficient corruption rents but not enough monitoring" (pp. 205).

Although the logic behind the presumed link running from education to property rights is not formally developed in the current paper, it could be articulated as follows. In most societies in general and in non-democracies in particular, the first people to get quality education are children of the political elites.¹ Once sufficiently large portion of the children of the political elites

¹Bueno de Mesquita and Smith (2011) argue that, for authoritarian regimes, world-class

are educated, they start gaining interest in careers outside the political establishment. As the political elites develop a stake in the productive sectors of the economy, they will have incentives to put up institutions to protect property rights. The alignment of the interests of the political elites and the owners of physical capital occurs through the channel of capital-skill complementarities. In the presence of such complementarities, the political elites become keen on assuring the business elites to invest in the capital stock that the former need to complement their offspring's human capital. Such intra-elite bargains to secure physical capital investment could be viewed only as partial institutionalization of property rights. However, once the elites have accumulated sufficient physical capital, they need the market to supply them with more skilled labor such that they encourage public investment in education (Galor and Moav, 2006). This allows for yet another iteration of institutionalization in which a newly skilled constituency tries to establish broader set of property rights in an attempt to attract more capital investment. This means the scope of property rights institutions differs when the non-elite acquire more human capital from what it is when only the elites are educated. Accordingly, in addition to the average level of education, the distribution of human capital can be taken as a key determinant of the security of property rights.

The abovementioned mechanisms link education to pre-conceived formal institutions. But even in the absence such institutions protecting property rights, the very structure of a modern economy with abundant human capital may hinder expropriation. For one thing, assets and output in a skill-intensive economy are more likely to be difficult to expropriate. For another, more educated people might find it easier to hide their worth. Therefore, even when *de jure* institutions are not established, there will be *de facto* mechanisms to protect property rights in skill-abundant economies.

The first set of empirical results in this paper are aimed at documenting basic empirical regularities in the relationship between property rights and education controlling only for rudimentary sources of endogeneity (i.e. reverse causality). In latter estimations of the relationship, though, I use standard methods of identification to take care of the endogeneity issue more thoroughly. Generally, the econometric evidence in this paper provides support to modernization theory by revealing the positive impact of education on property rights. However, the impact is not linear and independent of the level of income. Human capital investment helps countries in the lower and upper strata of average education to improve their property right institutions marginally more than the ones with intermediate education. Although education is found to outperform income in most specifications, its effect does crucially depend on the level of income of the country. Unless their incomes increase simultaneously with their stock of human capital, low income countries could have their property right institutions

higher education is a prerogative of the elites: "Dictators also like to have their children educated in leading universities in the United States and the United Kingdom. In fact, one might also conclude that Oxford is a breeding ground for authoritarians. It certainly is the alma mater of many, including Zimbabwe's Robert Mugabe, the Bhutto family of Pakistan, kings of Jordan, Bhutan, Malaysia, and even little Tonga" (pp. 109).

destabilized by educating more of their citizens. The results on some of the control variables are also worth noting on their own. For instance, democracy, as represented by constraint on the executive, is found to be less pertinent to de facto property rights. Between the two alternative measurements of stock of human capital used in this paper, cumulative 3rd quintile education is shown to be more robust from the point of view of econometric identification. Nevertheless, in terms of general explanatory power, cumulative 3rd quintile education is trumped by mean years of education in the benchmark specifications.

The rest of the paper is organized as follows: section two provides substantive background to the conceptualization and measurement of property rights adopted in this paper. Section three describes the data and lays down the econometric methodology. Section four presents the benchmark results. Section five deals with issues of identification by applying instrumental variable and dynamic panel techniques. Section six concludes.

2 Definition and measurement of property rights

No matter how ubiquitously it has been used across the economics literature, property right is a sparsely defined and a highly contextualized concept. Armen Alchian defines property rights in The New Palgrave dictionary of economics as “a socially enforced right to select uses of an economic good”. A more nuanced definition of property rights normally follows the ‘bundle of rights’ approach by enumerating the different aspects of property rights such as the right to consume, the right to earn income from, and the right to alienate assets (Barzel (1997), Frye (2004)).

Essentially, property rights are created because resources are scarce and there is a threat of predation. Hence, our understanding of property rights depends on the origin and scope of the potential threat on property. This, in turn, depends on our perception of the *state of nature* which precedes the existence of any social contract. There are two major strands of thought in social contract theory which offer different perspectives on the source of the threat on property and the corresponding solution. In the view of Thomas Hobbes, the threat emanates from the selfish interest of individuals and their temptations to encroach over other peoples’ property, which essentially renders life in the state of nature to be “solitary, poor, nasty, brutish and short”. The Hobbesian school of thought deems a strong king (or state) to be the paramount arbiter of contracts and protector of property. John Locke, on the contrary, does not necessarily consider the state of nature to be a warlike situation. When man mixes his labor to things of nature to produce value, the right to that property will automatically adhere in the individual regardless of any ‘leviathan’ to define property rights. The individual also retains the right for impartial protection of property. The Lockean school of thought reckons that the state itself could infringe on private property. Therefore Locke advocates limited government and enhanced civil society.

The classical dichotomy regarding the salience of private and public threats

against property resonates in the recent literature in the form of the contrast between the contract theory of the state and the predatory theory of the state (North, 1981). Built on transaction cost theory, in much of mainstream microeconomics, property rights are linked to the completeness and enforceability of contracts. In that case, the state is viewed as a neutral party that enforces contracts and creates an enabling environment. But, the political economy literature identifies the state as an apparatus that could be used to transfer resources from one group to another. Hence, the state is not only supposed to check private trespassers on property, but also to credibly commit to not renege on its own promises (Frye, 2004).

So, what is the ultimate yardstick one should be using to determine whether or not property rights are protected? How do we judge systems of government that are not strictly constrained by law but in which self-interested dictators choose to maintain stable property rights? There lies the contentious issue of whether property rights should be treated as *de jure* or *de facto* constraints. The conceptualization of institutions as the ‘rules of the game’ constraining individual behavior limits the measurement of property rights to *de jure* rules that are written in the form of a legal code or imprinted as an informal norm. However, institutions could also be defined as “a system of social factors that conjointly generate a regularity of behavior” (Greiff, 2006, pp. 30). In the latter case, the complex ‘system of social factors’ might not be readily observable and should be imputed mostly by examining the observed ‘regularity of behavior’. The adoption of the broader definition provided by Avner Greif furnishes more room for the measurement of property rights as *de facto* constraints that are reflected in the outcomes rather than in the rule books.²

The scope of property rights also differs depending on the specific context and the nature of property holding. In most developing countries, for instance, land is the single most crucial asset for the majority of the population. Therefore the security of land rights is considered to be the centerpiece of the analysis of property rights in such societies. But what is important in the modern day economy where resources are mobile and sectors are increasingly inter-linked is the analysis of systemic property rights. The definition of private property might be stretched to include such intangible assets as the future value of money determined by market interest rates. If a government prints money arbitrarily to create inflation and erode the value of the deposits of private agents, it could be considered as if it had violated their property rights (Clague et al., 1996).

For this particular paper, I have defined property rights in the broadest macroeconomic dimension that cuts across different sectors. The conceptualization of property rights applied in the subsequent empirical analysis does not hinge up on a specific form of property holding (for example, private property) or a particular legal framework. Accordingly, the current definition of property rights is more in line with the Greifian conceptualization of institutions as systems of social factors observed through the regularity of behavior that

²Glaeser et al. (2004) insist that empirical measurement of institutions should strictly conform to the conceptualization of institutions as constraints. Therefore, they argue, outcomes of conscious choices by unconstrained politicians should not be considered as institutions.

they generate. The specific indicators I used for the empirical analysis are supposed to capture the notion of constraints on the predatory state as well as the enforcement of contract between private agents.

Most of the measurements of institutional features that are available out there with a considerable length of time series are subjective ratings of different aspects of institutions provided by investors or experts. The subjectivity of the indicators has its own problem stemming from limited information and cognitive bias. However, from the point of view of the instrumental importance of property rights information as the basis of investment decisions, what really matters is what the investors and, to a certain extent the experts, perceive the security of property rights to be in a particular economy. The longest available time series of different indicators related to political and economic risk is provided in the International Country Risk Guide (ICRG) dataset. But among the raw ICRG indicators, there is no single indicator measuring the security of property rights as a whole. Therefore I performed a principal component analysis using the *corruption*, *law and order* and *bureaucratic quality* indicators in order to come up with a single composite indicator.

Corruption by government officials is a direct violation of property rights when it takes the form of arbitrary expropriation. When corruption happens with the purpose of leveraging transactions, it could be viewed as an outcome of a Coasian bargaining to overcome ill-defined property rights (Shleifer and Vishny, 1994). Nevertheless, given the fact that the corrupt official cannot be held accountable to an explicit contract, corruption will not be an efficient solution. Therefore, even in the Coasian sense, corruption cannot be deemed as anything more than a symptom of poorly defined property rights. Bureaucratic quality is linked to the general idea of property rights through its effect on the capacity of the state to protect property from trespassing and to enforce contracts. Apart from its independent effect on state capacity, bureaucratic quality can also be interlinked with corruption, bearing a combined effect on the enforcement of property rights by public officials (Acemoglu and Verdier, 1998). Law and order represents an indicator reflecting the state of rule of law in the political and economic spheres. While corruption and bureaucratic quality are mainly about specific state-society relationships, law and order measures the robustness of the social contract among private agents as well as between the state and private agents. The composite index constructed to evaluate property rights in the present paper represents a blanket measurement of the state of property rights in a given country as weighted by the relative importance of the three indicators discussed above.

3 Data and empirical strategy

As noted above, the data on the major variable of interest, i.e. property rights, is a composite transformation of three individual indicators from the ICRG dataset for the period between 1985 and 2005. I use Principal Component Analysis (PCA) to distill the information jointly contained in all the three in-

dicators to arrive at a composite index that may represent the general state of property rights in an economy. The Keiser-Meyer-Olkin (KMO) measure of sampling adequacy, which is normally employed to determine whether the variables under investigation warrant a PCA, turns out an average of 0.72, indicating the variables are ‘moderately’ adequate. Subsequently, a PCA was conducted on the indicators of corruption, bureaucratic quality and law and order for all 21 years.

The results show that the first principal component stands out as the closest measurement of property rights with all the three variables loading on it positively all the time. On average, the first component alone explains 74.4 percent of the total variance in the three base variables. The newly constructed series on property rights consists of the scores of the countries in the dataset on the first principal component for the years data is available.

Figure 1 provides a comparison of the newly constructed ICRG composite index with two of the most widely used indicators of property rights: the Fraser Institute property rights index and the Heritage Foundation property rights index.³ Both panels of figure 1 display the strong correlation that the new ICRG composite index maintains with established indicators of property rights. The two indices are more strongly correlated with the new ICRG index than they are correlated with each other.

In addition to the subjective index described above, I adopt the objective measure of Contract Intensive Money (CIM) proposed by Clague et al. (1999) as an alternative measurement of property rights. Precisely, CIM is the ratio of non-currency money to the total money supply in the economy. This ratio reflects the general climate of contract enforcement and property rights protection because, it basically measures the confidence agents have to hold their assets in financial products other than currency. A higher CIM ratio indicates more effective enforcement of contracts and better protection of property rights.

The following baseline specification, assuming away nonlinearities, is considered to analyze the link between property rights and education;

$$PRights_{it} = \alpha_t + \beta PRights_{i,t-T} + \gamma Educ_{i,t-T} + Z_{i,t-T}\varphi + u_{it} \quad (1)$$

where i is country, t is time period, and T is time lag. α , β , γ and φ , are parameters to be estimated whereas u is random disturbance. $PRights$ stands for either one of the indicators of property rights described above. The property rights indicator enters the set of explanatory variables too with a lag of T periods. The lagged dependent variable formulation operationalizes the notion of institutional persistence. $Educ$ represents the main explanatory variable of interest, i.e. education. Mean years of schooling of population aged over 25 years, which is the most widely used measurement of education, is employed as an indicator of the level of education. In addition to mean years of education,

³The present index is preferred over the Fraser Institute index because it balances bureaucratic enforcement of contracts with judicial enforcement, whereas the Fraser index exclusively focuses on the later. Compared to the Heritage Foundation index, the present index refrains from assuming ‘private property’ and tends to be inclusive of all forms of property holding. It also offers a longer time series than Heritage’s index.

"Cumulative 3rd quintile education" is also used as an alternative indicator of the level of education with special emphasis to the schooling of the less educated 60 percent of the population.

The control variables are represented by the vector Z in equation (1). The current empirical strategy draws on the set of potential determinants of property rights highlighted in the relevant literature to control for the effects of observable country specific effects. Along the line of the legal origin hypothesis (La Porta et al. (1998, 1999)), a dummy variable indicating whether a country has a common law system (or British origin) is incorporated as a control variable. The endowment school of thought is taken account of by the inclusion of European settler mortality rate and share of fuels in total exports. The former variable controls for historical diseases environment and its implications for centuries-old critical junctures (Acemoglu et al., 2001). The latter variable takes care of the effect of contemporary resource abundance (Hodler (2006), Beck and Laeven (2006)). The indicators for social endowment and harmony are the indices of ethnic fractionalization, ethnic polarization and Gini coefficient for income inequality.⁴ Since data on Gini coefficients of individual countries is scanty, for the estimation of the property rights model in year t , I take the average of all recorded coefficients in the decade preceding year t .

The vector of control variables also includes a measurement of the level of democratic accountability in the country. The 7-scale variable of executive constraint is incorporated as such measurement indicating regime characteristics. In line with the modernization hypothesis, government capacity to enforce property rights should be considered as one of the determinants of the security of property rights. In the present analysis, government capacity is captured by the ratio of taxes and social security contributions to GDP. Finally, the most natural control and the central determinant of property rights, according to the modernization hypothesis, is the level of GDP per capita.

There is no prior restriction imposed on the type of countries that would be included in the sample. The only filtering that is carried out prior to the analysis is the exclusion of small island nations and non-autonomous territories. In most cases the availability of data on a specific variable is the only determining factor for the number of observations that are actually included in a particular regression.

The empirical analysis is undertaken at two levels with the separate objectives of documenting empirical regularities and identifying causality. The baseline specification in (1) is estimated using the Seemingly Unrelated Regression (SUR) method. This particular method exploits the panel characteristics of the data in a subtle manner at the same time as it maintains the simplicity of least-square methods such as pooled OLS.⁵ Since data on schooling is reported in five-year intervals, we have a four-equation system of regressions for the period between 1985 and 2005 (i.e. for years 1990, 1995, 2000 and 2005). For each country, the error term, u_{it} , is allowed to be correlated over time. The constant

⁴See Alesina et al. (2003), Hodler (2006) and Keefer and Knack (2002) for discussion on the link between property rights and ethnic fractionalization or ethnic polarization.

⁵This is important from the point of view of the short panel in the current dataset.

term varies over the four periods, capturing the time effect. But all the other parameters are constrained to be constant over time in a way that shows the permanent effect of the explanatory variables.

Although the baseline SUR system, by taking the five-year lags of all the explanatory variables, reduces the effect of endogeneity that might have occurred in the form of reverse causality, it could not rule out the type of endogeneity that results from both the dependent and independent variables being generated by a common unobserved process. In an attempt to tackle the general problem of endogeneity and improve the accuracy of identification, two strategies of instrumental variable estimation are devised: external instruments and internal instruments. The external instruments approach employs the standard two-stage least squares estimator, while the internal instruments approach uses Generalized Method of Moments (GMM) to estimate the equation in first differences. In the case of the later approach, due to the high degree of persistence in the education variables and the consequent inadequacy of first differences to pick up sufficient variation, System GMM is the preferred method of estimation. This is specifically because System GMM estimates the equations in levels by instrumenting them with the lagged first differences.

4 Benchmark estimates

The seemingly unrelated systems of equation estimate the baseline relationship between property rights and the level of education. Table 2 presents the results of the most parsimonious specifications that include assortment of education variables along with per capita income and five-year lags of property rights as controls. The first two columns provide strong initial evidence in support of the general impact of education on property rights. Column 1 shows that a one standard deviation increase in mean years of education (i.e. 2.93 years) produces a rise of 0.22 or 14 percent of standard deviation in the score of property rights in the short-run. Due to the dynamic persistence of property rights over time, the long-run effect of the same increase in education will be a rise in property rights of 0.94 or 61 percent of standard deviation. Compared to one standard deviation increase in natural logarithm of per capita income, which induces 7 percent and 34 percent rise in the short- and long-run respectively, the mean level of education performs better in explaining the quality of property rights.

If the alternative measure of cumulative 3rd quintile education is used instead, a one standard deviation increase in that particular indicator will results in a 0.14 rise in the score of property rights (equivalent to 9 percent of standard deviation). When both indicators of levels of education are included in the regression, mean years of education trumps cumulative 3rd quintile education in terms of statistical significance in explaining property rights (see column 3). This result suggests that for the blanket concept of property rights embodied in the currently employed index, the general level of education is more important than the share of the less educated population. But columns 7-9 tend to tell a different story as to the relative importance of the two variables. Accord-

ing to those results, when property rights are measured by the more specific indicator of contract intensive money (CIM-ratio), cumulative 3rd quintile education becomes more important in explaining their security. This is probably because financial deepening, a proximate factor that is simultaneously captured by CIM-ratio, requires more broad-based education.

Does the marginal effect on property rights increase as countries climb up the average education ladder? Column 4 in table 2 shows that there is a sizable return for moving from the low education category of 2 and less years of average schooling to the lower-middle education category (between 2 and 4 years of average schooling). But the marginal return in terms of secure property rights declines when countries transition from lower-middle education to upper-middle education category, attaining between 4 to 8 years of schooling. The advancement to the highest category of education, however, boosts the marginal effect of average education to a large extent. The intermittent increase in the marginal effect of education hints that more education might not necessarily imply better property rights. This particular result leads to another curious question: to what extent does the impact of education depend on the level of income?

Based on the estimated coefficients given in columns 5 and 6 in table 2, table 3 provides the marginal effects of education at different levels of income. In order to give the comparison a tangible context, the levels of income selected to calculate the marginal effects are matched with countries. Hence, we could predict the comparative impact of an additional year of schooling on the security or property rights in low-income Liberia as opposed to in high-income Kuwait. For both indicators of level of education, the marginal impact of education increases with income. When a country is below a certain threshold level of income, a unilateral rise in schooling does more harm to property rights than it does good. For example, in 1995, if Cameroon increased the level of education attained by the least educated 60 percent of the population by 10 percent without raising its per capita income, it would see its property rights score decline by 0.107 points (7 percent of standard deviation). On the contrary, the same level of improvement in the share of the least educated 60 percent would have brought Malaysia a 0.17 increase in its property rights score.

It is also interesting to compare the sensitivity of the two measures of education to the effect of conditioning on income. As table 3 shows, most of the negative marginal effects are statistically significant for cumulative 3rd quintile education while they are not significant for mean years of education. The absolute magnitude of the effects is also much larger for cumulative 3rd quintile education. Intuitively, increasing the level of education of the lower-middle and working classes in poor countries, without increasing the size of the national cake, creates redistributive pressures that could ultimately undermine stable property rights. Human capital is normally expected to increase income and improve institutions both at the same time. However, the kind of boost in schooling, which does not effectively translate into a rise in productivity, may simply end up producing more skilled predators. From the point of view of the theoretical proposition presented in the introduction, the failure of education to improve property rights in poor countries could be interpreted as a consequence

of the lack of capital-skill complementarities in such economies. If the elites or any newly educated constituency do not expect the structural backwardness of the economy to allow a rise in the returns to their education when that human capital is matched with physical capital, they will have little incentive to respect property rights.

Finally, table 4 offers an overview of how the effect of average level of education fares when other control variables are added to the regression. As a side result, it also sheds light on the significance of the individual control variables independent of income and human capital. When an array of endogenous and exogenous controls are included into the regression one by one, mean years of education maintains its positive influence on property rights. In line with the prediction of downward bias induced by inclusion of endogenous controls in Acemoglu et al. (2001), the inclusion of variables such as income inequality and tax per GDP reduces the magnitude of the education coefficient. The share of fuel exports and the level of income inequality come out with strongly significant negative effect on property rights, lending credence to the endowment and social capital theses, respectively. Ethnic polarization is found to be more relevant than ethnic fractionalization in determining the quality of property rights institutions. Common law legal origin does not seem to have a statistically significant effect when included in the regression together with only income and schooling. However, when the other two exogenous variables are added at the same time as in column 9, common law legal origin stands out as the most significant of them all. Interestingly, democracy as represented by the level of constraint on the executive does not have a statistically significant impact on property rights.

5 Issues of identification

Following the benchmark results presented in the previous section, one question that still begs for an answer pertains to how well the currently used measures of human capital would fare if subjected to more standard tests of identification. As noted in section three, the specifications implemented in the benchmark SUR estimation could tackle reverse causality; but the problem of unobserved heterogeneity remains to be taken care of. To that end, both external and internal instrumentation are employed in two separate sets of regressions: two-stage least squares and system GMM, respectively.

The first external instrument that is supposed to determine current human capital without directly influencing contemporary institutions is early education. The rate of primary enrollment in 1920 is employed to represent early education. The fact that this particular variable measures input rather than output, which would be represented by level of attainment, is another reason to expect it to be less correlated with current property rights. The second external instrument is the percentage of protestant population in 1970. The strategy of using Protestantism as an instrument for human capital draws on the literature that links protestant ethics to higher investment on human capital (Becker

and Woessmann, 2009). Considered at a rather basic level, the emphasis of protestant religions on individual reading and self-understanding of the Bible contributes to literacy in less developed countries

The Wu-Hausman test in table 5 confirms that both measures of human capital are endogenous to the ICRG composite index, while they are found to be exogenous to the CIM ratio. But the instruments employed in the 2SLS regressions failed to identify the effect of mean years of education as signified by the very small p-values of the over-identification test. The over-identification test validated, albeit marginally, the use of the two instruments for identifying the effects of cumulative 3rd quintile education. Therefore, from the point of view of econometric identification, in the current setup, cumulative 3rd quintile education is a more robust measure of human capital. Column 4 shows, in the specification that seeks to control for income by proxy of latitude, the coefficient of cumulative 3rd quintile education is more than seven times larger than the corresponding coefficient from SUR estimation given in column 2 of table 2. As latitude is not a perfect proxy for per capita income, some of the upward swing in the magnitude of the coefficient could be attributed to the omission of the income variable.

The above issue of omitted income variable as well as more nuanced forms of unobserved heterogeneity is remedied by using system GMM estimation. Since per capita income could be instrumented for by its own lagged values, it is directly introduced in the system GMM estimation as an endogenous variable. As table 6 displays, two lags of the education variable are added as regressors to partially overcome the high degree of persistence in the stock of human capital and to distinguish between short-run and medium-run effects. In four of the five specifications in table 6, the 10-year lag of cumulative 3rd quintile education comes out with strong positive coefficient statistically significant at least at 10 percent level. However, the 5-year lag of the same variable appears with negative coefficient for all respective specifications. The combination of those results implies that, once the major chunk of human capital that has been attained 10 years ago is controlled for, transitional increases in the education of the less educated 60 percent population could destabilize property rights. Column 1, however, indicates that both lags of the education variable are rendered insignificant if contemporary income is incorporated as a regressor.⁶ Comparing the results of column 1 where income is the more robust predictor of property rights with those of the rest of the table where cumulative 3rd quintile education performs better, one gets the impression that lagged schooling might be working through current income to determine property rights. Among the exogenous variables included as additional controls in columns 3 – 5, ethnic polarization is the only variable that is found to be statistically significant in explaining property rights.⁷ In agreement with Keefer and Knack (2002), ethnic polariza-

⁶Note that inference based on the specification in column 1 should be considered extra cautiously due to the high level of autocorrelation as demonstrated in the AR(2) test.

⁷Unlike Difference GMM, System GMM allows the inclusion of time-invariant explanatory variables such as legal origin and ethnic polarization. “Asymptotically this does not affect the coefficient estimates for other regressors because all instruments for the level equation are

tion is negatively associated with property rights. It should also be noted that the high level of persistence exhibited in the autoregressive components of all specifications indicates the presence of institutional path-dependence.

6 Concluding remarks

In spite of growing interest on the empirical manifestations of the broader modernization theory, the link between human capital and property right institutions is little explored. Two reasons could be mentioned for this lack of empirical attention: difficulty of measuring systemic property rights and the fact that human capital is overshadowed by income as an explanatory factor. This paper takes on the task of analyzing the impact of human capital on property right institutions by employing a broad-based new index for property rights and by focusing on the joint effects of education and income.

The results confirm that, generally, more education promotes better protection of property rights. But the more interesting aspects do not become apparent until one looks at the non-linearity of the impact of education with respect to the level of education and the level of income. The fact that the advancement to intermediate levels of average schooling does not bring as much return in terms of improving property rights as the lower and upper level transitions triggers curiosity as to whether a medium-institution trap exists or not. The negative marginal effect of increasing schooling without raising income in poor countries finds some anecdotal support in the experience of post-independence African countries. The massive investment in human capital that followed decolonization in most of those countries only created an army of rent-seekers in the absence of economic growth particularly after the end of the commodity boom and the oil shocks in the 1970s (Pritchett, 2001). The results of the dynamic panel data analysis also suggest that a rise in the level of education might not immediately bear a positive impact on property rights.

The results presented in this paper are expected to provide exploratory lead in the empirical study of the endogenous generation of economic institutions. They are also intended to motivate further theoretical work on the link between human capital and property right institutions. The measurement of property rights might still prove a contentious issue. The composite index adopted to measure property rights in this paper may be susceptible to error of commission since it is essentially a blanket measurement. But it is relatively free from error of omission that might be prevalent with narrowly defined measures of property rights. As a contribution to further research, the results of the preceding analysis are supposed to motivate more nuanced investigation in the area of endogenous property rights at the same time as they fill in substantial gap in the empirical examination of the modernization theory.

assumed to be orthogonal to fixed effects, indeed to all time invariant variables" (Roodman, 2009, pp. 115). Nevertheless, this exercise comes with a relatively strong assumption of orthogonality between the measured country effects and the unobservable country effects.

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Table 1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ICRG composite index, 1985-2005	641	.0153	1.517	-3.69	3.61
Contract Intensive Money (CIM ratio), 1980-2005	669	.7984	.1515	.176	1
Mean years of education, 1980-2000	717	5.944	2.967	.031	13.2
Cumulative 3 rd quintile education, 1985-2000	508	.2738	.1808	0	.545
Ln GDP per capita, 1985-2000	778	8.122	1.176	5.05	10.7
Log settler mortality (duplicated for all years)	392	4.699	1.182	2.14	7.98
Share of fuel in merchandize export, 1980-2000	611	16.64	27.19	0	100
Common law legal origin (duplicated for all years)	796	.3165	.4663	0	1
Tax revenue to GDP ratio, 1980-1999	333	20.98	9.808	.043	44.7
Executive constraint, 1980-2000	681	4.136	2.345	1	7
Ethnic polarization index (duplicated for all years)	642	.5162	.2464	.016	.982
Ethnic fractionalization index (duplicated for all years)	642	.4464	.2778	.009	.958
Gini Coefficient, 1970-1995	350	38.66	10.93	17.6	73.2

Table 2: Property rights and education: benchmark SUR estimates

	Property rights: ICRG composite index						Property rights: CIM ratio		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ICRG composite index $t-5$	.768 ^a (.025)	.761 ^a (.027)	.751 ^a (.027)	.769 ^a (.026)	.715 ^a (.028)	.691 ^a (.031)			
CIM ratio $t-5$							.860 ^a (.024)	.818 ^a (.028)	.815 ^a (.028)
Ln GDP per capita $t-5$	.106 ^a (.040)	.196 ^a (.049)	.124 ^b (.050)	.150 ^a (.039)	-.062 (.058)	-.009 (.066)	.002 (.003)	.003 (.004)	.004 (.004)
Mean years of education $t-5$	.075 ^a (.015)		.098 ^a (.025)		-.273 ^a (.083)		.002 ^c (.001)		-.001 (.003)
Cumulative 3 rd Quintile education $t-5$		.763 ^a (.268)	-.297 (.375)			-6.726 ^a (1.541)		.051 ^b (.025)	.064 ^c (.036)
Mean years of education $t-5$ $\times$ Ln GDP per capita $t-5$					.041 ^a (.009)				
Cumulative 3 rd quintile education $t-5$ $\times$ Ln GDP per capita $t-5$						.942 ^a (.192)			
Lower middle education $t-5$				.317 ^a (.116)					
Upper middle education $t-5$				.290 ^b (.123)					
Upper level education $t-5$				.643 ^a (.145)					
Constant	-1.2,-1.3 -1.3,-1.4	-1.7,-1.8 -1.7,-1.9	-1.4,-1.5 -1.5,-1.6	-1.5,-1.6 -1.6,-1.7	.12, .01 -.01,-12	-.26,-38 -.34,-49	.82,.89 .96,.86	.11,.12 .12,.12	.11,.11 .12,.11
R-squared	.90, .77 .76, .90	.90, .78 .77, .90	.91, .77 .78, .90	.90, .77 .76, .90	.90, .77 .78, .91	.91, .77 .80, .91	.74, .87 .87, .82	.71, .85 .88, .85	.71, .85 .88, .84
N	105, 105 105, 105	89, 89 89, 89	89, 89 89, 89	105, 105 105, 105	105, 105 105, 105	89, 89 89, 89	89, 89 89, 89	77, 77 77, 77	77, 77 77, 77

Standard errors are in parenthesis. a, b, and c denote 1%, 5% and 10% significance level respectively.

Table 3: Marginal effects of education at different levels of income

Income level (country example as of 1995)	Marginal effect of mean years of education	Marginal effect of cumulative 3 rd quintile education
1 (Liberia)	-.068 (.037)	-2.015 ^a (.618)
2 (Cameroon)	-.028 (.029)	-1.073 ^b (.453)
3 (Kenya)	.013 (.021)	-.131 (.321)
4 (Sri Lanka)	.054 ^a (.016)	.811 ^a (.272)
5 (Malaysia)	.095 ^a (.016)	1.753 ^a (.346)
6 (Kuwait)	.136 ^a (.021)	2.695 ^a (.489)

Standard errors are in parenthesis. a, b, and c denote 1%, 5% and 10% significance level respectively.

Table 4: Property rights and education: benchmark SUR estimates with additional controls

Property rights: ICRG composite index									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ICRG composite index $t-5$	.765 ^a (.025)	.732 ^a (.033)	.732 ^a (.032)	.741 ^a (.034)	.768 ^a (.026)	.759 ^a (.025)	.756 ^a (.028)	.720 ^a (.044)	.704 ^a (.034)
Ln GDP per capita $t-5$	.112 ^a (.041)	.028 (.062)	.264 ^a (.069)	.144 ^b (.065)	.058 (.047)	.082 ^c (.043)	.130 ^a (.044)	.191 ^a (.074)	.096 (.066)
Mean years of education $t-5$	.074 ^a (.015)	.085 ^a (.023)	.041 ^b (.019)	.052 ^a (.020)	.090 ^a (.016)	.087 ^a (.016)	.066 ^a (.016)	.049 ^b (.022)	.073 ^a (.022)
<i>Legal origin control</i>									
Common law legal origin	.044 (.059)								.202 ^b (.085)
<i>Endowment controls</i>									
Log settler mortality		-.022 (.046)							-.004 (.046)
Share of fuels in merchandise export $t-5$			-.004 ^a (.001)						
<i>Social capital controls</i>									
Income inequality $t-10$				-.010 ^a (.004)					
Ethnic fractionalization					-.134 (.126)				
Ethnic polarization						-.291 ^b (.119)			-.219 (.195)
<i>Political regime controls</i>									
Executive constraint $t-5$							.005 (.015)		
<i>State capacity control</i>									
Tax revenue per GDP $t-5$								.007 (.004)	
Constant	-1.3,-1.4 -1.4,-1.5	-.63,-.80 -.56,-.86	-2.2,-2.4 -2.3,-2.4	-.93,-1.1 -1.0,-1.1	-.86,-.95 -.92,-1.0	-.94,-1.0 -1.0,-1.1	-1.3,-1.4 -1.5,-1.6	-1.9,-1.9 -1.9	-1.1,-1.3 -1.1,-1.3
R-squared	.90, .76 .77, .90	.87, .67 .72, .87	.93, .83 .77, .89	.92, .71 .81, .88	.91, .78 .77, .90	.91, .78 .77, .90	.89, .73 .78, .89	.92, .81 .77	.87, .69 .72, .88
N	105,105 105,105	57, 57 57, 57	63, 63 63, 63	61, 61 61, 61	97, 97 97, 97	97, 97 97, 97	93, 93 93, 93	55, 55 55	56,56 56,56

Standard errors are in parenthesis. a, b, and c denote 1%, 5% and 10% significance level respectively.

Table 5: IV regressions of property rights on education

	Property rights: ICRG composite index				Property rights: CIM ratio			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Two stage least squares								
Mean years of education, 1970-2005	.528 ^a (.051)	.455 ^a (.071)			.027 ^a (.005)	.033 ^a (.006)		
Cumulative 3 rd quintile education, 1970-2000			9.43 ^a (1.08)	5.66 ^a (1.01)			.436 ^a (.063)	.434 ^a (.076)
Latitude		1.14 (.787)		3.69 ^a (.649)		-.184 ^b (.075)		.003 (.053)
Constant	-2.99 ^a (.341)	-2.91 ^a (.317)	-2.54 (.365)	-2.53 ^a (.255)	.656 ^a (.032)	.671 ^a (.029)	.703 ^a (.020)	.703 ^a (.020)
R-squared	.66	.69	.64	.71	.28	.33	.56	.56
Panel B: First stage regressions for average years of education and cumulative 3 rd quintile education								
Primary enrollment, 1920	.079 ^a (.007)	.067 ^a (.007)	.004 ^a (.001)	.005 ^a (.001)	.087 ^a (.008)	.077 ^a (.008)	.005 ^a (.001)	.005 ^a (.001)
Protestant population, 1970 (%)	1.27 ^c (.771)	.292 (.767)	.051 (.049)	.046 (.055)	.952 (.913)	-.220 (.886)	.021 (.061)	.023 (.069)
Latitude		3.68 ^a (1.01)		.016 (.083)		4.03 ^a (1.03)		-.005 (.094)
R-squared	.50	.57	.63	.64	.66	.72	.63	.63
N	84	84	71	71	74	74	62	62
Wu-Hausman F (Endogeneity)	p=.004	p<.00	p<.00	p<0.00	p=.13	p=.25	p=.61	p=.63
Sargan Chi2 (Over-identification)	p=.010	p=.004	p=.103	p=.011				

Standard errors are in parenthesis. a, b, and c denote 1%, 5% and 10% significance level respectively.

Table 6: System GMM estimates of property rights

	Property rights: ICRG composite index				
	(1)	(2)	(3)	(4)	(5)
ICRG composite index $t-5$	.384 ^a (.109)	.489 ^a (.119)	.452 ^a (.092)	.449 ^a (.123)	.417 ^a (.107)
Cumulative 3 rd quintile education $t-5$	-3.93 (3.11)	-4.39 ^c (2.54)	-5.02 ^c (2.98)	-3.75 (2.56)	-4.92 ^b (2.51)
Cumulative 3 rd quintile education $t-10$	2.65 (3.03)	6.12 ^a (2.34)	4.48 ^c (2.64)	5.67 ^a (2.25)	5.23 ^b (2.29)
Ln GDP per capita t	3.52 ^a (.818)				
Ln GDP per capita $t-5$	-2.67 ^b (1.16)	-.012 (.844)	1.04 (.789)	.245 (.896)	.165 (.685)
Ln GDP per capita $t-10$	-.038 (.843)	.338 (.720)	-.766 (.706)	.146 (.766)	.116 (.618)
Settler mortality			-.193 (.347)		
Common law legal origin				.597 (.638)	
Ethnic polarization					-2.72 ^b (1.42)
Constant	-7.07 ^a (2.38)	-3.09 ^b (1.71)	-1.52 (.406)	-3.99 ^b (1.87)	-.872 (1.96)
Time dummies	Yes	Yes	Yes	Yes	Yes
Countries	89	90	51	90	90
Observations	353	354	201	354	354
AR (2) test	p=.041	p=.468	p=.457	p=.549	p=.388
Sargan test	p=.829	p=.242	p=.261	p=.303	p=.150

Robust standard errors are in parenthesis. a, b, and c denote 1%, 5% and 10% significance level respectively.

Fig 1: Comparison of the new ICRG composite index with other commonly used Property rights indicators

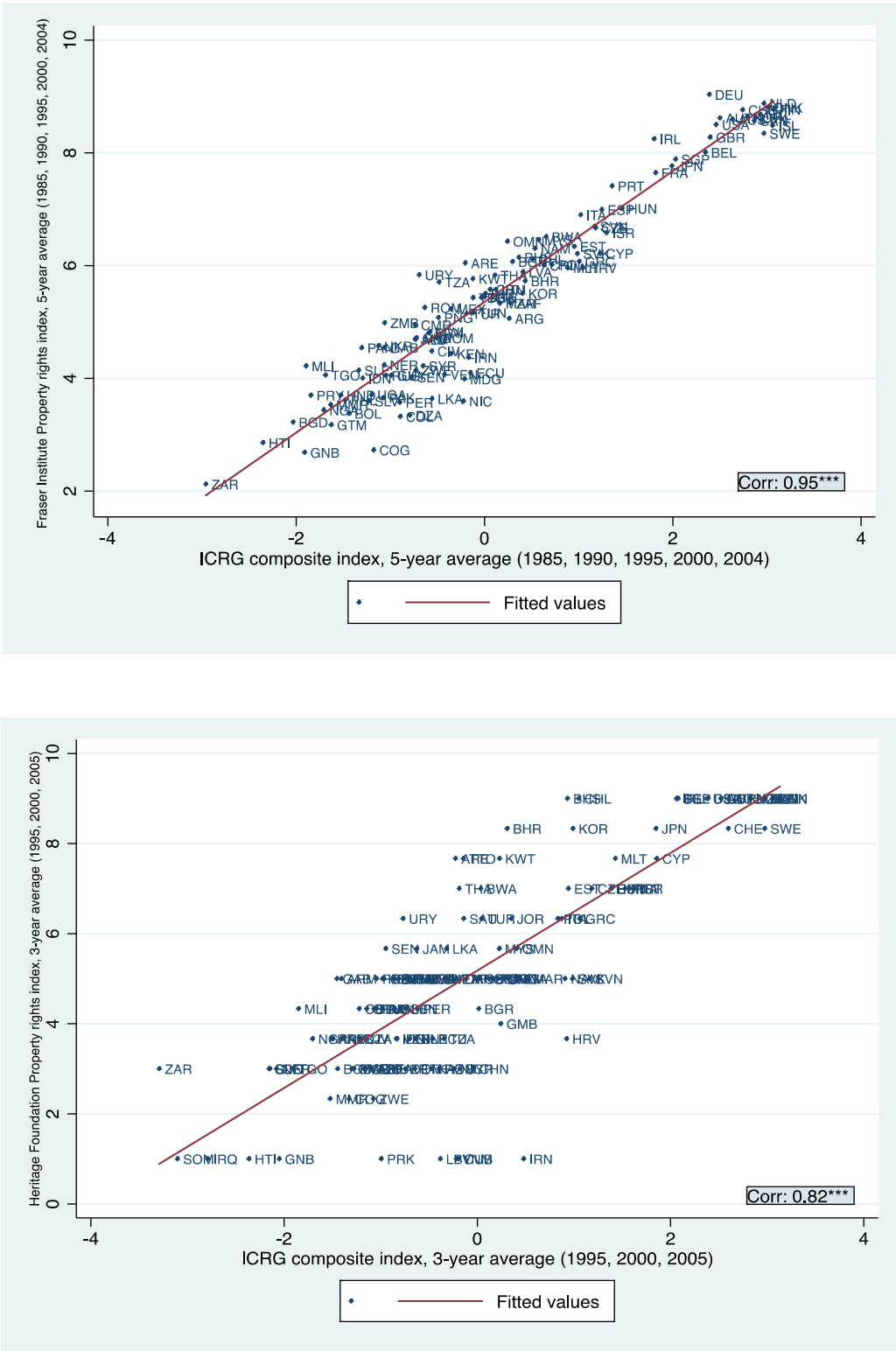
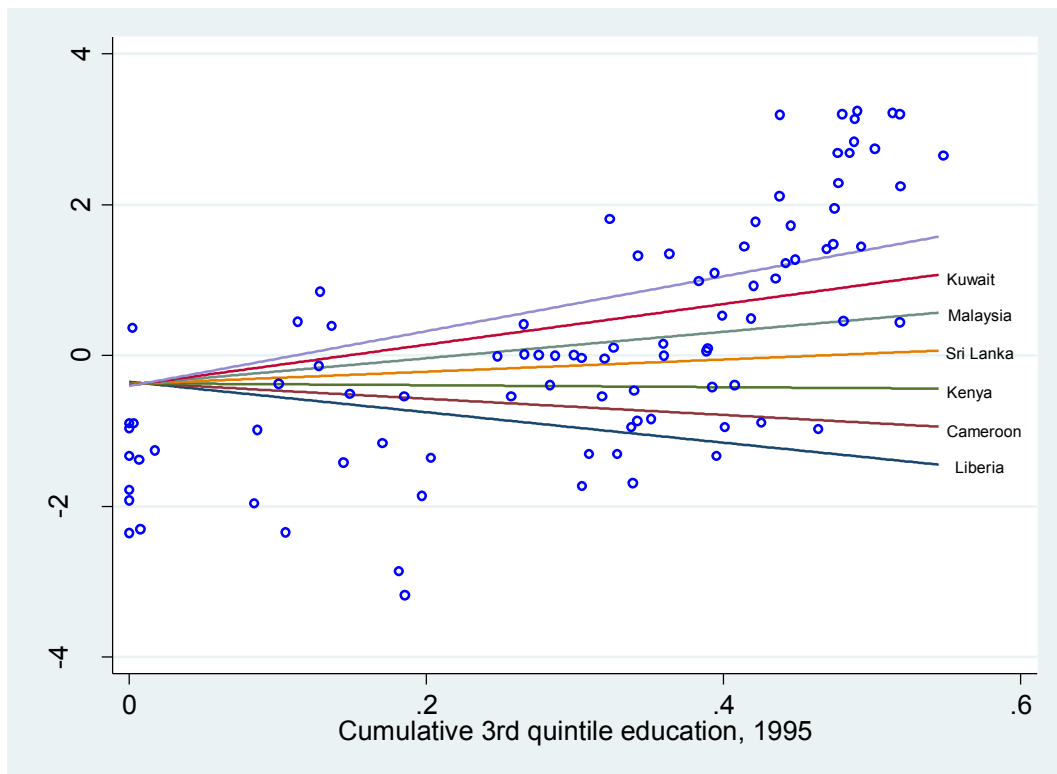


Fig 2: Graphical simulation of the marginal effect of education at different income levels



Appendix 1: Variable definition and data source

Components of the composite index

Corruption - This is an assessment of corruption within the political system. Although this measure takes political corruption into account, it is more concerned with actual or potential corruption in the form of excessive patronage, nepotism, job reservations, 'favor-for-favors', secret party funding, and suspiciously close ties between politics and business. Corruption is measured on a 6-point scale. *Source: Political Risk Service (International Country Risk Guide)*

Bureaucratic quality - High points are given to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services. In these low-risk countries, the bureaucracy tends to be somewhat autonomous from political pressure and to have an established mechanism for recruitment and training. Countries that lack the cushioning effect of a strong bureaucracy receive low points because a change in government tends to be traumatic in terms of policy formulation and day-to-day administrative functions. Bureaucratic quality is measured on a 4-point scale. *Source: Political Risk Service (International Country Risk Guide)*

Law and order - Law and Order are assessed separately, with each sub-component comprising zero to three points. The Law sub-component is an assessment of the strength and impartiality of the legal system, while the Order sub-component is an assessment of popular observance of the law. Thus, a country can enjoy a high rating – 3 – in terms of its judicial system, but a low rating – 1 – if it suffers from a very high crime rate or if the law is routinely ignored without effective sanction (for example, widespread illegal strikes). The overall index is measured on a 6-point scale. *Source: Political Risk Service (International Country Risk Guide)*

Other variables

Contract Intensive Money - The ratio of non-currency money to the total money supply, or $(M2 - C2)/M2$, where $M2$ is a broad definition of the money supply and C is currency held outside banks. *Source: International Financial Statistics, IMF*

Mean years of schooling - Years of schooling of the total population aged over 25. *Source: Barro and Lee (2000)*

Shares of quintiles of schooling - The shares of schooling of the whole population divided in five quintiles calculated based on the Barro and Lee (2000) dataset. *Source: Castello and Domenech (2002)*

Schooling Gini coefficient - Gini coefficient calculated for schooling following the standard procedures of calculating income Gini coefficient. *Source: Castello and Domenech (2002)*

GDP per capita - Real Gross Domestic Product divided by population (2000 prices) *Source: Heston et al. (2002)*

Settler mortality - Log of the mortality rate faced by European settlers at the time of colonization. *Source: Acemoglu et al. (2001)*

Share of fuel in merchandize exports - The percentage of gas and oil exports out of total merchandize exports. *Source: World Development Indicators (2009)*

Legal origin - An indicator of whether the country's company or commercial law originated from British Common law. *Source: La Port et al. (1999)*

Tax revenue to GDP ratio - Total government revenue from taxes and social security contributions as a percentage of GDP. *Source: Easterly (2001)*

Executive constraint - The extent of institutionalized constraints on the decision-making powers of chief executives, whether individuals or collectivities. This variable is measured on a seven-point scale. *Source: Marshall and Jagers (2002)*

Ethnic polarization index - Index of ethnolinguistic polarization calculated using the data of the World Christian Encyclopedia. *Source: Montalvo and Reynal-Querol (2005)*

Ethnic fractionalization index - Index of ethnolinguistic fractionalization calculated using the data of the World Christian Encyclopedia. *Source: Montalvo and Reynal-Querol (2005)*

Gini coefficient - Gini index of income inequality. *Source: Deininger and Squire (1996)*

Rate of primary enrollment 1920 - National primary enrollment ratio in 1920. *Source: Benavot and Riddle (1988)*

Percentage of protestant population - Percentage of population identified as following protestant religion. *Source: World Christian Database*