GÖTEBORGS UNIVERSITET
HANDELSHÖGSKOLAN

WORKING PAPERS IN ECONOMICS

No 329

Same Same but Different?
A Comparison of Institutional Models

Gustav Hansson

November 2008

ISSN 1403-2473 (print)
ISSN 1403-2465 (online)

Institutionen för nationalekonomi med statistik
Handelshögskolan vid Göteborgs universitet
Vasagatan 1, Box 640, SE 405 30 Göteborg
031 786 0000, 031 786 1326 (fax)
www.handels.gu.se info@handels.gu.se

EFMD
EQUIS
ACCREDITED

Same Same but Different?
A Comparison of Institutional Models

Gustav Hansson*
University of Gothenburg

November 10, 2008

Abstract

In the growing literature on the creation of institutions, the theories emphasizing colonial and legal origin, religious affiliation, Western European influence, and settler mortality, have been especially influential. The influence of these studies rests heavily on empirical modeling, which, since the theories are obviously closely related, might actually capture the same primary mechanism. It is therefore unclear whether the empirical relationships found are the same or if they are different. Therefore, this paper takes the empirical models seriously and discriminates amongst the existing models by using modeling selection criteria, tests of encompassing, and modeling selection.

Keywords: institutions, colonial origin, non-nested tests, modeling selection.
JEL Codes: N40, F54.

1. Introduction

Institutions have come to play an increasingly important role in economics, both as indicators and determinants of the wealth of nations. The importance of good institutions is by now a well-established finding (North, 1990; Knack and Keefer, 1995; Hall and Jones, 1999; Acemoglu et al., 2001). Consequently, the search to understand the creation of institutions is of great importance. The arguably most influential theories in this context emphasize the importance of legal origin and religion (La Porta et al., 1999), ethnic diversity and colonial origin (Mauro, 1995), Western European influence (Hall and Jones, 1999), and settler mortality (Acemoglu et al., 2001). One of the most prominent factors responsible for the large impact of these studies is that they to a large extent are motivated by empirical modeling. However, since these theories are obviously related,

*gustav.hansson@economics.gu.se, Department of Economics, University of Gothenburg, Box 640, SE-40530 Göteborg, Sweden. I would like to thank Arne Bigsten, Dick Durevall, Anders Fredriksson, Annika Lindskog, Ola Olsson, Sven Tengstam, and seminar participants at the Nordic Conference in Development Economics 07 and at the University of Gothenburg for helpful comments. All errors are my own.

the question is whether the empirical finding in one study is not actually capturing the mechanism portrayed in one of the other studies?

There is for example a large literature documenting that the identity of the colonial ruler has played an important part in the institutional and economic development of many countries (Grier, 1999; Bertocchi and Canova, 2002; Price; 2003, and Bernhard et al., 2004). Among other things, the colonial rulers transplanted their legal systems, religions, and languages. The empirical findings in La Porta et al. (1999) concerning legal origin and religious affiliation might therefore in fact directly capture the importance of colonial origin.

Hall and Jones (1999) emphasize the importance of Western European influence, measured by absolute latitude and the fraction speaking a European language. Acemoglu et al. (2001) argue instead that it is not the *extent* of Western European influence that matters, but rather the *type* of colonization strategy, proxied by settler mortality, that is. The mechanism proposed by Hall and Jones (1999) and Acemoglu et al. (2001) are both clearly related to a colonial origins effect, whereas their empirical findings might also to a large extent capture the same mechanism.

The proposed mechanisms of latitude, settler mortality, and colonial origin are obviously related and hard to disentangle. The validity and influence of these theories rest heavily on empirical findings, and might in fact capture the mechanism proposed by a competing theory. According to De Haan (2007) the reason why the literature is full of papers with conflicting results, is because of empirical modeling without a solid sensitivity analysis. Therefore, this paper takes the empirical models of La Porta et al. (1999), Mauro (1995), Hall and Jones (1999), and Acemoglu et al. (2001) seriously, in order to discriminate among existing models and to identify the model and variables that best explain the variation in institutional quality. The aim of this paper is thus to provide answers to the following questions: (i) Is there one model which explains more of the variation in institutional quality than the other models? (ii) Do these models capture the same information? And (iii), if we let the information pertained in the data decide, which combination of variables would be selected?

In order to discriminate among the empirical models, this paper conducts encompassing tests following Mizon and Richard (1986). The test of encompassing, sometimes referred to as a test of non-nested models, enables us to test whether a model A encompasses the information of a rival model B. The test also provides interesting information about the interrelationships between models, such as if the data is

compatible with both models, or simply if the models both contain a partial truth, indicating that we might benefit from searching for a new model. For example: legal origin and colonial origin do not seem to empirically capture the same information, neither in a sample of the world nor in a sample of former colonies. Religious affiliation on the other hand, is not significantly related to institutional performance if we control for either of legal origin, colonial origin, Western European influence, or settler mortality. The tests also show that the Hall and Jones model, with absolute latitude and language spoken, dominates all other models when using a strict selection rule and controlling for outliers. Interestingly, the Hall and Jones model is also preferred based on modeling selection criteria such as the adjusted R-square and the Akaike information criteria.

Since the Hall and Jones model only dominates the other models when using a strict selection rule, the question is whether it is possible to construct a new model specification which strongly dominates all the other models. With the help of modeling selection methods, such as backwards selection and PcGets associated with Hendry and Krolzig (1999, 2001), a new model specification is suggested. Interestingly, the selected specification contains a little of all models with for example settler mortality and latitude alongside each other.

The econometric framework in this paper is similar to Bleaney and Nishiyama (2002), who use non-nested tests and modeling selection to discriminate among income growth models in a cross country setting. The method used in this paper is from Hendry and Krolzig (2001) which greatly improves the accuracy of the well-known methods implemented by Levine and Renelt (1992) and Sala-i-Martin (1997) in their search for robust determinants of economic growth. The paper is also related to Serra (2006), Islam and Montenegro (2002), Straub (2000), and Barro (1999) who empirically examine the determinants of different aspects of institutional quality, although the focus, variables, and empirical methods are vastly different.

The main contribution of this paper is that it is the only study, to my knowledge, that explicitly compares these institutional models using tests of encompassing, and modeling selection in order to answer the question whether these models capture the same mechanism or not. This exercise is done on samples representing the whole world, as well as former colonies. Out of the 20 pair-wise comparisons, only seven have been made before, yet, these seven comparisons are now based on different samples. For example, although the comparison between legal origin and religious affiliation has previously been investigated in La Porta et al. (1999), the number of countries is now

larger, and interestingly, the result is different. The present study therefore gives new information about the interrelationships among colonial and legal origin, religious affiliation, Western European influence, and settler mortality.

The paper is organized as follows: Section 2 shortly describes the theoretical background of the institutional models. Section 3 discusses data issues as well as presents regression results. Section 4 compares the empirical models by using tests of encompassing, and Section 5 forms an encompassing model based on modeling selection. Section 6 concludes the paper.

2. Theoretical Background

2.1. Colonial Origin, Legal Origin, and Religion

La Porta et al. (1999) propose two possible channels to explain the variation in institutional quality and governance across countries: the importance of legal origin and religious affiliation. Legal traditions are intended to capture the power of the State in relation to private property owners, and thus to indicate the degree of private property protection. According to La Porta et al. (1999) the Socialist legal tradition is created by the State in order to maintain ultimate control of the economy. The English legal tradition, on the other hand, partly developed as a defense against the attempts by the sovereign to regulate and expropriate property owners. English legal tradition is therefore predicted to be the least interventionist and the most efficient in protecting private property. The Socialist legal tradition is predicted to be the most interventionist and the least efficient. The French system also developed as a means for the sovereign to control economic life, although it is ranked slightly higher than the Socialist. Lastly, the German and Scandinavian systems are ranked higher than the French, but not as high as the English system.

Religious affiliation, or more specifically the proportion of the population adhering to a specific religion, is intended to proxy for cultural influences such as norms, values, and customs. Cultural influences are in line with Landes (1998) argued to be especially important in shaping institutions. La Porta et al. (1999) focus on the three most widespread religions: Catholicism, Protestantism, and Islam. Catholicism and Islam partly grew to support the State and are therefore seen as more interventionist. La Porta et al. (1999) therefore predict that Catholic and Muslim countries will exhibit inferior government performance compared to Protestant countries.

The different legal traditions developed in England, France, Germany, Scandinavia, and the Soviet Union and then spread across the world through conquest, colonization, or voluntary adoption. Legal origin is therefore not equivalent to colonial origin. Countries with a French legal origin consist for example of countries colonized by France, Spain, or Portugal, as well as countries that voluntarily adopted their legal tradition. The same reasoning goes for religions, which also spread across the world through conquest, colonization, or voluntary adoption. However, it is difficult to ignore the close connections among colonial origin, legal origin, and religion. In fact, legal origin and religion could be proxies for the institutions left behind by the colonial rulers.

There is a large literature documenting that the identities of the colonial rulers have played a large part in the institutional and economic development of countries (Mauro, 1995; Grier, 1999; Bertocchi and Canova, 2002; Price, 2003; Bernhard et al., 2004). Colonial rulers had vastly different strategies of how their colonies should be managed. The British colonies were for example generally much more decentralized than the French and Spanish colonies. According to Grier (1999), the decentralized rule in the British colonies not only allowed local governments to develop; it also resulted in an educational system constructed to be integrated with the native culture. This is in stark contrast to the French who implemented a very strict centralized form of rule which also alienated the indigenous population, not only from their own native culture both also from their fellow Frenchmen. Other major differences involved trade restrictions. The British colonies experienced mostly free trade, while the French and the Spanish were very restrictive. The Spanish colonies were for example only allowed to trade with Spain (Grier, 1999). There are therefore strong historical indications that colonial heritage matters for the development of current day institutions.

La Porta et al. (1999) acknowledge that colonization might have integrated both religion and legal systems, but argue that by including religion and law as explanatory variables, the effect on institutions is measured directly instead of indirectly. Surprisingly, La Porta et al. (1999) did not check their results by controlling for colonial origin, both since a country does not have to be colonized to have a certain legal tradition and since colonial status is hard to measure. The use of data on colonial origin is, however, widespread (see, e.g., Mauro, 1995; Sala-i-Martin, 1997; Grier, 1999; Bertocchi and Canova, 2002; and Price, 2003). The results in La Porta et al. (1999) might therefore be driven by colonial origin and actually have very little to do with a specific legal system or a specific religion.

2.2. Western European Influence and Settler Mortality

Instead of focusing on the identity of the colonizers, the specific religion, or legal system, Hall and Jones (1999) argue that it is simply the degree of Western European influence that matters. The degree of Western European influence is measured by the distance to the equator using absolute latitude degrees, and by the fraction of the population using English or a European language (English, French, German, Portuguese, or Spanish) as a first language today.[1] The reasoning behind using latitude is that Europeans were more likely to migrate to areas that were broadly similar in climate to Western Europe, and hence distant from the equator. Since Europe early developed well functioning institutions (e.g., property rights), countries subject to Western European influence were more likely to have a positive development of institutions.

Acemoglu et al. (2001) later added refinements to this reasoning with their measure of settler mortality. The main idea is that high settler mortality, measured as the mortality of bishops and soldiers during colonial days, should result in low European settlement intensity and therefore result in harmful extractive colonial institutions which have persisted to this day. Low settler mortality should, on the contrary, result in high European settlement and consequently beneficial institutions. The settler mortality measurement can therefore be interpreted as an actual estimate of Western European settlement and influence in colonial days.[2]

Acemoglu (2005) points out that the theories behind using latitude and settler mortality are different. Firstly, settler mortality is designed solely for former European colonies, while latitude is used for the entire world. Secondly, while Hall and Jones argue that the extent of European influence on institutional quality was generally positive, Acemoglu et al. (2001) argue that the European influence had vastly different effects depending on what the most attractive colonization strategy was. Acemoglu (2005) therefore argues that there is no reason for using latitude instead of settler mortality. Others, including Persson and Tabellini (2003) and Easterly and Levine (2003), argue that latitude and settler mortality operate by the same channel: where the mortality risk was

[1] The constructed trade share from Frankel and Romer (1999) was also included. This variable was most probably included since the measure for institutional quality, social infrastructure, was partly constructed by a measure for trade openness. The core variables to proxy for Western European influence were latitude, English, and European language spoken.

[2] It is important to note that both Western European influence and settler mortality are by Hall and Jones and Acemoglu et al. used as instruments for institutional quality in an income regression. As pointed out by Rodrik (2004), "An instrument does not a theory make." Although this is true, both Western European influence and settler mortality are presented and interpreted as theories in the literature and are therefore treated as such in this paper as well.

low, as measured either by settler mortality or by latitude, Europeans settled and were therefore more likely to incorporate the institutional framework they were accustomed to from home. Clearly, both settler mortality and latitude measure some sort of geographical features. An important difference is instead that while settler mortality measures the extent of Western European influence in colonial days, latitude alongside language spoken today measures the extent of Western European influence in colonial and post-colonial days.

To sum up, we have described five highly influential theories of how institutions are created. Three of them argue that institutions are created dependent on the identity of the colonizer and what type of legal system and religion they incorporated, while the other two theories focus on the extent of Western European influence and settler mortality. Now which of these theories tell us the right story? The next section tries to answer this question by taking the empirical models seriously and compare the information contained in the data.

3. Data and Regression Specifications

3.1. Data

The models by La Porta et al. (1999), Hall and Jones (1999) and Acemoglu et al. (2001) are all related to measures of property rights and expropriation risk. The dependent variable in Hall and Jones (1999) is "Social Infrastructure" and consists of measures of law and order, bureaucratic quality, corruption, risk of expropriation, government repudiation of contracts, and trade openness. Acemoglu et al. (2001) make use of one of these variables as their dependent variable: risk of expropriation.[3] La Porta et al. (1999) use a wide variety of measures for institutional quality where one of the most important is an index of property rights that captures the extent to which the government protects and enforces private property laws. The three measures (Property Rights, Social Infrastructure, and Expropriation Risk) are all highly related and have a specific focus on property rights and the protection from arbitrary expropriation.

For our analysis it is important to find a measure that captures all the attributes of the measures mentioned above, and at the same time being neutral in the sense that it does not a priori favor any of the models examined. The main dependent variable used in

[3] For more information on Social Infrastructure, Expropriation Risk and other institutional measures, see Hansson (2006).

this paper is a measure of Rule of Law from Kaufmann et al. (2005). Rule of Law is the concept that no individual is above the law, and is therefore a safeguard against arbitrary governance and expropriation. Rule of Law does therefore not only capture protection of property rights, but also measures the quality and efficiency of the police and court system, and whether everyone is equal before the law. By definition, Rule of Law is therefore not exactly the same as Expropriation Risk or Property Rights. However, Rule of Law by definition encompasses all the attributes of property rights and expropriation risk, and is therefore a highly suitable measure for our purposes. Not surprisingly, the correlations among Rule of Law, Property Rights, Social Infrastructure, and Expropriation Risk are very high, as can be seen in Table 1.

Concerning the explanatory variables, the original data from La Porta et al. (1999), Hall and Jones (1999), and Acemoglu et al. (2001) are used as far as possible. A detailed description of all the variables as well as descriptive statistics are presented in the appendix. The only variable that may deserve some further explanation here is the colonial origins data. Most of the previous literature starting with Barro (1999) and Sala-i-Martin (1997) uses the last official colonial power to proxy for colonial influence (with a dummy for former British colony, etc.). This paper therefore measures colonial origin by using the identity of the last ruler, with data from Sala-i-Martin (1997). Due to data limitations a few adjustments have been made, details of which are described in the appendix.

3.2. Regression Specifications

The baseline regression model, from which all regression specifications in this paper are based on, is directly inspired by a specification in La Porta et al. (1999) of the following form:

$$inst_i = \alpha + \beta(ethnic_i) + \mathbf{X}_i'\boldsymbol{\gamma} + \varepsilon_i, \qquad (1)$$

where $inst_i$ is our institutional measure Rule of Law, $ethnic_i$ is the common control variable (ethnolinguistic fractionalization), $\boldsymbol{X}_i$ is the vector with the variables under focus (legal origin or religious affiliation), ε_i is a random error, and i refers to country. For obvious reasons, the La Porta et al. (1999) models with legal origin (referred to as *LP1*) and religious affiliation (referred to as *LP2*) are going to be modeled this way also in this paper. For ease of comparability, the remaining models are specified in the same way. For example, the model with colonial origin includes *ethnic* as the common control

variable and the core model with dummies for *British*, *French*, *Spanish*, and *Other colonial origin*. To follow the La Porta et al. model set-up is especially suitable for our purposes, since it provides us with a minimum of control variables, where we instead of capturing differences in controls capture differences in the core models, which enables us to compare the models at an equal footing.

The colonial origins model with ethnic fractionalization directly resembles a model originally used by Mauro (1995), and will therefore be referred to as the *M*-model. Similarly, the Hall and Jones (1999) model will be referred to as the *HJ*-model, and the Acemoglu et al. (2001) model the *AJR*-model.

3.3. Results I

Tables 2 and 3 present the regression results. In Table 2, the models are estimated with all possible data available, resulting in four slightly different samples representing the whole world, and a fifth that only consists of former colonies (*AJR*).

All coefficients have the expected sign and magnitude. For ease of interpretation, the dependent variable Rule of Law is scaled to take a value between 0 and 100, where a high number indicates a high degree of Rule of Law. For example, having a *Socialist legal origin* is associated with a 17.70 percentage point lower Rule of Law compared to a country with *English legal origin*. Examining the adjusted R-squares, the *HJ*-model explains most of the variation in Rule of Law.

Because the samples in Table 2 are slightly different from each other, it would be interesting to compare the models when the sample of countries is the same. Table 3 restricts the regressions to the same sample, which also translates into a sample consisting only of former colonies. Since the five models are all related to a colonial origin story, the examination of this sample is perhaps the most interesting.[4]

In the colony sample, the *LP1*-model now only consists of *English*, *Socialist*, and *French legal origin*. The coefficients for *Socialist* and *French legal origin* have doubled, although their confidence intervals overlap with their respective confidence intervals in Table 2.[5] The coefficients for *Muslim* and *Other religions* are not individually significant, but jointly significant at the 10% level (p-value=0.07). Probably the most interesting result in Table 3 is that the adjusted R-square and the Akaike Information Criterion (AIC) single out the *HJ*-model as explaining most of the variation in Rule of Law.

[4] This sample is presented in Table A2 in the appendix.
[5] For Socialist legal origin in Table 2, the 95% confidence interval is [-7.04; -28.36], and in Table 3 [-25.59; -44.45].

To summarize: the results in Tables 2 and 3 indicate that all five models, except the *LP2*-model, explain a large fraction of the variation in Rule of Law. The *HJ*-model explains most of the variation in Rule of Law both for the whole world and for former colonies. These results, however, tell us nothing about whether the models capture the same information. Comparing the five models based on the information they posses is therefore the topic of the next section.

4. Comparing Models

4.1. Tests of Encompassing

This section compares the five models with the help of tests of encompassing associated with Mizon and Richard (1986), sometimes also referred to as tests of non-nested models. Simply put, a model A is said to encompass model B (denoted $M_A \, \varepsilon \, M_B$)[6] if model A contains the information of model B, or as Hendry (1995:501) explains: "Encompassing seeks to resolve the proliferation of rival models by requiring any given model to account for, or to explain, the results obtained by other models."

To test whether model A encompasses model B, one simply forms the non-redundant joint model of A and B, and performs the *F*-test for A being a valid reduction of the joint model. For example, if we were to form the non-redundant joint model of *LP1* (with legal origin) and *LP2* (with religion), we would get:

$$inst_i = \alpha + \beta(ethnic_i) + \mathbf{X}_i'\boldsymbol{\gamma} + \mathbf{Y}_i'\boldsymbol{\eta} + \varepsilon_i, \qquad (2)$$

where $\mathbf{X}_i$ is the vector with the legal origin variables and $\mathbf{Y}_i$ is the vector with the religious affiliation variables. Then, if $\boldsymbol{\eta}$ is found not to be significantly different from zero by the usual *F*-test, *LP1* is said to encompass *LP2*. Recall that the *F*-statistic can be written as a function of the R-square of the unrestricted model (equation 2) and the restricted model (equation 1). The test can therefore be interpreted as whether or not *LP2* contributes to *LP1*.

[6] Then notation for encompassing (ε) should not be confused with the notation for subset ($\subseteq$). If $M_A \subseteq M_B$, then naturally $M_B \, \varepsilon \, M_A$, but it could also be the case that $M_A \, \varepsilon \, M_B$ so-called "parsimonious encompassing." In modeling selection it is the notion of parsimonious encompassing that enables us to go from a general model to a specific model. See Hendry (1995:511).

Obviously, the testing procedure can result in four possible outcomes: Case 1 when model A encompasses model B, but model B does not encompass model A (denoted $M_A \, \varepsilon \, M_B$ and $M_B \, \varepsilon^c \, M_A$). We will interpret this as model A "dominates" model B, (denoted $M_A \, d \, M_B$). Similarly, Case 2 is when model B "dominates" model A.

Case 3 is when model A encompasses model B, and model B encompasses model A ($M_A \, \varepsilon \, M_B$ and $M_B \, \varepsilon \, M_A$). It is here not possible to discriminate between the two models. Model A contains the information of model B, and B contains the information of model A. This can be interpreted as if models A and B are "approximately equivalent" (and will be denoted $M_A \approx M_B$).

The fourth case is when model A does not encompass model B, and B does not encompass A ($M_A \, \varepsilon^c M_B$ and $M_B \, \varepsilon^c M_A$). It is not possible here either to discriminate between the two models. This is interpreted as that the two models A and B are "different" (denoted here as $M_A \neq M_B$), and therefore, both explain a partial truth and are complimentary to each other.

It is important to remember that for the inference to be valid, the joint model in (2) must fulfill the assumptions of the classical linear regression model as well as normality of the errors.[7] To test for model adequacy, White's test for heteroscedasticity and the Shapiro-Wilks test for normality of the residuals are used (α=0.05). If the White test rejects the null of homoscedasticity, then the robust Wald test is used instead. The White test does not rely on the normality assumption, and the *F*-test as well as the Wald test are asymptotically valid regardless of the normality assumption.[8] However, if any of the model assumptions are not fulfilled we will try to assess why and adjust for it accordingly.

An alternative test of non-nested models is the *J*-test associated with Davidson and Mackinnon (1981). It comes with the problem of only being valid asymptotically. In small samples, it tends to reject the null hypothesis more frequently than it should, and conclude that the models are different when they really are not (Baltagi, 1998:209). The *F*-test is still valid, and therefore preferable for our analysis. It is also intuitively appealing and resembles what researchers actually do when they check the robustness of their main results while controlling for other factors. The encompassing *F*-test is also the preferred test used in sophisticated modeling selection algorithms such as Hoover and Perez (2004) and PcGets associated with Hendry and Krolzig (1999, 2001).

[7] This is the notion of congruence, see Hendry (1995:511) or Hendry and Krolzig (2001:135). A formal definition of congruence can be found in Hendry (1995:465).
[8] See for example Gujarati (2004:413, 280) and Amemiya (1985:144).

4.2. Results II: Tests of Encompassing

Table 4 presents the first set of results of the encompassing tests. For all model comparisons, the sample of countries is a representation of the whole world, except those that involve the *AJR*-model, which is confined only to former colonies. In several of the comparisons, the homoscedasticity and/or normality requirements are not met. The notation (N) indicates when the normality assumption is not met, and (R) indicates that the homoscedasticity assumption is not met and the robust Wald-test is used instead. In trying to assess why the model requirements are not met, country dummies are included for countries where the absolute studentized residual is larger than or equal to 2.5.[9] This correction usually takes care of the problem, and the conclusion reached in Table 4 remains the same. Most of the time, the countries that are singled out are Singapore, Hong Kong, and Malaysia. These countries are often singled out as outliers in cross-country studies.

For almost all model comparisons, the tests rule that the models are "different" (≠) and both each explain a partial truth. Interesting to note is that *LP1* and *LP2* are here termed as different. This is in contrast to La Porta et al. (1999) who find the legal origin variables to be significantly related to property rights, while the effect from the religious variables is insignificant. A difference that could possibly help explain this is that the regression in La Porta et al. has a sample size of 124 countries, while the sample size in Table 4 is 150.[10]

The comparisons between *AJR* and *LP1* and between *AJR* and *M*, are partially already covered in Acemoglu et al. (2001) as part of their robustness check. The results in Acemoglu et al. and the results in this paper is the same, although their base sample is slightly different compared to ours. Acemoglu et al. also control for religion, but although we are informed that log settler mortality is significant, we are not told what happens to religion. Table 4, shows that religious affiliation has no explanatory power when log settler mortality is included.

Regarding the *HJ*-model, Acemoglu et al. do include latitude as a control variable. However, it is important to note that they do not include the full *HJ*-model with *English* and *European Language*, and they therefore do not compare the significance of *Log Settler Mortality* to the full *HJ*-model. Including both these models together as in Table 4 gives

[9] The studentized residual for an observation can be interpreted as the *t*-statistic of including a dummy for that observation in the regression (Belsley, Kuh, and Welsch, 1980). The studentized residual is therefore useful in identifying outliers that do not appear to be consistent with the rest of the data.
[10] See La Porta et al. (1999) Table 6 with property rights as the dependent variable.

us a regression where neither the homoscedasticity nor the normality requirements are fulfilled. The robust Wald-test finds these two models to be "different." Controlling for Singapore and Hong Kong, as indicated by the studentized residuals, the requirements are fulfilled and the models are still different. Controlling for Malaysia, as indicated by the partial scatter plot in Figure 1, *HJ* is found to dominate *AJR*. Using *Expropriation Risk* as the dependent variable, the *HJ* model is again found to dominate *AJR* when controlling for Singapore, Hong Kong, and Malaysia.[11]

In Table 5, all model comparisons are done with the former colonies sample. The model comparisons involving *AJR* are thus very much the same as in Table 4. *LP1* and *M* are still "different." Legal origin does therefore not simply capture a colonial origin, even in a sample of former colonies. Regarding *LP2*, this model is "dominated" by either of *LP1*, *M*, or *AJR*. Concerning the difference between *HJ* and *LP2*, the joint model fails to satisfy the normality assumption, and the *F*-test indicates that the models are "different." Controlling for the countries with large absolute studentized residuals (Singapore and Hong Kong) takes away the problem; now *HJ* "dominates" *LP2*. For a sample of former colonies, the *LP2*-model with religious affiliation therefore seems to be dominated by all other models.

In the comparisons involving the *HJ*-model, the homoscedasticity and normality requirements are usually not fulfilled. Comparing *HJ* with *LP1*, the robust Wald-test determines that they are "different." Controlling for Singapore and Hong Kong satisfies the model requirements, and the *F*-test determines that *HJ* "dominates" *LP1* at the 5% level but that they are "different" at the 10% level. The same goes for *HJ* and *M*: control for Singapore and Hong Kong and the requirements are fulfilled, where *HJ* and *M* are different at the 10% level but where *HJ* dominates *M* at the 5% level.

To conclude, if we choose to have a strict selection rule at the 5% significance level and controlling for outliers, there is some evidence that the *HJ*-model dominates all other models in a sample of former colonies. If instead a more lenient approach is chosen with a 10% significance level, then no single model dominates all other models. This last approach is probably the most reasonable, especially since the model requirements are not met in six out of the ten comparisons in Table 4. That the regression models in Tables 4 and 5, as well as in Tables 2 and 3, often fail to meet the homoscedasticity and/or normality assumptions indicates that there might be something wrong with the model specification. Therefore, the fact that the model comparisons are not able to

[11] This is also true by using the same base sample as in Acemoglu et al. (2001) (excluding Vietnam due to data limitation).

clearly decide on a dominating model, and that the model requirements are violated so frequently, indicate that we might benefit from forming an encompassing model that captures the information of all models. The selection of such as model is the topic of the next section.

5. Modeling Selection

5.1. Can Modeling Selection Help?

Modeling selection is an interesting complement to deductive learning and guides us towards thinking in new directions. Trying to form a model that encompasses the information of all five models, modeling selection provides us with an interesting alternative based on the information contained in the data. The modeling selection literature can basically be divided into two main branches: Bayesian Modeling Averaging (BMA) and classical modeling selection such as general-to-specific. According to Hendry and Reade (2005), modeling averaging performs poorly when dummy variables are present in the model. The focus in this paper is therefore on classical modeling selection methods.

Probably the best known modeling selection method is backwards selection. It starts with a *general* model where the variable associated with the lowest *t*-value is excluded. The regression is then estimated again, and the next variable associated with the lowest *t*-value is excluded. This is repeated in a stepwise manner until a *specific* model is reached where all the remaining variables have statistically significant coefficients. Due to its familiarity and simplicity, backwards selection is one of two methods used in this paper.

Two other methods that have received a lot of attention in the literature are those proposed by Levine and Renelt (1992) and Sala-i-Martin (1997), who search for robust correlates to income growth in a cross country setting. While the method in Levine and Renelt (1992) is criticized for being too strict (De Haan, 2007), the method in Sala-i-Martin (1997) is argued to be too slack (Hoover and Perez, 2004). Hoover and Perez (2004) therefore suggests a general-to-specific modeling selection method that is somewhere in-between, not too strict and not too loose. Based on Hoover and Perez (1999), Hendry and Krolzig (1999, 2001) made several refinements which resulted in their general-to-specific algorithm PcGets. The PcGets algorithm rests heavily on the

theory of reduction and encompassing (see e.g., Hendry, 1995). In brief the algorithm reduces the "general" model from "top to bottom" (similar to backwards selection) as well as from the "bottom and up" eliminating variables individually as well as in blocks. Using multiple paths, the algorithm can suggest several specifications that are selected amongst using test of encompassing. The final selected model encompasses the information of all models as well as the general model. The performance of PcGets is well documented (see, e.g., Hendry and Krolzig, 1999, 2001, 2005, and Owen, 2002), and is probably the most respected automated modeling selection method on the market today. PcGets is the second modeling selection method used in this paper.

5.2. Results III: Modeling Selection

The results from backwards selection and PcGets are presented in Table 6. The analysis is here restricted to the former colonies sample and all models (*LP1*, *LP2*, *M*, *HJ*, *AJR*) are included in the "general model" from which the selection begins.

Column 1 presents the specific equation from the backwards selection method. This regression consists of one especially obvious outlier: Singapore.[12] If we single out the countries where the absolute value of the studentized residual is greater than or equal to 2.5 in the general model, we are left with only Singapore. Column 2 therefore presents the specific equation from backwards selection while also controlling for Singapore, and reassuringly, this is the same equation as in Column 1. Finally, Column 3 presents the selected equation from PcGets. PcGets is here set to the default settings for a cross section, which automatically controls for outliers.[13] Reassuringly, PcGets selects the same set of variables as backwards selection as well as controlling for Singapore.

As a first observation, it is interesting to note that the selected equation consists of a little of all models: *Socialist legal origin* (from *LP1*), *Other religion*s (from *LP2*), *Former Spanish colony*, and *Other colonial origin* (from *M*), *Latitude* and *European language* (from *HJ*), and *Log Settler Mortality* (from *AJR*).

The *Socialist legal origin* dummy exerts a significant negative effect, and is actually a dummy for Laos and Myanmar. There are at least three ways to interpret this: Either we still have a legal origins effect, but it is only *Socialist legal origin* that is important, or, this as a pure Socialism effect which has very little to do with different legal codes. Alternatively,

[12] This specification is also heteroscedastic; thus robust standard errors are used. In all the previous stages, all specifications where homoscedastic.
[13] PcGets version 1.0. Default settings for a cross section with the outlier correction set to 2.56. The "Liberal strategy" with outlier correction gives the same result.

since the dummy is only equal to one for Laos and Myanmar, we might be capturing mainly noise.

The *Former Spanish colony* dummy exerts a negative effect on Rule of Law. This variable translates into almost the same as a dummy for Latin America. A Latin America dummy is often included in cross country growth regressions, which makes one wonder if the significant effect from *Former Spanish colony* is actually a Latin America effect, or vice versa. Another possibility is that it is a time effect since the Latin American countries were colonized early.

That both *Other colonial origin* and *Other religions* are selected is interesting. Usually, the contents of these "other" groups are not viewed as very important, which is the reason why they are bundled together. The fact that they are selected here begs to differ. *Other colonial origins* include former Portuguese, Belgian, and Dutch colonies. Among these, the Democratic Republic of the Congo (former Belgian colony) and Guinea-Bissau (former Portuguese colony) are both countries with relatively low values of Rule of Law.[14] *Other religions* consists of the share of the population who adhere to Hinduism, Buddhism, Chinese folk religions, different local tribe religions, and minor religions.

If we replace *Other colonial origin* and *Other religions* with their disaggregated groupings in column 2 in Table 6 and run the regression again, the coefficients for *Former Portuguese colony* and *Chinese folk religion* are statistically significant (see Table A3 in the appendix). The effects from *Other religions* thus seem to be driven mainly by Asian countries where a large part of the population are adherent to Chinese folk religions. This finding also helps explain why in Table 5 the *LP2*-model with religion was dominated by all other models *only* when also controlling for outliers, which were all Asian countries. Besides, starting from the general model where all models are included, the conditional information set is both richer and different; therefore the results are also slightly different than with the encompassing tests in Table 5.

Probably the most interesting result in Table 6 is that *Log Settler Mortality* is selected alongside *Latitude* and *European language*. The modeling selection did therefore not decide in favor of the *AJR*- or *HJ*-model, but instead simply that these two models are complementary to each other. The significant effect from *Log Settler Mortality* is here not sensitive to Singapore, Hong Kong and Malaysia, as it was in Table 5.

There are at least two ways to interpret why both the *HJ*- and *AJR*-model are selected: A skeptic interpretation would be that *Latitude* and *Settler Mortality* capture the

[14] The other former colonies of this group are Angola and Brazil (former Portuguese colonies), Burundi, and Rwanda (former Belgian colonies), Indonesia, and Suriname (former Dutch colonies).

same mechanism. While *Latitude* is an objective measure, *Settler Mortality* is subjectively constructed, and the accuracy of the construction is heavily questioned by Albouy (2006). Preferably, *Settler Mortality* should therefore be dropped from the regression. A more constructive interpretation would instead accept both measures and realize that the two models are complementary. While *Settler Mortality* captures the extent of Western European influence in colonial days, *Latitude* and *European language* capture the degree of Western European influence in colonial *and* post-colonial days. With this interpretation, it seems natural that the *AJR*- and *HJ*-model are entered alongside each other.

All in all, the selected specification makes intuitive sense and points mainly towards a Western European influence story, as well as captures the heterogeneous nature that exists across countries.

5.3. Additional Results

It is important to point out that the models examined are designed to explain the variation in Rule of Law and property rights. The results concerning other types of institutional quality could therefore be different. Moreover, there could be other variables than those considered here that are important to institutional quality.

Table 7 presents some additional results using PcGets with three different aspects of institutional quality. In column 1 the dependent variable is Legal Systems & Property Rights from the Fraser Institute's index for economic freedom. This variable is similar to Rule of Law and the results can therefore be viewed as a robustness check of the previous results. Reassuringly, the specification is the same as with Rule of Law in Table 6, except the inclusion of Singapore as an outlier.

In Table 7, column 2, the dependent variable is Political Rights[15] from the Freedom House organization, and in column 3 the dependent variable is the Corruption Perception Index from Transparency International. The selected specifications for these dependent variables are somewhat different to the specification with Rule of Law or Property Rights. Firstly, *Latitude* and *European language fraction* are present both in columns 2 and 3, whereas *Log Settler Mortality* is only present in column 3. The Western European influence effect thus still seems to play an important role. The same goes for *Socialist Legal Origin* which is included in all models. The difference instead lay in that the models with Corruption and Political Rights both include *Catholic* and *Muslim*. This can be interpreted as while the measure for Rule of Law is heavily influenced by formal rules,

[15] The original score is reversed (8-score) in order for a high value to mean higher level of political rights, in accordance with the other dependent variables.

the measures of Corruption and Political Rights are perhaps more influenced by informal rules such norms and values. The measures for *Catholic* and *Muslim* could thus proxy for informal rules, and could therefore be the reason for why these variables are selected for Corruption and Political Rights.

6. Conclusions

In the growing empirical literature on the creation of institutions, the importance of legal origin and religious affiliation (La Porta et al., 1999), ethnic diversity and colonial origin (Mauro, 1995), Western European influence (Hall and Jones, 1999), and settler mortality (Acemoglu et al., 2001) have been especially influential. The validity and influence of these theories rest heavily on empirical findings, which, due to the similarity across theories, might in fact capture the mechanism proposed by a competing theory. Therefore, this paper takes the empirical models seriously in order to discriminate among the existing models and to identify the model and variables that best explain the variation in institutional quality. There are four main conclusions:

(1) Modeling selection criteria such as the adjusted R-square and the Akaike information criteria singles out the Hall and Jones (1999) model with latitude, English and European language, explaining most of the variation in Rule of Law.

(2) In samples representing the whole world and of former colonies; tests of encompassing indicate that no single model dominates and thereby solely captures the information of all other models.

(3) Although no single model clearly dominates all other models, the encompassing tests point to interesting interrelationships. For example, legal origin and colonial origin do not seem to capture the same information, even in a sample of former colonies.

(4) Using the modeling selection methods backwards selection and PcGets gives a regression specification that contains a little of all models. The results, however, mainly points towards a Western European influence story with Latitude and Settler Mortality entered alongside each other. This can be interpreted as while Settler Mortality captures the extent of Western European influence in colonial days, Latitude and European language capture the degree of Western Europe influence in colonial *and* post-colonial days.

References

Acemoglu, Daron. (2005) "Constitutions, Politics, and Economics: A Review Essay on Persson and Tabellini's The Economic Effects of Constitutions" *Journal of Economic Literatur*e, Vol. 43(4): 1025-1048.

Acemoglu, Daron, Simon Johnson and James A. Robinson. (2001) "The Colonial Origins of Comparative Development: An Empirical Investigation" *American Economic Review,* Vol. 91(5): 1369-1401.

Albouy, David. (2006) "The Colonial Origins of Comparative Development: An Investigation of the Settler Mortality Data" Center for International and Development Economic Research, University of California, Berkeley. Paper C04-138.
< http://repositories.cdlib.org/iber/cider/C04-138>

Amemiya, Takeshi. (1985) *Advanced Econometrics*. Cambridge, Mass: Harvard University Press.

Baltagi, Badi H. (1998) *Econometrics*. New York: Springer.

Barrett, David B., ed. (1982) *World Christian Encyclopedia: A Comparative Study of Churches and Religions in the Modern World, AD 1900-2000*. New York: Oxford University Press.

Barro, Robert J. (1999) "Determinants of Democracy" *Journal of Political Economy* Vol. 107(6): S518-S183.

Belsley, David A., Kuh, Edwin, and Roy E. Welsch. (1980) *Regression Diagnostics: Identifying Influential Data and Sources of Collinearity*. New York: John Wiley & Sons.

Bernhard, Michael., Christopher Reenock, and Timothy Nordstrom. (2004) "The Legacy of Western Overseas Colonialism on Democratic Survival" *International Studies Quarterly*, Vol. 48: 225-250.

Bertocchi, Grazilla, and Fabio Canova. (2002) "Did colonization matter for growth? An empirical exploration into the historical causes of Africa's underdevelopment" *European Economic Review*, Vol. 46: 1851-1871.

Bleaney, Michael, and Akira Nishiyama. (2002) "Explaining growth: a contest between models" *Journal of Economic Growth,* Vol. 7: 43-56.

Davidson, Russell, and James G. MacKinnon. (1981) "Several tests for model specification in the presence of alternative hypotheses" *Econometrica,* Vol. 49(3): 781-793.

De Haan, Jakob. (2007) "Political institutions and economic growth reconsidered – Presidential address for the European Public Choice Society conference, Turku, April 2006" *Public Choice*. Vol. 131: 281-292.

Easterly, William, and Ross Levine. (1997) "Africa's Growth Tragedy: Policies and Ethnic Divisions" *Quarterly Journal of Economics,* Vol. 112(4): 1203-1250.

Easterly, William, and Ross Levine. (2003) "Tropics, germs, and crops: how endowments influence economic development" *Journal of Monetary Economics,* Vol. 50(1): 3-39.

Frankel, Jeffrey A, and David Romer. (1999) "Does Trade Cause Growth?" *American Economic Review,* Vol. 89(3):379-399.

Glaeser, Edward L., Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer. (2004) "Do Institutions Cause Growth?" *Journal of Economic Growth*, Vol. 9(3): 271-303.

Grier, Robin. (1999) "Colonial legacies and economic growth" *Public Choice,* Vol. 98: 317-335.

Gujarati, Damodar N. (2003) *Basic Econometrics 4th International Edition*. New York: McGraw-Hill.

Hall, Robert E. and Charles I. Jones. (1999) "Why Do Some Countries Produce So Much More Output Per Worker Than Others?" *Quarterly Journal of Economics,* Vol. 114 (1):83-116.

Hansson, Gustav. (2006) "Institutions and their Measures: A Black Box of Goodies" Göteborg University, Working Papers in Economics No. 206.
http://swopec.hhs.se/gunwpe/abs/gunwpe0206.htm

Hendry, David F. (1995) *Dynamic Econometrics*. Oxford: Oxford University Press.

Hendry, David F, and Hans-Martin Krolzig. (1999) "Improving on 'Data mining reconsidered' by K.D. Hoover and S.J. Perez" *Econometrics Journal,* Vol. 2: 202–219.

Hendry, David F, and Hans-Martin Krolzig. (2001) *Automatic Econometric Model Selection*. London: Timberlake Consultants Press.
http://www.pcgive.com/pcgets/index.html

Hendry, David F. and Hans-Martin Krolzig. (2005) "The properties of automatic gets modelling" *Economic Journal,* Vol. 115: C32–C61

Hendry, David F, and J. James Reade. (2005) "Problems in Model Averaging with Dummy Variables" Paper presented at Model Evaluation in Macroeconomics Workshop, University of Oslo, 6-7th of May 2006
http://folk.uio.no/rnymoen/Evalwork_ModAver.pdp retrieved February 9, 2006.

Hoover, Kevin D., and Stephen J. Perez. (2004) "Truth and Robustness in Cross-country Growth Regression" *Oxford Bulletin of Economics and Statistics,* Vol. 66(5):765-798.

Islam, Roumeen and Claudio E. Monenegro. (2002) "What Determines the Quality of Institutions" World Bank Policy Research Working Paper No. 2764.

Kaufmann, Daniel, Aart Kraay, and Massimo Mastruzzi. (2005) "Governance Matters IV: Governance Indicators for 1996-2004" World Bank Policy Research Working Paper 3630.

Knack, Stephen and Philip Keefer. (1995) "Institutions and Economic Performance: Cross-Country Tests using Alternative Institutional Measures" *Economics and Politics*, Vol. 7: 207-227.

Landes, David. (1998) *The Wealth and Poverty of Nations*. New York: W.W. Norton.

La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer and Robert Vishny. (1999) "The Quality of Government" *Journal of Law, Economics, & Organization*, Vol. 15 (1): 222-279.

Levine, Ross and David Renelt. (1992) "A Sensitivity Analysis of Cross-Country Growth Regressions" *American Economic Review,* Vol. 82(4): 942-963.

Mauro, Paolo. (1995) "Corruption and Growth" *Quarterly Journal of Economics*, Vol. 110(3): 681-712.

Mizon, Grayham H. and Jean-Francois Richard. (1986) "The Encompassing Principle and its Application to Testing Non-Nested Hypotheses" *Econometrica*, Vol. 54(3): 657-678.

North, Douglass C. (1990) *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press.

Owen, P. Dorian. (2002) "General-to-Specific Modelling Using PcGets" University of Otago Economic Discussion Papers No. 0213.

Persson, Torsten and Guido Tabellini. (2003) *The economic effects of constitutions*. Cambridge: The MIT Press.

Price, Gregory N. (2003) "Economic Growth in a Cross-section of Nonindustrial Countries: Does Colonial Heritage Matter for Africa?" *Review of Development Economics*, Vol. 7(3): 478-495.

Rodrik, Dani. (2004) "Getting Institutions Right" CESifo DICE Report. <http://www.ifo-institut.de/pls/guestci/download/CESifo%20DICE%20Report%202004/CESifo%20DICE%20Report%202/2004/dicereport204-forum2.pdf>

Sala-i-Martin, Xavier X. (1997) "I just rand four million regressions" NBER Working Paper No. 6252.

Serra, Danila. (2006) "Empirical determinants of corruption: A sensitivity analysis" Public Choice. Vol. 126: 225-56.

Straub, Stéphane. (2000) "Empirical Determinants of Good Institutions: Do We Know Anything?" Inter-American Development Bank Research department Working Paper No. 423.

Teorell, Jan, Sören Holmberg & Bo Rothstein. 2006. The Quality of Government Dataset, version 15Nov06. Göteborg University: The Quality of Government Institute, http://www.qog.pol.gu.se

Table 1: Correlation of Institutional Measures

	Property Rights Index (La Porta et al.)	Social Infrastructure (Hall and Jones)	Expropriation Risk (Acemoglu et al.)
Rule of Law	0.8244	0.8320	0.8084
Obs.	149	125	129
p-value	0.0000	0.0000	0.0000

Notes: Pearson correlation coefficients. Rule of Law for the year 1998 (Kaufmann et al., 2005). Property Rights 1997 (La Porta et al., 1999), Social Infrastructure 1986-1995 (Hall and Jones, 1999), and Expropriation Risk 1982-1997 (Acemoglu et al., 2001). See Data Appendix for more information.

Table 2: Institutional Models (Different Samples)

Dependent variable: Rule of Law

(1) LP1		(2) LP2		(3) M		(4) HJ		(5) AJR	
Constant	58.57***	Constant	76.39***	Constant	76.43***	Constant	18.10***	Constant	89.20***
	[4.27]		[8.66]		[3.66]		(4.30)		[9.98]
Ethnic	-25.79***	Ethnic	-27.77***	Ethnic	-24.40***	Ethnic	3.73	Ethnic	-9.35*
	[5.33]		[5.22]		[6.08]		(5.54)		[5.60]
Socialist	-17.70***	Catholic	-23.47**	Former British	-17.91***	Latitude	95.99***	Log Settler	-9.56***
legal origin	[5.40]		[9.60]	colony	[5.58]		(8.93)	Mortality	[2.06]
French	-9.05**	Muslim	-32.49***	Former Spanish	-30.66***	English	10.04*		
legal origin	[3.71]		[8.80]	colony	[5.11]	Language frac.	(5.91)		
German	28.48***	Other	-19.27*	Former French	-31.99***	European	11.91***		
legal origin	[6.82]	religions	[10.28]	colony	[5.50]	language frac.	(4.31)		
Scandinavian	35.52***			Other colonial	-36.38***				
legal origin	[4.14]			origin	[6.94]				
Obs.	150		150		129		138		78
Adj. R^2	0.351		0.214		0.429		0.565		0.376

Notes: Standard errors in ( ), robust standard errors in [ ]. * significant at 10%; ** significant at 5%; *** significant at 1%. Dependent variable Rule of Law 1998 is between 0 and 100, where a high number means a high degree of Rule of Law. For *LP1* the omitted group is English legal origin, for *LP2* the omitted group is Protestant.

Table 3: Institutional Models (Colony Sample)

Dependent variable: Rule of Law

(1) LP1		(2) LP2		(3) M		(4) HJ		(5) AJR	
Constant	64.33***	Constant	71.32***	Constant	62.37***	Constant	23.34***	Constant	89.23***
	[5.85]		[16.81]		[5.79]		(6.24)		[9.94]
Ethnic	-26.54***	Ethnic	-29.11***	Ethnic	-24.08***	Ethnic	1.95	Ethnic	-10.09*
	[6.26]		[7.50]		[6.42]		(7.88)		[5.65]
Socialist	-35.02***	Catholic	-29.39*	Former Spanish	-16.67***	Latitude	62.18***	Log Settler	-9.46***
legal origin	[4.73]		[16.82]	colony	[5.73]		(16.79)	Mortality	[2.06]
French	-18.78***	Muslim	-23.07	Former French	-17.46***	English	22.95***		
legal origin	[4.66]		[15.40]	colony	[4.61]	Language frac.	(7.74)		
		Other	-6.61	Other colonial	-29.15***	European	9.74		
		religions	[21.21]	origin	[5.32]	language frac.	(6.49)		
Obs.	77		77		77		77		77
Adj. R^2	0.320		0.189		0.332		0.406		0.379
AIC	658.44		672.97		658.06		649.03		650.57

Notes: Standard errors in ( ), robust standard errors in [ ]. * significant at 10%; ** significant at 5%; *** significant at 1%. AIC=Akaike Information Criterion. Dependent variable Rule of Law 1998 is between 0 and 100, where a high number means a high degree of Rule of Law. For *LP1* the omitted group is English legal origin, for *LP2* the omitted group is Protestant. For *M*, which now consists of only former colonies, the omitted group is former British colonies. In Column (2), Muslim and Other religions are jointly significant at the 10% level.

Table 4: Encompassing Tests (different samples)

	LP1	LP2	M	HJ
LP2	LP1 ≠ LP2 n=150 (N)	-		
M	M ≠ LP1 n=129 (R)	M ≠ LP2 n=129	-	
HJ	HJ ≠ LP1 n=138 (N)	HJ ≠ LP2 n=138 (N)	HJ ≠ M n=127 (N)	-
AJR	AJR ≠ LP1 n=78	AJR *d* LP2 n=78	AJR ≠ M n=78 (R)	AJR ≠ HJ n=77 (R, N)

Notes: Test of encompassing (F-test, a=0.05).
$M_A \varepsilon M_B$ and $M_B \varepsilon^c M_A$ are denoted $M_A \, d \, M_B$ (M_A dominates M_B).
$M_A \varepsilon M_B$ and $M_B \varepsilon M_A$ are denoted $M_A \approx M_B$ (M_A is approx. equivalent to M_B).
$M_A \varepsilon^c M_B$ and $M_B \varepsilon^c M_A$ are denoted $M_A \neq M_B$ (M_A is different from M_B).
(R) indicates that White's test rejects the null of homoscedasticity (α=0.05), and the robust Wald-test is used instead. (N) indicates that the Shapiro Wilks test rejects the null of normality (α =0.05). See text for further information.

Table 5: Encompassing Tests (Colony sample, n=77)

	LP1	LP2	M	HJ
LP2	LP1 *d* LP2	-		
M	M ≠ LP1 (R)	M *d* LP2	-	
HJ	HJ ≠ LP1 (R, N)	HJ ≠ LP2 (N)	HJ ≠ M (N)	-
AJR	AJR ≠ LP1	AJR *d* LP2	AJR ≠ M (R)	AJR ≠ HJ (R, N)

Notes: Test of encompassing (F-test, a=0.05).
$M_A \varepsilon M_B$ and $M_B \varepsilon^c M_A$ are denoted $M_A \, d \, M_B$ (M_A dominates M_B).
$M_A \varepsilon M_B$ and $M_B \varepsilon M_A$ are denoted $M_A \approx M_B$ (M_A is approx. equivalent to M_B).
$M_A \varepsilon^c M_B$ and $M_B \varepsilon^c M_A$ are denoted $M_A \neq M_B$ (M_A is different from M_B).
(R) indicates that White's test rejects the null of homoscedasticity (α =0.05), and the robust Wald-test is used instead. (N) indicates that the Shapiro Wilks test rejects the null of normality (α =0.05). See text for further information.

Table 6: Modeling Selection

Dependent variable: Rule of Law

Independent Variables	(1) BWS	(2) BWS (w/ outlier)	(3) PcGets	(4) Model
Socialist legal origin	-38.08*** [6.64]	-33.71*** (9.27)	-33.71*** (9.27)	LP1
Other religions	24.45*** [7.57]	20.34*** (6.86)	20.34*** (6.86)	LP2
Former Spanish colony	-9.06** [3.86]	-9.54** (4.33)	-9.54** (4.33)	M
Other colonial origin	-14.08*** [3.81]	-12.63*** (4.50)	-12.63*** (4.50)	M
Latitude	38.79** [17.93]	50.57*** (13.58)	50.57*** (13.58)	HJ
European language fraction	18.28*** [4.35]	19.68*** (4.11)	19.68*** (4.11)	HJ
Log Settler Mortality	-5.84*** [1.98]	-4.45*** (1.38)	-4.45*** (1.38)	AJR
Singapore (dummy)		47.67*** (12.26)	47.67*** (12.26)	outlier
Constant	53.12*** [12.54]	44.53*** (9.20)	44.53*** (9.20)	-
Observations	77	77	77	
Adj. R^2	0.639	0.700	0.700	

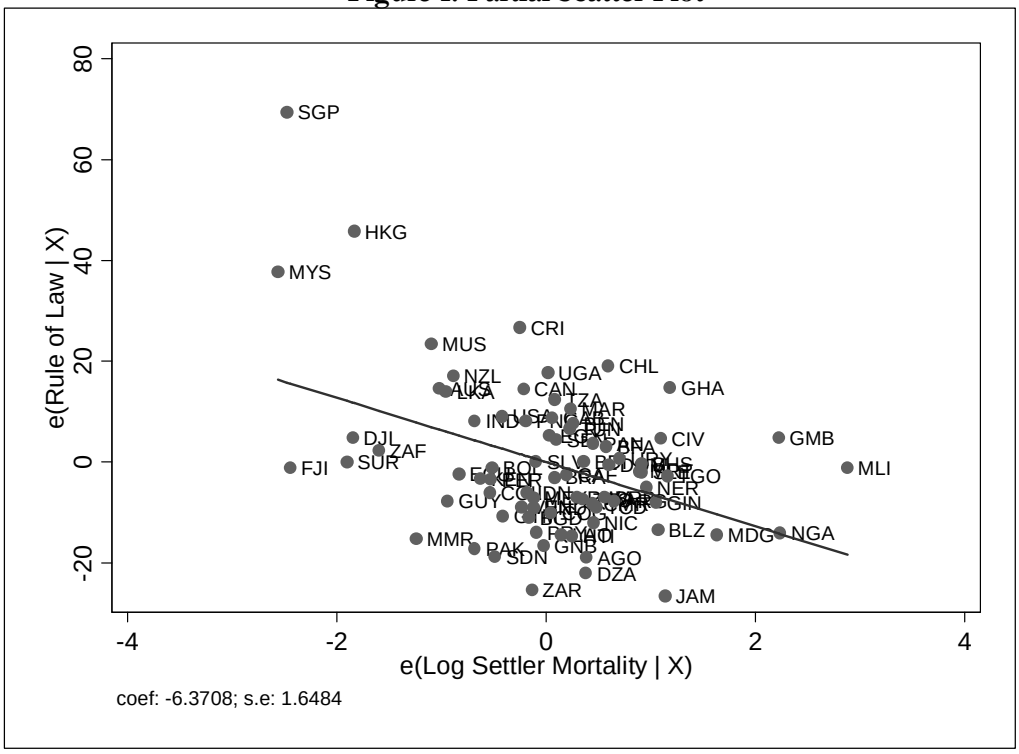
Notes: Standard errors in ( ), robust standard errors in [ ]. * significant at 10%; ** significant at 5%; *** significant at 1%. Column (1): BWS = Backwards selection (α =0.05). Column (2): BWS = Backwards selection with outlier correction (α =0.05). A dummy is included if the absolute value of the studentized residual from the GUM is greater or equal to 2.5. Column (3): PcGets using liberal strategy with outlier correction. The general model includes (all variables from Table 3): Ethnic, Socialist legal origin, French legal origin, Catholic, Muslim, Other religions, Former French colony, Former Spanish colony, Other colonial origin, Latitude, English language frac., European language frac., and Log Settler Mortality.

Table 7: Additional results using PcGets

Independent Variables	(1) Legal System & Property Rights	(2) Political Rights	(3) Corruption Perception Index	(4) Model
Socialist legal origin	-3.14***	-3.70***	-3.11***	LP1
	(1.09)	(1.04)	(0.84)	
Catholic		-1.82***	-2.41***	LP2
		(0.63)	(0.53)	
Muslim		-2.52***	-2.24***	LP2
		(0.68)	(0.56)	
Other religions	1.41**			LP2
	(0.66)			
Former Spanish colony	-1.40***			M
	(0.40)			
Other colonial origin	-1.35***			M
	(0.45)			
Latitude	3.47***	3.22**	5.35***	HJ
	(1.24)	(1.53)	(1.40)	
European language fraction	1.49***	2.86***	1.29***	HJ
	(0.38)	(0.55)	(0.46)	
Log Settler Mortality	-0.45***		-0.39***	AJR
	(0.14)		(0.14)	
Singapore (dummy)			5.26***	outlier
			(1.19)	
Constant	6.00***	4.16***	5.47***	-
	(0.92)	(0.42)	(0.83)	
Observations	68	76	75	
Adj. R^2	0.641	0.579	0.666	

Notes: Standard errors in ( ), robust standard errors in [ ]. * significant at 10%; ** significant at 5%; *** significant at 1%. Method is PcGets with defaults cross section with outlier detection set to 2.56. The general model includes (all variables from Table 3): Ethnic, Socialist legal origin, French legal origin, Catholic, Muslim, Other religions, Former French colony, Former Spanish colony, Other colonial origin, Latitude, English language frac., European language frac., and Log Settler Mortality.

Figure 1: Partial Scatter Plot



Note: Partial scatter plot for Log Settler Mortality for the regression $inst_i = \alpha + \beta(Ethnic_i) + \gamma_1(Log\ Settler\ Mortality) + \eta_1(Latitude) + \eta_2(English) + \eta_3(European) + \varepsilon_i$

Data Appendix

Variable Description and sources

Corruption Perception Index: Index for corruption year 2007 (due to data availability. The index for 1998 contains only 40 countries in our colony sample. The correlation between the 2007 and 1998 measures are 0.95). From Transparency International <http://www.icgg.org/corruption.cpi_2007.html>

English Language frac: Fraction of population speaking English. Source Hall and Jones (1999)

Ethnic: Ethnolinguistic fractionalization. Average value of five different indices of ethnolinguistic fractionalization. Its value ranges from 0 to 1. The five component indices are: (1) index of ethnolinguistic fractionalization in 1960, which measures the probability that two randomly selected people from a given country will not belong to the same ethnolinguistic group; (2) probability of two randomly selected individuals speaking different languages; (3) probability of two randomly selected individuals not speaking the same language; (4) percent of the population not speaking the official language; and (5) percent of the population not speaking the most widely used language. Source: La Porta et al. (1999) whose main source is Easterly and Levine (1997).

European language frac: Fraction of population speaking a Western European language (English, French, German, Portuguese, and Spanish) as a first language. Source: Hall and Jones (1999).

Expropriation Risk: Risk of "outright confiscation and forced nationalization" of property. Calculated as the 1982-1997 average on a scale from 0 to 10 where higher values equal a lower probability of expropriation. Source: Glaeser et al. (2004) (originally from International Country Risk Guide, i.e., the same source as Expropriation Risk 1985-1995 used in Acemoglu et al., 2001).

Former Colony: Dummy variables indicating the identity of a former colony (most recent ruler). Divided into former British, Spanish, and French colonies as well as a group called "Other colonial origin." The data is from Hoover and Perez (2004), originally from Sala-i-Martin (1997) and Barro (1996). The data has been adjusted as follows: (1) Use the data from Hoover and Perez (2004) on former British, Spanish, and French colonies. (2) For countries that are former colonies according to the Log Settler Mortality data, but miss information on the identity of the former ruler, the data has been imputed. There are four cases: Belize (British), Djibouti, Laos, and Vietnam (all French). Listing was based on CIA World Factbook. (3) For countries that are former colonies according to Log Settler Mortality but were not listed as a British, Spanish, or French former colony, a dummy called "Other colonial origin" was created (Angola, Brazil, Burundi, DR Congo, Guinea-Bissau, Indonesia, Rwanda, and Suriname). Papua New Guinea was here listed as a former British colony, as suggested by Price (2003). (4) For countries that are in the Sala-i-Martin (1997) sample (a sample of the world), and are listed as former colonies according to the Quality of Government dataset (Teorell et al., 2006) but not as British, Spanish, or French, further adjustments were made (five cases): Cape Verde, Mozambique, Philippines (all listed as Other colonial origin), Yemen (listed as British, as suggested by Price, 2003), and Oman (dropped from the sample since it is arguably not a former colony, as suggest by Price, 2003). The latter correction (4) is only

in effect for the world sample in Table 2, Column 3, and in the encompassing tests in Table 4.

Latitude: Distance from the equator, calculated as the absolute value of latitude degrees divided by 90. Source: Hall and Jones (1999).

Legal origin: Identifies the legal origin of the Company Law or Commercial Code for each country. Divided into five dummy variables: English Common Law, French Commercial Code, Socialist/Communist laws, Scandinavian Commercial Code, and German Commercial Code. For example: French legal origin equals one if French legal origin, otherwise zero. English legal origin is the omitted group. Source: La Porta et al. (1999).

Legal System & Property Rights: Index for Legal System & Property Rights year 2000. From the Economic Freedom of the World Data 2007, Fraser Institute, <http://www.freetheworld.com/datasets_efw.html>

Log Settler Mortality. Ln of Settler Mortality, originally used in Acemoglu et al. (2001). Data retrieved from Glaeser et al. (2004) (http://www.andrei-shleifer.com/data.html). Afghanistan and Ethiopia where dropped since they are clearly not former colonies.

Political Rights: index for political rights year 1998. Reversed so that a high number means high level of political rights (8 – score). From Freedom House <http://www.freedomhouse.org>

Property rights index: A rating of property rights in each country in 1997 (on a 1-5 scale). The more protection private property receives, the higher the score. The score is based, broadly, on the degree of legal protection of private property, the extent to which the government protects and enforces laws that protect private property, the probability that the government will expropriate private property, and the country's legal protection of private property. Source: La Porta et al. (1999).

Religion: Identifies the fraction of the population of each country that belonged to one of the three most widely spread religions in the world in 1980. The three religions identified here are: Roman Catholicism, Protestantism, Islam, and with the residual called "Other religions" (=1-Catholic-Protestant-Muslim). Source: La Porta et al. (1999). When disaggregating "Other religions" Barrett (1982) is used, which is also the source used by La Porta et al. (1999). "Non-religious" in Table A3 consists of both non-religious and atheists.

Rule of Law: Rule of Law in 1998. Scaled to be a number between 0 and 100 (by taking 100*(score-(min))/(max-min)). The higher the score, the higher the level of Rule of Law. Source: Kaufmann et al. (2005).

Social Infrastructure: Social Infrastructure 1986-1995 (on a 0-1 scale). The higher the score, the more Social Infrastructure. Source: Hall and Jones (1999).

Table A1: Descriptive statistics (former colony sample)

Variable	Obs	Mean	Std. Dev.	Min	Max
Rule of Law	77	40.3947	20.5820	0.0000	97.2286
Ethnic	77	0.4359	0.3133	0.0000	0.8902
English legal origin	77	0.3636	0.4842	0.0000	1.0000
French legal origin	77	0.6104	0.4909	0.0000	1.0000
Socialist legal origin	77	0.0260	0.1601	0.0000	1.0000
Protestant	77	0.1142	0.1511	0.0000	0.5840
Catholic	77	0.3749	0.3579	0.0010	0.9660
Muslim	77	0.2336	0.3366	0.0000	0.9940
Other religions	77	0.2772	0.2540	0.0030	0.9800
Former British colony	77	0.4026	0.4936	0.0000	1.0000
Former French colony	77	0.2857	0.4547	0.0000	1.0000
Former Spanish colony	77	0.2078	0.4084	0.0000	1.0000
Other colonial origin	77	0.1039	0.3071	0.0000	1.0000
Latitude	77	0.1690	0.1207	0.0025	0.4859
English language frac.	77	0.1156	0.2907	0.0000	1.0000
European language frac.	77	0.3124	0.4155	0.0000	1.0000
Log Settler Mortality	77	4.6969	1.2114	2.1459	7.9862
Legal System & Property Rights	68	4.9430	1.6935	1.9826	9.4947
Political Rights	76	4.2237	2.0951	1.0000	7.0000
Corruption Perception Index	75	3.4573	1.8964	1.4000	9.4000

Table A2: The former colony sample

Country	Code	Country	Code
Africa (35 countries)			
ALGERIA	DZA	KENYA	KEN
ANGOLA	AGP	MADAGASCAR	MDG
BENIN	BEN	MALI	MLI
BURKINA FASO	BFA	MAURITANIA	MRT
BURUNDI	BDI	MAURITIUS	MUS
CAMEROON	CMR	MOROCCO	MAR
CENTRAL AFRICAN REPUBLIC	CAF	NIGER	NER
CHAD	TCD	NIGERIA	NGA
CONGO, REP.	COG	RWANDA	RWA
CONGO, DEM. REP.	ZAR	SENEGAL	SEN
DJIBOUTI	DJI	SIERRA LEONE	SLE
EGYPT	EGY	SOUTH AFRICA	ZAF
GABON	GAB	SUDAN	SDN
GAMBIA	GMB	TANZANIA	TZA
GHANA	GHA	TOGO	TGO
GUINEA	GIN	TUNISIA	TUN
GUINEA-BISSAU	GNB	UGANDA	UGA
IVORY COAST	CIV		
Latin America and the Caribbean (26 countries)			
ARGENTINA	ARG	NICARAGUA	NIC
BELIZE	BLZ	PANAMA	PAN
BOLIVIA	BOL	PARAGUAY	PRY
BRAZIL	BRA	PERU	PER
CHILE	CHL	SURINAME	SUR
COLOMBIA	COL	URUGUAY	URY
COSTA RICA	CRI	VENEZUELA	VEN
ECUADOR	ECU	BAHAMAS	BHS
EL SALVADOR	SLV	BARBADOS	BRB
GUATEMALA	GTM	DOMINICAN REPUBLIC	DOM
GUYANA	GUY	HAITI	HTI
HONDURAS	HND	JAMAICA	JAM
MEXICO	MEX	TRINIDAD AND TOBAGO	TTO
Asia (10 countries)			
BANGLADESH	BGD	MALAYSIA	MYS
HONG KONG	HKG	MYANMAR	MMR
INDIA	IND	PAKISTAN	PAK
INDONESIA	IDN	SINGAPORE	SGP
LAOS	LAO	SRI LANKA	LKA
Oceania (4 countries)			
AUSTRALIA	AUS	NEW ZEALAND	NZL
FIJI	FJI	PAPUA NEW GUINEA	PNG
North America (2 countries)			
CANADA	CAN	UNITED STATES	USA

Note: Compared to the base sample in Acemoglu et al. (2001), the colony sample above includes: Benin, Burundi, Central African Republic, Chad, Djibouti, Guinea-Bissau, Mauritania, Mauritius, Rwanda, Belize, Suriname, Barbados, Laos, Myanmar, Fiji, and Papua New Guinea (16 countries). The colony sample excludes Ethiopia and Malta, since they are not former colonies, and excludes Vietnam due to lack of data.

Table A3: Selected regression with disaggregated values

Dependent variable: Rule of Law

Independent Variables		Independent Variables cont.	
Socialist legal origin	-29.71**	Former Portuguese colony	-17.10**
	(13.88)		(6.51)
Hindus	7.53	Former Belgian colony	-10.38
	(11.50)		(6.83)
Buddhists	16.39	Former Dutch colony	-7.50
	(16.35)		(8.27)
Jewish	168.91	Latitude	50.72***
	(316.53)		(15.48)
Chinese folk religions	85.44***	European language fraction	22.15***
	(24.36)		(4.46)
Non-religious	26.29	Log Settler Mortality	-3.14**
	(34.52)		(1.56)
Other religions2	14.45	Singapore (dummy)	12.53
	(9.12)		(16.79)
Former Spanish colony	-11.56**	Constant	38.40***
	(4.38)		(9.96)
Observations			77
Adj. R^2			0.724

Notes: This is one regression. Standard errors in ( ), * significant at 10%; ** significant at 5%; *** significant at 1%. Other religions2 = Other religions – (Hindus+Buddhists+Jewish+Chinese folk religions+non-religious). The data for religion is from Barrett (1982).