Same Same but Different?
A Comparison of Institutional Models

Gustav Hansson*
Göteborg University

May 26, 2007

Abstract

In the growing empirical literature on the creation of institutions, the importance of colonial and legal origin, religious affiliation, Western European influence, and settler mortality has been especially influential. These explanations, however, are without much consensus. Which explanation is telling us the right story, or could it be that they all capture the same information? With the help of non-nested tests, this paper investigates if there is one model which dominates all other models. Since no such model is found, an encompassing model is instead proposed with the help of an automated modeling selection algorithm.

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 an indicator and a determinant for 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 towards understanding the creation of institutions is of great importance. The arguably most influential theories for how good institutions are created 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). Unfortunately, this literature is without much consensus. Moreover, these explanations are presented as different models although they are clearly highly related and might actually capture the same mechanisms.

There is a large literature documenting that the identity of the colonial ruler has played a large part in countries development (Grier, 1999; Bertocchi and Canova,

*gustav.hansson@economics.gu.se, Department of Economics, Göteborg University, Box 640, SE-40530 Göteborg, Sweden. I would like to thank Arne Bigsten, Dick Durevall, Ola Olsson and seminar participants at Göteborg University for helpful comments on an earlier draft. All errors are my own.

2002; Price, 2003, Bernhard et al., 2004). Amongst other things, the colonial rulers transplanted their legal systems, religions, and languages. The results concerning legal origin and religion in La Porta et al. (1999) might therefore indirectly capture the importance of colonial origin or Western European influence.

A second set of theories emphasize the importance of Western European influence: either in colonial days measured by settler mortality rates as in Acemoglu et al. (2001), or in colonial and post-colonial days measured by latitude and language spoken as in Hall and Jones (1999). Now which of these theories are telling us the right story? Does settler mortality capture the same mechanism as the Hall and Jones (1999) variables? Is legal origin and religion simply a proxy for colonial origin? Is there any model which single handedly captures the information of all other models, or is it possible to construct an encompassing model which does? As eloquently pointed out by La Porta et al (1999, p.226): "Unfortunately, scholars often pursue their own theories without paying too much attention to the alternatives." There is therefore a clear need to adequately discriminate between existing models in order to pinpoint the channels by which good institutions are created. The purpose of this paper is therefore firstly to examine if there is a model which is able to capture the information pertained in all other models, and secondly to build a new model which encompasses the information of all models.

In order to discriminate between models, this paper conducts encompassing tests following Mizon and Richards (1986). The encompassing tests, sometimes also referred to as a test of non-nested models, enables us to test whether a model A encompasses the information of the rival model B. The test also provides interesting information about the interrelationships between models, such as if the data are compatible with both models, or simply if the models both contain a partial truth, indicating we might benefit to search for a new model. For example: legal origin and colonial origin do not seem to 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 while also controlling: legal origin, colonial origin, Western European influence, or settler mortality. There is however, some evidence that the Hall and Jones model, with absolute latitude and language spoken, dominates all other models using a strict selection rule. 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 there is no single model which strongly dominates all other models, it is interesting to try to construct an encompassing model which does. With the help of modeling selection methods such as Backwards selection and the automated modeling selection algorithm PcGets associated with Hendry and Krolzig (1999, 2001) a new model specification is suggested. Interestingly, the selected specification contains a little bit of all models, with settler mortality, latitude and language along side each other.

The econometric framework in this paper is similar to Bleaney and Nishiyama (2002), which used non-nested tests and modeling selection to discriminate between income growth models in a cross country setting. Bleaney and Nishiyama (2002) only make use of the simple backwards selection method. The method chosen in this paper is therefore closer to Hoover and Perez (2004) which greatly improves the accuracy of the by now infamous methods proposed by Levine and Renelt (1992) and Sala-i-Martin (1997) in their search towards robust determinants of income growth. The paper is also related to Islam and Montenegro (2002), Straub (2000), and Barro (1999) who empirically examines what determines institutional quality. Although the focus, variables, and empirical methods are vastly different.

The contributions of this paper is that it is the only study, to my knowledge, which explicitly compare these institutional models using tests of encompassing and which use modeling selection to propose a new encompassing model. This exercise is done on samples representing the whole world, as well as former colonies. Out of the 20 pair wise comparisons, only five have been compared before, and still, these five comparisons are now based on different samples. For example the comparison between legal origin and religious affiliation is previously covered in La Porta et al. (1999), although the number of countries is now larger and interestingly the result is different. This study therefore gives new information about the interrelationships between colonial and legal origin, religious affiliation, Western Europe influence, and settler mortality.

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

2. Theoretical Background

This section shortly describes the theoretical background why colonial and legal origin, religion, Western European influence, and settler mortality would have an effect on institutional quality and good governance.

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. The legal tradition of a country is intended to indicate the relative power of the State in relation to private property owners. Measures of legal traditions can therefore be used to capture the extent of private property protection. The different legal traditions are in La Porta et al. (1999) divided into English common law, French civil law, German civil law, Scandinavian law, and Socialist law. The differences between French, German, and Scandinavian law are relatively subtle, but the differences between Socialist law, civil law and common law are not. The Socialist legal tradition is a created by the State in order to maintain ultimate power and control of the economy. The goal of Socialist law is therefore to keep the communist party in power, and not to protect private property rights or freedom. Civil law has also been developed as a means for the sovereign to control economic life, although not at all to the same degree as in the socialist tradition. The common law tradition developed more as a defense against the attempts by the sovereign to regulate and expropriate property owners. A country with a common law tradition should therefore indicate that private property rights are highly regarded and an intention to limit the power of the State. English common law is therefore predicted to create a bureaucracy that is the most efficient and the least interventionist. The Socialist legal tradition is seen as the least efficient and most interventionist, followed by the French system which was built to be powerful and unconstrained. The German and Scandinavian system developed a highly efficient bureaucracy and is therefore valued slightly higher than the French.

Religious affiliation, or more specifically the proportion of the population adherent to a specific religion, is intended to be a proxy for cultural influence 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 predicts 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 over the world through conquest, colonization, or voluntary adoption. Legal origin is therefore not directly comparable to colonial origin. Countries with a French legal origin consist for example of countries colonized by France, Spain and Portugal, as well as countries which voluntary adopted their legal tradition. The same goes for the spread of religions which also spread over the world through conquest, colonization or voluntary adoption. Although it is hard to ignore the close connection between 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 identity of the colonial ruler has played a large part in countries development (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 in general 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 implemented 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 to their own native culture both also to there fellow Frenchman. 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 itself (Grier, 1999). There are therefore strong historical indications that different sets of colonial heritage matter for the subsequent development of present day institutions.

La Porta et al. acknowledge that colonization might have transplanted both religion and legal system, but they argue that by including religion and law as explanatory variables, the effect on institutions is measured directly instead of

indirectly, as would be the case if using colonial origin. Surprisingly, La Porta et al. do not check their results by controlling for colonial origin since a country does not have to be colonized to have a certain legal tradition, and that colonial status is hard to measure. The use of colonial origins data is, however, widespread (see e.g. Mauro, 1995; Sala-i-Martin, 1997; Grier, 1999; Bertocchi and Canova, 2002; and Price, 2003). Interestingly, Mauro (1995) explained the variation in corruption by ethnic fractionalization and colonial origin, which is very much alike the La Porta et al. regression set-up which replaced colonial origin with legal origin and religion. Consequently, the results in La Porta et al. might be driven by the countries' colonial heritage and might in fact have very little to do with the specific legal system or religion.

2.2. Western European Influence

Instead of focusing on the identity of the colonizers, the specific religion or legal system, Hall and Jones (1999) argues 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 the fraction of the population speaking English or a European language – English, French, German, Portuguese, or Spanish - as a first language today.[1] The reasoning behind using latitude was that Europeans were more likely to migrate to areas which were broadly similar in climate to Western Europe, and hence distant from the equator. Since Europe early developed well functioning institutions, such as property rights, countries which were 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, would result in low European settlement intensity and therefore result in harmful extractive colonial institutions which have persisted to this day. Low settler mortality would, on the contrary, result in high European settlement and consequently beneficial institutions.

[1] Included was also the constructed trade share from Frankel and Romer (1999). This variable was most probably included as an explanatory variable since the measure for institutional measure used, 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.

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 theory behind using latitude or settler mortality is different. Firstly, settler mortality is design 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 is positive, Acemoglu et al (2001) argues that the European influence had vastly different effects depending on what was the most attractive colonization strategy. Acemoglu (2005) therefore argue that there is no reason for why latitude should be used for the entire world, and 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 low, as measure either directly by settler mortality or indirectly by latitude, Europeans settled and were therefore more likely to incorporated the same set of institutional framework as accustomed to at 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. A first set of theories which argue that institutions are created dependent on the identity of the colonizer and what type of legal system and religion they incorporated. A second set of theories focusing on the extent of Western European influence. Now which of these theories are telling us the right story? Are these models the same or are they different? The next section will start to answer these question by solely examining the information pertained in the data.

[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 also in this paper.

3. Data and Regression Specifications

3.1. Data

Doing a comparison of institutional models one quickly runs into a problem: what measure of institutional quality should be used? Unlike studying differences in income levels, which has a more or less undisputed measure GDP per capita, there is no self-evident measure for institutional quality. Since Knack and Keefer (1995) the empirical literature has directed its attention towards measures of "economic" institutions such as property rights and rule of law which in line with North (1990) are argued to more conducive towards economic development.

La Porta et al. use a wide variety of measures for institutional quality and good governance. Amongst the more important is an index of property rights which captures the extent to which the government protects and enforces private property laws. Hall and Jones focus on their own measure "Social Infrastructure" which is intended to capture "the institutions and government policies that determine the economic environment within which individuals accumulate skills, and firms accumulate capital and produce output" (Hall and Jones, 1999, p. 84). This measure is constructed by combining the two measures: government antidiversion policies, and trade openness. The index for government antidiversion policies is directly inspired by Knack and Keefer (1995) and is an aggregate measure of law and order, bureaucratic quality, corruption, risk of expropriation, and government repudiation of contracts. The measure used in Acemoglu et al. (2001), are also inspired by Knack and Keefer but focus only on one of the antidiversion policies, namely risk of expropriation.[3]

The three measures; Property Rights, Social Infrastructure, and Expropriation Risk, are all highly related and with a specific focus on property rights and the protection from arbitrary expropriation. In this paper we are going to use a measure of Rule of Law developed by Kaufmann et al. (2005) which arguably captures the attributes of the measures used by La Porta et al. Hall and Jones, and Acemoglu et al. Rule of Law is the concept that no individual is above the law, and therefore a safeguard for the protection of private property, arbitrary governance and

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

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, as well as that everyone is equal in front of the law. By definition, Rule of Law is therefore not exactly the same as Expropriation Risk or Property Rights. Although, by definition Rule of Law encompasses all the attributes of property rights and expropriation risk. Rule of Law is therefore a highly suitable measure for our purposes, which captures the institutional features intended by La Porta et al. Hall and Jones, and Acemoglu et al. Not surprisingly, the correlation between Rule of Law, Property Rights, Social Infrastructure, and Expropriation Risk is very high, as can be seen in Table 1.

Concerning the explanatory variables, the original data from the La Porta et al. Hall and Jones, and Acemoglu et al. are used as far as possible. The probably only variable that deserves some further explanation is the colonial origins data. Most of the previous literature starting with Barro (1999) and Sala-i-Martin (1997) use the last official colonial power to proxy for colonial influence (with a dummy for former British colony etc). This paper will therefore measure colonial origin by using the identity of 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 data appendix.

3.2. Regression Specifications

The baseline regression model from which all regression specifications in this paper will be based on, are directly inspired by a specification in La Porta et al. 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 the random error, and i refers to country. For obvious reasons the La Porta et al. 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 represented in the same way. For example, the model with colonial origin includes *ethnic* as the common control variable alongside 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 is therefore going to be referred to as the *M*-model. Similarly, the Hall and Jones model are going to be referred to as *HJ*-model, and the Acemoglu et al. model is referred to as *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, except the fifth model with settler mortality which only consists of former colonies.

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 indicate a high degree of Rule of Law. For example, having a *Socialist legal origin* is associated with 17.70 percentage points worse Rule of Law compared to a country with *English legal origin*. Examining the adjusted R-squares, the *HJ*-model explains the 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 in to a sample only consisting 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.

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 the confidence intervals overlap with their respective confidence interval in Table 2.[4] The coefficients for *Muslim* and *Other religions* are not individually significant, but jointly significant at the 10% level (p-value=0.07). The probably most interesting result in Table 3 is that the adjusted R-square as well as the

[4] For Socialist legal origin Table 2 the 95% confidence interval is [-7.04; -28.36], and in Table 3 [-25.59; -44.45]

Akaike Information Criterion (AIC) singles out the *HJ*-model as explaining the most of the variation in Rule of Law.

To summarize: the results in Tables 2 and 3 point to 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, tells us nothing whether the models capture the same information. Comparing the five models based on the different 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 encompassing tests, sometimes also referred to as tests of non-nested models. Simply put, a model A is said to encompasses model B (denoted $M_A \, \varepsilon \, M_B$) if model A contains the information of model B, or as Hendry (1995, p. 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."

In testing whether model A encompasses model B, simply form the non-redundant joint model of A and B, and perform 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) it would look like the following equation:

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

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 being 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 (as in equation 2) and the restricted model (as in equation 1). The test can therefore be interpreted as whether *LP2* contributes to *LP1* or not.

Obviously, the testing procedure can result in four possible outcomes: Case 1 where 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 encompass model B, and model B encompass 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 $M_B \ \varepsilon^c M_A$). Neither here is it possible 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 explaining a partial truth and are complimentary to each other.

Important to remember is that for 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.[5] To test for model adequacy, Whites test for heteroscedasticity and the Shapiro-Wilks test for normality of the residuals will be used. If the requirements of homoscedasticity and/or normality are not fulfilled, an alternative test is conducted. If the homoscedasticity requirement is not fulfilled, the robust *F*-test is used instead. If the normality assumption is not met, the Lagrange Multiplier test (which does not depend on the normality assumption) is used. If neither the homoscedasticity nor the normality requirement is fulfilled, the robust LM-test is used. Unfortunately, these alternative tests are only valid asymptotically.[6] In addition, we will try to assess why the model requirements are not fulfilled and adjust for it accordingly.

An alternative test of non-nested models is the *J*-test associated with Davidson and Mackinnon (1981). A problem with the *J*-test is that it is only valid asymptotically. In small samples the *J*-test will tend to reject the null hypothesis, that the models are different, more frequently than it ought to (Baltagi, 1998, p.209). The

[5] This is the notion of Congruence, see Hendry (1995, p.511) or Hendry and Krolzig (2001, p.135), a formal definition of congruence can be found in Hendry (1995, p.465). The principal reference to the test of encompassing is Mizon and Richard (1986).
[6] See for example Wooldridge (2002).

F-test is still valid, and therefore preferable for our analysis. The *F*-test 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).

4.2. Results II: Encompassing Tests

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 including the *AJR*-model which is confined only to former colonies. For almost all model comparisons, the tests rules that they are "different" (≠). Model A does not encompass model B, and model B does not encompass model A. It is not possible to reduce the joint model, because both models add significantly to the explanatory power and both therefore 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) where the legal origins variables are found to be significantly related to property rights, while the effect from the religious variables are insignificant. A difference that possible could help to 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.[7]

In several of the comparisons in Table 4, the homoscedasticity and/or normality requirements are not met. The notation (R), (LM), and (R LM) therefore indicates when the robust *F*-test (R), the LM-test (LM), or the robust LM-test (R LM) has been 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 or equal to 2.5.[8] This small correction usually takes care of the problem, and for Table 4 the conclusions are still the same. For most of 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.

Concerning the comparisons between *AJR* and *LP1*, and *AJR* and *M*, they are partially already covered in Acemoglu et al. (2001) as part of their robustness check.

[7] See La Porta et al. (1999) Table 6 with property rights as the dependent variable.
[8] 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 which do not appear to be consistent with the rest of the data.

The results are still the same, although their base sample and our sample of former colonies differ slightly. Acemoglu et al. also control for religion, where we are informed that log settler mortality is still significant, but not what happens to religion. From Table 4, we can see that religious affiliation has no explanatory power whilst log settler mortality is included.

Regarding the *HJ*-model, Acemoglu et al. do include latitude as a control variable. But it is important to note that Acemoglu et al. do not include the full *HJ*-model with *English* and *European Language*, and therefore do not compare the significance of *Log Settler Mortality* compared to the full *HJ* model. Including both these models together as in Table 4 gives us a regression where both the homoscedasticity and normality requirements are not fulfilled. The robust *F*-test as well as the robust LM-test indicates that the two models are "different." The regression thus seems to be plagued by three outliers: Singapore, Hong Kong, and Malaysia. When control for these outliers, the homoscedasticity and normality requirements are fulfilled, but the effect from settler mortality is now insignificant (p-value=0.25), while the variables of the *HJ*-model are still jointly significant. Figure 1, which is the partial scatter plot for *Log Settler Mortality* while controlling for the *HJ* variables, describes this well: take away Singapore (SGP), Hong Kong (HKG), and Malaysia (MYS) and the relationship between Rule of Law and *Log Settler Mortality* is non existent. If Rule of Law is replaced by Expropriation Risk as the dependent variable, the story is the same: controlling for Singapore, Hong Kong, and Malaysia, and the variables of the *HJ*-model have a significant effect while the effect from *Log Settler Mortality* is insignificant.[9]

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 termed as "different." Legal origin does therefore not simply capture a colonial origin, even in a former colony sample. Regarding *LP2*, this model is "dominated" by either of *LP1*, *M*, or the *AJR*-model. Concerning, the difference between *HJ* and *LP2*, the joint model fails to satisfy the normality assumption, and the LM-test indicates that the models are "different." Controlling for the countries with large absolute studentized residuals (Singapore and Hong Kong) takes away the problem, and *HJ* is now found to "dominate" *LP2*. For a sample of former colonies,

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

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 LM-test determines that *HJ* "dominates" *LP1* at the 5% significance level but that they are "different" at the 10% level. Controlling for Singapore and Hong Kong satisfies the model requirements and the usual *F*-test also determines that *HJ* "dominates" *LP1* at the 5% level but that they are "different" at the 10% level.

To conclude, if we choose to have a strict selection rule at the 5% significance level, 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, there is no model which dominates all other models. This last approach is probably the most reasonable, especially since in six out of the ten comparisons in Table 4, the model requirements are not met. That the regressions models in Tables 4 and 5, as well as Tables 2 and 3 often fails 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 clearly decide on a dominating model, and that the model requirements are violated so frequently, indicates that we might benefit by forming an encompassing model which 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. For the problem at hand, trying to form a model which 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 described to consist of 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 badly when dummy variables are present in the model. The focus in this paper is therefore on classical modeling selection methods.

The probably best known modeling selection methods is backwards selection, also called general-to-specific. This method simply consists of starting with a *general* model where the variable associated with the lowest *t*-value is excluded. The regression is then estimated again, where the next variable associated with the lowest *t*-value is excluded. This repeats itself in a stepwise manner until a *specific* model is reach where all the remaining variables have statistically significant coefficients. Due to its familiarity and simplicity, the backwards selection method is one of two methods used in this paper.

Two other methods that have received a large interest in the literature is Levine and Renelt (1992) and Sala-i-Martin (1997) which search for robust correlates to income growth in a cross country setting. The critique about these two methods is that while Levine and Renelt is too strict, Sala-i-Martin is too slack. 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. The accuracy of the Hoover and Perez method is proven to be very high, or as Hoover and Perez (2004, p.778) writes: "...finds the truth nearly as well as one would if God had whispered the true specification in one's ear." Based on Hoover and Perez (1999), Hendry and Krolzig (1999, 2001) made several refinements which resulted in their general-to-specific algorithm PcGets, which probably is the most respected automated modeling selection methods on the market today. The performance of PcGets is well documented (see e.g. Hendry and Krolzig, 1999, 2001, 2005, and Owen, 2002). The details of the program will therefore not be discussed here. Both Backwards selection and PcGets are used in this paper.[10]

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. Because the *LP2*-model where found dominated by all other models in Table 5, *LP2* is not included in the general model.

[10] I would like to thank Kevin Hoover and Stephen Perez for advising me towards using PcGets.

Column 1 presents the specific equation from backwards selection where all variables are significant at the 10% level. This regression consists of one especially obvious outlier: Singapore. If we instead include a dummy equal to one for the countries with an absolute studentized residual greater than 2.5 in the general model, it gives us only one country: Singapore. Column 2 therefore presents the specific equation from backwards selection while also controlling for Singapore. Reassuringly, this is the same equation as in Column 1, although now all variables are significant at the 5% level. Finally, in Column 3 the specific equation from PcGets is presented. PcGets is here set to the default settings for a cross section which automatically controls for outliers. PcGets therefore automatically controls for Singapore and reassuringly choose the same specification as in Columns 1 and 2.

As a first observation, it is interesting to note that the selected equation consists of a little bit of all models: *Socialist legal origin* (from *LP1*), *Former Spanish colony*, and *Other colonial origin* (from *M*), *Latitude* and *European language* (from *HJ*), and *Log Settler Mortality* (from *AJR*). That the *Socialist legal origin* dummy exerts a significant effect might not come as a big surprise, and is actually a dummy for Laos and Myanmar. The importance of legal origin therefore seem miniscule, and the *Socialist legal origin* is instead probably capturing something else than the legal code.

The *Former Spanish colony* dummy exerts a negative effect on Rule of Law. The Spanish colony dummy translates into almost the same as a dummy for Latin America. The Latin America dummy is often included in cross country growth regressions, which makes one wonder if the significance of the Latin America dummy is actually a former colonies effect, or vice versa.

It is also interesting that *Other colonial origin* is selected. Usually this "other" group is not view as so important. The fact that it is selected here begs to differ. The "Other" group consists of former colonies of Portugal, Belgium, and the Netherlands. 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.[11]

The probably most interesting finding in Table 6 is that 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 simply decided

[11] 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).

that these two models are complementary to each other. The significant effect from *Log Settler Mortality* is here not sensitive to the countries Singapore, Hong Kong and Malaysia, as it is in Table 5.

There are at least two ways to interpret why both the *AJR* and *HJ*-model are selected: The skeptic interpretation would argue that *Latitude* and *Settler Mortality* captures the same mechanism. While *Latitude* is an objective measure, *Settler Mortality* is a subjectively constructed measure, where the correctness of this construction is heavily questioned by Albouy (2006). *Settler Mortality* should therefore preferable be dropped from the regression. A more constructive interpretation would instead accept both measures, and instead realize that these two models are complementary to each other. While *Settler Mortality* captures the extent of Western European influence in colonial days, *Latitude* and *European language* captures the degree of Western Europe influence in colonial *and* post-colonial days. With this interpretation, it seems natural that the *AJR* and *HJ*-model are entered alongside each other.

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) has been especially influential. Unfortunately these explanations are without much consensus. The purpose of this paper is therefore to discriminate between these models and if possible propose a new encompassing model in order to identify the channels by which high quality institutions are created. There are five 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, as explaining most of the variation in Rule of Law.

(2) In samples representing the whole world, encompassing tests indicates that there is no model which dominates and thereby solely captures the information of all other models.

(3) In a sample of former colonies, there are some evidence that the Hall and Jones model dominates all other models. Interestingly, the Hall and Jones model is found to capture the information of the Acemoglu et al. model with settler mortality while controlling for the three outlier countries Singapore, Hong Kong, and Malaysia.

(4) Although there is no model which clearly dominates all other models, the encompassing tests points to interesting interrelationships. Legal origin and colonial origin does not seem to capture the same information, even in a sample of former colonies. Religious affiliation on the other hand, does not have any explanatory power in a sample of former colonies whilst controlling for legal origin, colonial origin, Western European influence, or settler mortality.

(5) The encompassing model specifies that settler mortality should be entered alongside latitude and European language spoken. This can be motivated as while settler mortality captures the extent of Western European influence in colonial days, Latitude and European language captures the degree of Western Europe influence in colonial and post-colonial days. Naturally, these two models can therefore be interpreted as complementary to each other.

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>

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

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.

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.

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. (1999) "Data mining reconsidered: encompassing and the general-to-specific approach to specification search" *Econometrics Journal,* Vol. 2: 167-191.

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.

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

Wooldridge, Jeffrey M. (2002). *Econometric Analysis of Cross Section and Panel Data*. Cambridge: The MIT Press.

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

Notes: Pearson correlation coefficients. Rule of Law for the year 1998 from Kaufmann et al. (2005). Property Rights 1997 from La Porta et al. (1999), Social Infrastructure 1986-1995 from Hall and Jones (1999), and Expropriation Risk 1982-1997. 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, is between 0 and 100, where a high number means high degree of Rule of Law. For LP1 the omitted dummy 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, is between 0 and 100, where a high number means high degree of Rule of Law. For LP1 the omitted dummy 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 (LM)	-		
M	M ≠ LP1 n=129 (R)	M ≠ LP2 n=129	-	
HJ	HJ ≠ LP1 n=138 (LM)	HJ ≠ LP2 n=138 (LM)	HJ ≠ M n=127 (LM)	-
AJR	AJR ≠ LP1 n=78	AJR *d* LP2 n=78	AJR ≠ M n=78 (R)	AJR ≠ HJ n=77 (R LM)

Notes: Test of encompassing (F-test, α=0.05).
$M_A \varepsilon M_B$ and $M_B \varepsilon^c M_A$ is denoted M_A *d* M_B, (M_A dominates M_B).
$M_A \varepsilon M_B$ and $M_B \varepsilon M_A$ is denoted $M_A \approx M_B$, (M_A is approx. equivalent to M_B).
$M_A \varepsilon^c M_B$ and $M_B \varepsilon^c M_A$ is denoted $M_A \neq M_B$, (M_A is different to M_B).
Tests of model adequacy: Whites test for heteroscedasticity, Shapiro-Wilks test for normality (α=0.05). "R" indicates that the requirement of homoscedasticity is not met and the Robust F-test is used instead. "LM", indicate the normality requirement is not met and the Lagrange Multiplier test is used. "R LM" indicates that neither the requirement of homoscedasticity nor normality is fulfilled and the robust LM test is used. 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 *d* LP1 (R LM)	HJ ≠ LP2 (LM)	HJ *d* M (R LM)	-
AJR	AJR ≠ LP1	AJR *d* LP2	AJR ≠ M (R)	AJR ≠ HJ (R LM)

Notes: Test of encompassing (F-test, α=0.05).
$M_A \varepsilon M_B$ and $M_B \varepsilon^c M_A$ is denoted M_A *d* M_B, (M_A dominates M_B).
$M_A \varepsilon M_B$ and $M_B \varepsilon M_A$ is denoted $M_A \approx M_B$, (M_A is approx. equivalent to M_B).
$M_A \varepsilon^c M_B$ and $M_B \varepsilon^c M_A$ is denoted $M_A \neq M_B$, (M_A is different to M_B).
Tests of model adequacy: Whites test for heteroscedasticity, Shapiro Wilks test for normality (α=0.05). "R" indicates that the requirement of homoscedasticity is not met and the Robust F-test is used instead. "LM", indicate the normality requirement is not met and the Lagrange Multiplier test is used. "R LM" indicates that neither the requirements of homoscedasticity nor normality are fulfilled and the robust LM test is used. See text for further information.

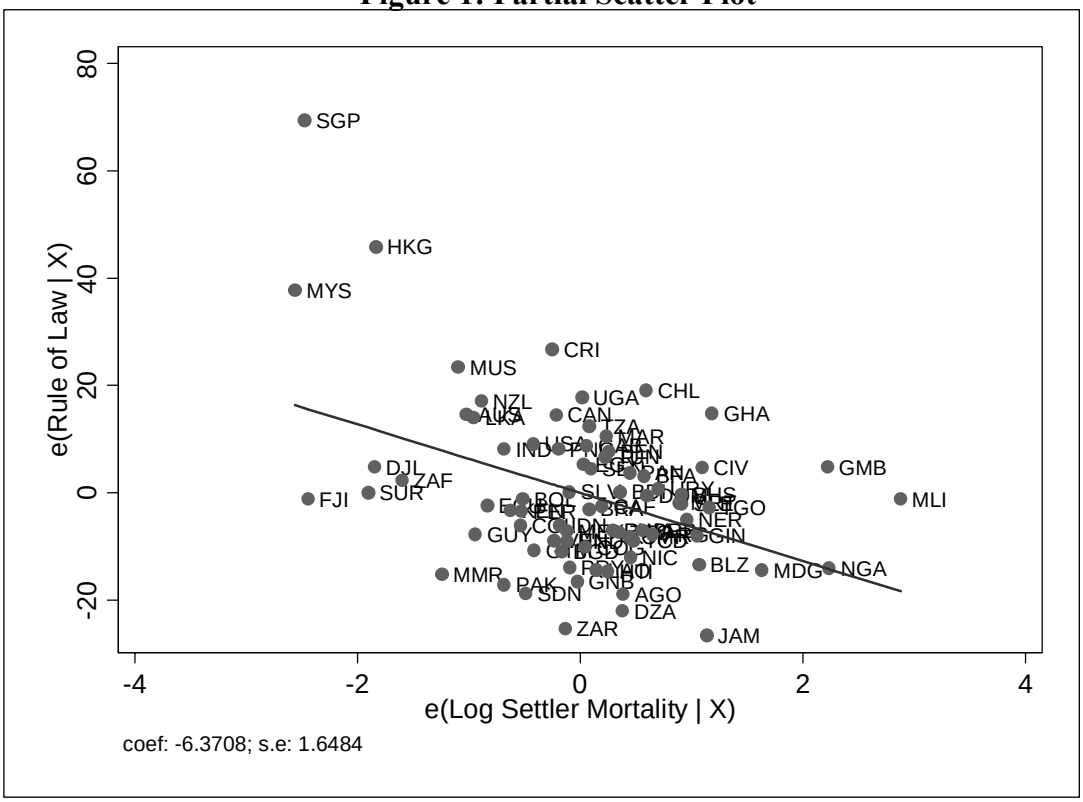
Table 6: Modeling Selection

Dependent variable: Rule of Law

Independent Variables	(1) BWS	(2) BWS (w/ outlier)	(3) PcGets	(4) Models
Socialist legal origin	-23.14**	-21.06**	-21.06**	LP1
	(9.63)	(8.68)	(8.68)	
Former Spanish colony	-16.22***	-15.41***	-15.41***	M
	(4.50)	(4.06)	(4.06)	
Other colonial origin	-16.87***	-14.72***	-14.72***	M
	(5.18)	(4.69)	(4.69)	
Latitude	25.42*	41.10***	41.10***	HJ
	(14.90)	(13.93)	(13.93)	
European language fraction	18.84***	20.29***	20.29***	HJ
	(4.79)	(4.33)	(4.33)	
Log Settler Mortality	-7.20***	-5.40***	-5.40***	AJR
	(1.50)	(1.41)	(1.41)	
Singapore (dummy)		53.27***	53.27***	outlier
		(12.78)	(12.78)	
Constant	69.77***	57.04***	57.04***	All
	(8.96)	(8.63)	(8.63)	
Observations	77	77	77	
Adj. R^2	0.588	0.666	0.666	

Notes: Standard errors in ( ). * significant at 10%; ** significant at 5%; *** significant at 1%.
Column (1): BWS = Backwards selection (alfa=0.10). Column (2): BWS = Backwards selection with outlier correction (alfa=0.05). A dummy is included if the studentized residual from the GUM is greater or equal to 2.5. Column (3): PcGets using default for cross section. The GUM includes: Ethnic, Socialist legal origin, French legal origin, 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

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 that 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 do not speak 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 average from 1982 to 1997, on a scale from 0 to 10 where higher values equals a lower probability of expropriation. Source: Glaeser et al. (2004) (originally from International Country Risk Guide, i.e. same source as Expropriation Risk used in Acemoglu et al. 2001).

Former Colony: Dummy variables identifying 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 Sala-i-Martin (1997) (originally from Barro, 1996) data retrieved from Hoover and Perez (2004). The data has been adjusted as follows: (1) Use the data from Sala-i-Martin (1997) on former British, Spanish, and French colony. (2) For countries that are a former colony according to the Log Settler Mortality data, but miss information on the identity of the former ruler, the data has been imputed. Four cases: Belize (British), Djibouti, Laos, Vietnam (all French). Listing was based on CIA World Factbook. (3) For countries that are former colonies according to Log Settler Mortality but where not listed as British, Spanish, or a French former colony, a dummy variable called "Other colonial origin" was created (Angola, Brazil, Burundi, DR Congo, Guinea-Bissau, Indonesia, Rwanda, 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 listed as a former colony according to the Quality of Government dataset, but not listed as British, Spanish or French, further adjustments was made (only five cases): Cape Verde, Mozambique, Philippines (all listed as Other colonial origin), Yemen (listed as British, as suggested by Price, 2003), and Oman was dropped from the sample since it is arguably not a former colony (as suggest by Price, 2003). This last correction (#4) is in effect 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 dived by 90. Source: Hall and Jones (1999).

Legal origin: Identifies the legal origin of the Company Law or Commercial Code for each country. There are five possible origins: English Common Law, French Commercial Code, Socialist/Communist laws, Scandinavian Commercial Code, and German Commercial Code. Divided into five dummy variables, for English legal origin =1 if English legal origin, otherwise 0. Source: La Porta et al. (1999).

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.

Property rights index: A rating of property rights in each country in 1997 (on a scale from 1 to 5). 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 1980. The numbers are in decimals. The three religions identified here are: Roman Catholicism, Protestantism, Islam, and with the residual called "Other religions" (=100-Catholic-Protestant-Muslim). Source: La Porta et al. (1999).

Rule of Law: Rule of Lawfor the year 1998. Scaled to be a number between 0 and 100 my 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 scale from 0 to 1). The higher the score, the more Social Infrastructure. Source: Hall and Jones (1999).

Descriptive statistics (former colonies)

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

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	COG	RWANDA	RWA
Congo, Dem. Rep. (Zaire)	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.