BOFIT Discussion Papers
12 • 2017

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BOFIT Discussion Papers
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BOFIT Discussion Papers 12/2017
21.8.2017

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ISBN 978-952-323-182-5, online
ISSN 1456-5889, online

This paper can be downloaded without charge from http://www.bofit.fi/en.

Suomen Pankki
Helsinki 2017

Financial Development, Rule of Law and Wealth Inequality: Bayesian Model Averaging Evidence*

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August 17, 2017

Abstract

We examine the determinants of financial development using our global sample and employing a rich set of measures of financial development that assess the degree of depth, access, stability and efficiency of financial intermediaries. We use Bayesian model averaging to test competing theories within this unifying framework. Examining nearly 40 potential determinants of financial development, we find that the rule of law and the level of economic development are the most important. Wealth inequality is irrelevant for banking sector development but positively associated with stock market development. Finally, our results suggest that financial market regulations matter for stock market efficiency and financial stability.

Keywords: Financial development, Bayesian model averaging, rule of law, wealth inequality

JEL Codes: G10, G20

*We thank Matthieu Bussiere, Jakob de Haan, Milka Dimitrova, Zuzana Fungacova, Martin Gregor, Christa Hainz, Iftekhar Hasan, Jan Mares, Gian Maria Milesi-Ferretti, Daniele Siena, Laura Solanko, Ulrich Volz, Laurent Weill, Kamil Yilmaz and workshop participants at 21st ICMAIF annual conference (Rethymno, Greece), Bank of Finland workshop on Banks and Institutions (Helsinki, Finland), European Public Choice Society annual conference (Budapest, Hungary), Financial Globalization and its Spillovers (Cologne, Germany) and World Finance conference (Cagliari, Italy) for helpful comments. Horvath acknowledges the hospitality of the University of Economics in Bratislava, where he stayed as a visiting professor in Fall 2016 thanks to the support of the VUB Foundation. Horvath acknowledges support from the Czech Science Foundation No. P402/12/G097.

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1 Introduction

The level of financial development varies significantly across countries. For example, the stock market capitalization in the US is approximately 3 times greater than that in Germany and 50 times greater than that in Venezuela. What is the source of this vast heterogeneity in financial development? A number of competing theories have been advanced as explanations. Rajan and Zingales (2003a) show that countries that allow cross-border trade and capital flows are less likely to suffer from financial underdevelopment. They also note that the decision to open the economy to international trade and capital flows is, to some extent, political. Guiso et al. (2004) find that social capital, of which generalized trust is one of the most important features, affects financial development. They also show that the effects of social capital on financial development depend on the rule of law and degree of education. La Porta et al. (1998) identify legal protection of creditors and shareholders as important prerequisites of financial development.

Overall, these authoritative papers show that macroeconomic, institutional, regulatory, political and social factors can all contribute to financial development. However, which factors matter the most? Moreover, are there any factors that are theoretically important but less empirically relevant? Obviously, it is prohibitively difficult to provide a definite answer to the question of what determines financial development, but we shed light on this issue empirically by examining a rich dataset of 80 countries with 7 different measures of financial development and nearly 40 different explanatory variables.

Our contribution to the literature on financial development is threefold. First, this paper takes these competing theories of financial development and tests them within a unifying econometric framework – Bayesian model averaging (BMA). The advantage of this model averaging procedure is that it jointly tests the relevance and importance of various theories and addresses omitted variable bias in a more systematic manner than do model selection approaches.[1] Therefore, we contribute to some previous empirical literature, which focuses on selected driving factors of financial development, for example, Baltagi et al. (2009a) on the effect of trade and financial openness, Huang (2010) on the role of political institutions and Chinn and Ito (2006) on the importance of interactions between capital controls and institutional quality for financial development.

Second, the existing literature on financial development (and the finance-growth nexus) typically focuses only on a particular aspect of financial development – financial depth – and proxies for the state of financial development using measures such as the credit-to-GDP ratio or stock market capitalization over GDP. The recently developed World Bank Global Financial Development Database more fully appreciates the multidimensionality of financial systems and provides rich cross-country data not only on the depth of but also access to finance, the stability of financial markets or the efficiency of financial intermediaries.[2]

[1] Some prominent recent applications of BMA include Fernandez et al. (2001); Sala-I-Martin et al. (2004); Durlauf et al. (2008); Ciccone and Jarocinski (2010); Eicher et al. (2011), who all study long-term economic growth.

[2] As we show later, the correlations among various measures of financial development are often far from one. Therefore, we do not generate a single index of overall level of financial development because different measures of

Third, we examine whether income inequality and wealth inequality matter for the state of financial development. Although income inequality has come to the forefront of public discussions on the causes of the global financial crisis, the implications of these inequalities have rarely been examined empirically, and the literature does not reach unequivocal conclusions. While Kumhof et al. (2015) find that rising income inequality causes credit booms and subsequent financial crises, Bordo and Meissner (2012) fail to observe such a relationship. However, these two studies examine the effect of income inequality on financial crises and not on the level of financial development. Importantly, Degryse et al. (2017) provide evidence showing that the limitation of voting rights to a wealthy elite has been conducive to stock market development over the last two centuries. After voting rights were granted to a larger share of the population, political support shifted more toward banking sector development. To the best of our knowledge, there is no empirical study that explicitly examines the effects of wealth (or income) inequality on financial development.

Our results suggest that the rule of law and the level of economic development are the primary factors explaining the level of financial development across countries. We find that wealth inequality is positively associated with stock market development but not associated with banking sector development. Bank regulations matter for long-term financial development in a complex manner suggesting the trade-off between financial stability and efficiency of financial intermediaries.

The paper is organized as follows. Section 2 discusses the related literature on financial development. Section 3 introduces the BMA model. Section 4 presents the data. We provide the results in section 5 and conclude in section 6. Robustness checks are available in the Appendix.

2 Related Literature

We selectively discuss the literature examining the determinants of financial development in this section. The literature largely focuses on the role of trade and financial openness and the quality of the institutional framework.

Rajan and Zingales (2003a) propose the interest group theory of financial development. This theory states that interest groups such as financial and industrial incumbents oppose the financial development because financial development provides opportunities to new firms and enhances competition and access to cheap finance for incumbents. The interest group theory helps to explain why financial development in some countries was lower in the second half of the 20th century vis-a-vis prior to World War I. Incumbents' opposition to financial development is weaker when the economy has opened not only to trade flows but also to capital flows.

Using several measures of financial development (bank deposits to GDP, domestic credit to GDP, stock market capitalization, and the number of companies listed and publicly traded over the population), they argue that the demand for financial services (which is stronger in more developed countries) is an important component of financial development but cannot fully

financial development convey different information. In addition, we also show that different explanatory variables are important for the different measures of financial development, to a certain extent.

explain financial development. Similarly, posing the legal origin or social capital approach as the determinant of financial development provides an incomplete story of financial development. In addition, Rajan and Zingales (2003a) argue that trade openness without financial openness is insufficient to spur financial development.

Chinn and Ito (2006) investigate the effect of financial openness on financial development and examine whether this effect differs according to the quality of institutions (such as the general development of the legal system, corruption, law and order, and the quality of the bureaucratic system), namely whether there are threshold effects in financial development. In addition, they examine the role of sequencing, i.e., whether trade openness is a necessary requirement for financial openness (as assessed by the Chinn-Ito capital openness index) and whether bank development is a prerequisite for stock market development. They test these hypotheses for 108 countries over the period 1980 – 2000 using stock market activity as the measure of financial development and find support for threshold and sequencing effects. Notably, the general level, rather than the finance-specific level, of legal development matters more for financial development. Ito (2006) examines Asian countries in detail and finds evidence for threshold and sequencing effects in financial development.

Baltagi et al. (2009a) examine the determinants of financial development with a focus on role of financial and trade openness and on their complementarity as precondition for financial development using dynamic panel data techniques. They find that both types of openness matter for financial development, especially among less developed and relatively closed economies. In terms of sequencing, countries can be more financially developed even without simultaneous openness in trade and finance, and openness at least to trade or to finance is already conducive to financial development.

Beck et al. (2003) extend the work by Acemoglu et al. (2001) on the interaction of colonial origin, type of institutions and economic growth and examine the determinants of financial development. Beck et al. (2003) show that the presence of an inhospitable environment often leads to the creation of institutions that do not support private property rights and, thus, do not favor financial development. In this context, geographical characteristics might work against or in favor of economic development, mainly through the demand side of financial intermediation, as Huang (2011) notes.

Rajan and Zingales (2003a) emphasize that the decision to open the economy to international trade and finance is driven not only by economic but also by political factors. Huang (2010) focuses on the role of political institutions in financial development. The results suggest that lower income countries benefit from political stability and that democracy is typically positively related to financial development.

La Porta et al. (1997) and La Porta et al. (1998) provide evidence showing that legal origin, rule of law, the quality of law enforcement and the protection of investors' property rights explain financial development across countries. In general, capital markets evolve faster in countries built around a common rather than a civil law system. Culture, religion and linguistic affinity might help to predict similarities in the protection and enforcement of property rights,

thereby indirectly affecting the process of financial development (Stulz and Williamson, 2003). In addition, the cultural, linguistic and religious variables may also be helpful to capture some of the unobserved heterogeneity among the countries.

Overall, the empirical literature on the determinants of financial development suggests that various factors, including institutional quality, political stability, trade openness and financial openness, matter for financial development. We build upon this important work but consider a wider set of possible determinants, including geographical variables and measures of wealth and income inequality.

3 Bayesian Model Averaging

We describe BMA in this section.[3]. The application of BMA is particularly fruitful when there is uncertainty regarding the specification of the regression model, for example when competing theories all suggest different regression models, which is the case for the financial development literature. Researchers typically specify some general regression model and sequentially eliminate the least significant explanatory variables to obtain the "best" model. This process of model selection, however, poses the risk that some relevant explanatory variables are eliminated, and there is no guarantee that researcher will ultimately obtain the "best" model. Koop (2003) shows that the risk of arriving at a model other than the "best" model increases with the number of sequences of eliminating the least significant variables. In contrast, BMA does not select the "best" model but, as its name suggests, averages all possible regression models and assigns greater weight to "better" models. Therefore, BMA addresses the regression model uncertainty inherent to many economic theories. In addition, the BMA methodology is largely robust to outliers, as the individual regression models with outliers receive lower weight because of their lower fit.

To illustrate the BMA, consider the following linear model:

$$y = \alpha + X\beta + \varepsilon \qquad \varepsilon \sim \ N(0, \sigma^2 I) \tag{1}$$

where y is a dependent variable, α is a constant, X is the matrix of explanatory variables, β represents the corresponding coefficients, and ε is a vector of normally distributed IID error terms with variance σ^2.

BMA considers all possible combinations of X from equation 1 and takes a weighted average of the coefficients (as such a combination is typically an extremely large number and that even with modern computers, it is impossible to estimate all of these regression models, researchers consider only a subset of models; see the remarks on the MCMC sampler below). The substructure of the model can be depicted as follows:

$$y = \alpha_i + X_i\beta_i + \varepsilon \qquad \varepsilon \sim \ N(0, \sigma^2 I) \tag{2}$$

[3]The description draws heavily on Feldkircher and Zeugner (2009) and Hasan et al. (2017), who examine the determinants of long-term economic growth including several indicators of financial development

Here, X_i is a subset of X, and α_i and β_i are the corresponding coefficients. Assuming that the total number of possible explanatory variables is K, the total number of models is equal to 2^K and $i \in [1, 2^K]$.

It follows from Bayes' rule that

$$p(\beta|y, X) = \frac{p(y, X|\beta)p(\beta)}{p(y, X)} \tag{3}$$

where $p(\beta|y, X)$ is the posterior density, $p(y, X|\beta)$ is the marginal likelihood (ML), also known as the data-generating process, $p(\beta)$ is the prior density, and $p(y, X)$ is the probability of the data. In BMA, we essentially compare numerous different models $M_1, ..., M_i$. Assuming K possible regressors as discussed above, we have $M_1, ..., M_i$, where $i \in [1, 2^K]$. Given Bayesian logic, whereby we formally define the model using a likelihood function and a prior density, M_i depends on the parameters β_i, and their posterior probability can be derived as follows:

$$p(\beta_i|M_i, y, X) = \frac{p(y|\beta_i, M_i, X)p(\beta_i|M_i)}{p(y|M_i, X)} \tag{4}$$

The following subsections describe the averaging principle of BMA and the individual components of equation 3.

Posterior Model Probability

The posterior model probability (PMP) is fundamental to the BMA framework, as it provides the weights for averaging model coefficients across submodels. PMP also arises from Bayes' theorem:

$$p(M_i|y, X) = \frac{p(y|M_i, X)p(M_i)}{p(y|X)} \tag{5}$$

where $p(y|M_i, X)$ is the marginal likelihood (ML) of the model (i.e., the probability of the data given the model M_i), $p(M_i)$ is the prior model probability, and $p(y|X)$ is the integrated likelihood. The term in the denominator is typically disregarded, as it is constant across all models under consideration. The PMP is then directly proportional to the ML and prior probability. A popular practice is to set the prior probability $p(M_i \propto 1)$ to reflect the lack of knowledge regarding the true model.

$$p(M_i|y, X) \propto p(y|M_i, X)p(M_i) \tag{6}$$

We discuss the calculation of the ML in detail later in this section. The model prior needs to be elicited by the researcher and reflects the initial beliefs before inspecting the data.

Posterior Mean

Point estimates of the model parameters are often the focus of research, and it is possible to derive them within the Bayesian framework. Zeugner (2011) and Moral-Benito (2012) assert

that the weighted posterior distribution of any statistic (most notably the β coefficients) is obtained using the following:

$$p(\beta|y,X) = \sum_{i=1}^{2^K} p(\beta_i|M_i,y,X)p(M_i|y,X) \tag{7}$$

where $p(M_i|y,X)$ is the PMP of the corresponding model M_i from equation 5. The point estimates can be acquired by taking expectations across the following equation:

$$E(\beta|y,X) = \sum_{i=1}^{2^K} E(\beta_i|M_i,y,X)p(M_i|y,X) \tag{8}$$

Here, $E(\beta|y,X)$ is the averaged coefficient, and $E(\beta|M_i,y,X)$ is the estimate of the β_i coefficients from model M_i. The posterior distribution of the coefficients is dependent on the choice of the prior g. Zeugner (2011) expresses the expected value of the parameter in M_i as follows:

$$E(\beta_i|y,X,g,M_i) = \frac{g}{1+g}\hat{\beta}_i \tag{9}$$

with $\hat{\beta}_i$ representing the standard OLS estimate.

Posterior Variance

Moral-Benito (2012) presents a formula for variance corresponding to the expected values of coefficients derived in the previous section:

$$\begin{aligned} Var(\beta|y,X) = &\sum_{i=1}^{2^K} p(M_i|y,X)Var(\beta_i|M_i,y,X) \\ &+ \sum_{i=1}^{2^K} p(M_i|y,X)(E(\beta_i|M_i,y,X) - E(\beta|y,X))^2 \end{aligned} \tag{10}$$

The variance consists of the weighted average of variance estimates across different regression models $Var(\beta_i|M_i,y,X)$ and the weighted variance across different models captured in the second component $E(\beta_i|M_i,y,X) - E(\beta|y,X))^2$. $E(\beta|y,X)$ is the posterior mean from equation 8. As a consequence, this may result in uncertainty regarding the parameter estimates due to the substantial differences across models even if the estimates of individual models are highly precise. Zeugner (2011) shows how the value of the prior g affects the posterior variance of the parameters:

$$Cov(\beta_i|y,X,g,M_i) = \frac{(y-\bar{y})'(y-\bar{y})}{N-3}\frac{g}{1+g}\left(1 - \frac{g}{1+g}R_i^2\right)(X_i'X_i)^{-1} \tag{11}$$

where $\bar{y}$ is the mean of vector y, N is the sample size, and R_i^2 is the R-squared of model i.

Marginal Likelihood

The ML can be calculated using equation 4 for each M_i. We need to integrate both sides of the equation with respect to β_i, employ $\int_\beta p(\beta_i|M_i, y, X)\, d\beta_i = 1$, and rearrange to arrive at

$$p(y|M_i, X) = \int_\beta p(y|\beta_i, M_i, X)p(\beta_i|M_i, X)\, d\beta_i \tag{12}$$

The above equation illustrates the general textbook derivation, but the computation depends on the elicited priors. Zeugner (2011) employs "Zellner's g prior" structure, which we utilize in this paper. The ML for a single model can then be expressed using the prior as in Feldkircher and Zeugner (2009):

$$p(y|M_i, X, g) = \int_0^\infty \int_\beta p(y|\beta_i, \sigma^2, M_i)p(\beta_i, \sigma^2|g)\, d\beta d\sigma \tag{13}$$

Furthermore, Feldkircher and Zeugner (2009) show that the ML is in this case simply proportional to

$$p(y|M_i, X, g) \propto (y - \bar{y})'(y - \bar{y})^{-\frac{N-1}{2}}(1 + g)^{-\frac{k_i}{2}} \left(1 - \frac{g}{1 + g}R_i^2\right)^{-\frac{N-1}{2}} \tag{14}$$

In this equation, R_i^2 is the R-squared of model M_i, and k_i is the number of explanatory variables in model i introduced to include a size penalty for the model. N and $\bar{y}$ are the same as in equation 11, the number of observations and the mean of vector y, respectively.

Posterior Inclusion Probability

The standard BMA framework reports the posterior inclusion probability (PIP), which reflects the probability that a particular regressor is included in the "true" model. PIP is the sum of the PMPs of the models including the variable k in question:

$$PIP = p(\beta_k \neq 0|y, X) = \sum_{i=1}^{2^K} p(M_i|\beta_k \neq 0, y, X) \tag{15}$$

Priors

The BMA methodology requires determining two types of priors: g on the parameter space and $p(M_i)$ on the model space. The priors are crucial in determining the posterior probabilities (Ciccone and Jarocinski, 2010; Feldkircher and Zeugner, 2009; Liang et al., 2008). In the following subsections, we present the prior framework and support our choices.

Parameter Priors

As noted previously, we use Zellner's g prior structure, which is a common approach in the literature. It assumes that the priors on the constant and error variance from equation 2 are evenly distributed, $p(\alpha_i) \propto 1$ and $p(\sigma) \propto \sigma^{-1}$. Zeugner (2011) notes that this is very similar to

the normal-gamma-conjugate model accounting for proper model priors on α and σ described in Koop (2003), for example, with practically identical posterior statistics.

We assume that the β_i coefficients follow the normal distribution, and we have to formulate beliefs regarding their mean and variance before examining the data. Conventionally, researchers assume a conservative mean of 0 to reflect the lack of prior knowledge regarding the coefficients. Zellner's g defines their variance structure $\sigma^2(g(X_i'X_i)^{-1})$. Combining these assumptions, we have the coefficient distribution dependent on prior g:

$$\beta_i|g \sim \ N(0, \sigma^2(g(X_i'X_i)^{-1}) \tag{16}$$

The prior variance of the coefficients is proportional to the posterior variance $(X_i'X_i)^{-1}$ estimated from the sample. Parameter g denotes how much weight we attribute to the prior variance as opposed to the variance observed in the data (Feldkircher and Zeugner, 2009). Selecting a small g results in low variance in the prior coefficients and thus reduces the coefficients to zero. Conversely, a large g attributes higher importance to the data and expresses researchers' uncertainty regarding zero β_i coefficients (Zeugner, 2011). Note that with $g \to \infty$, $\beta_i \to \beta_i^{OLS}$. Popular choices include the following:

- UIP; $g = N$.
- BRIC; $g = max\{N, K^2\}$.
- hyper-g; $\frac{g}{1+g} \sim Beta(1, \frac{a}{2} - 1)$, where $a \in (2, 4]$, which is a Beta distribution with mean $\frac{2}{a}$.

While the first two (Unit Information Prior - UIP, Benchmark Risk Inflation Criterion - BRIC) are known as "fixed-g" priors for the parameter prior set for all the models under consideration, hyper-g allows the researcher to update the prior for individual models in a Bayesian fashion and therefore limits the unintended consequences of prior selection based on posterior results. Note that setting $a = 4$ corresponds to the UIP, whereas $a = 2$ concentrates the prior mass close to unity, corresponding to $g \to \infty$. For details on the hyper-g prior, see Liang et al. (2008).

We employ the hyper-g prior to estimate the baseline models following Feldkircher and Zeugner (2009), who suggest that using model-specific priors leads to a more stable posterior structure. We check the robustness of the results by applying the UIP parameter prior.

Model Priors

Moral-Benito (2012) notes that the most popular setting in the BMA literature is the binomial distribution, where each of the regressors is included in the model with a probability of success θ. The prior probability of model M_i with k_i regressors given θ is then

$$p(M_i) = \theta^{k_i}(1-\theta)^{K-k_i} \tag{17}$$

A standard setting is $\theta = \frac{1}{2}$, which assigns equal probability $p(M_i) = 2^{-K}$ to all the models under consideration. This model prior is also known as the uniform model prior. Assuming

different values of θ can shift the prior model distribution to either smaller or larger sizes (see Zeugner (2011)).

We focus on models using the uniform model prior, which is typically employed in BMA applications (Fernandez et al., 2001). However, the uniform model prior tends to assign greater weight to intermediate model sizes. Several other model priors may be found in the literature, and we also use them to conduct sensitivity checks of our results. In particular, we employ the collinearity-adjusted dilution model prior described by George (2010). While the uniform and beta-binomial model priors assume that the probability of inclusion of one regressor is independent of the inclusion of another regressor, some regressors are usually correlated. A simple way of addressing the dilution property is to account for such collinearity and adjust the model probabilities by weighting them with the determinant of the correlation matrix, $|R_i| = |X_i X_i'|$. In practice, the collinearity-adjusted dilution model prior takes the following form:

$$p(M_i) = |R_i|\theta^{k_i}(1-\theta)^{K-k_i} \tag{18}$$

where R_i is the correlation matrix of model i under consideration. If the variables in the examined model are orthogonal, the determinant $|R_i|$ goes to 1. However, if the variables are highly collinear, it goes to 0 and consequently down-weights the models with redundant regressors.[4]

MCMC Sampler

One of the limitations of BMA is its computational difficulty when the number of potential explanatory variables K is very large. Historically, this was the primary factor preventing researchers from employing Bayesian methods. Zeugner (2011) notes that for small models, it is possible to enumerate all variable combinations. When $K > 25$, it becomes impossible to evaluate the entire model space within a reasonable time frame. In such cases, BMA utilizes MC^3 samplers to approximate the crucial part of the posterior model distribution containing the most likely models. BMA applies the Metropolis-Hastings algorithm, which is outlined in Zeugner (2011), in following way:

At any step i, the sampler is currently at model M_i, having PMP $p(M_i|y, X)$. In the next step $i+1$, model M_j is proposed to replace M_i. The sampler accepts the new model M_j with the following probability:

$$p_{i,j} = min\left(1, \frac{p(M_j|y,X)}{p(M_i|y,X)}\right) \tag{19}$$

If model M_j is rejected, the next model M_k is suggested and compared with M_i. As the number of iterations increases, the number of times that each model is retained converges to

[4]We also run an estimation using the tesselation-defined dilution prior, which assigns uniform probabilities to the neighborhoods of models. This construction of the model prior better reflects the idea of dilution, as it dilutes the probability across all, not only some, neighborhood models. For a detailed discussion, we refer to George (2010). The resulting PIPs are in general slightly lower compared to the baseline, but the conclusions regarding our financial indicators remain unchanged. The results are available upon request.

the distribution of posterior model probabilities. Typically, one of the following MC^3 samplers is used to draw the models:

- Birth-death sampler - it randomly chooses one of the explanatory variables, which is included if it is not already part of the current model M_i or dropped if it is already in M_i.
- Reversible-jump sampler - with 50% probability, the Birth-death sampler is used to determine the next candidate model. With 50% probability, the sampler randomly swaps one of the regressors in M_i for a regressor previously excluded from M_i.

Because the sampler can begin with a "poor" model with low PMP, a predefined number of initial draws, the so-called burn-ins, are usually eliminated. The quality of the approximation can be evaluated on the basis of the correlation between the PMP derived from an analytical approach and the PMPs obtained from the MC^3 sampler. It depends on the number of iterations (draws) and the likelihood of the initially selected model. Zeugner (2011) notes that a PMP correlation of approximately 0.9 indicates a "good degree of convergence". In the event that the correlation is lower, the number of sampler iterations should be increased.

4 Data

Our dataset consists of 7 measures of financial development and 36 explanatory variables that capture various economic, financial, institutional, political, regulatory, demographic, social, cultural or geographical factors for 80 countries. Therefore, this dataset is much richer than the datasets of any previously conducted empirical study on financial development. We discuss the measures of financial development below and present the detailed data definitions, including the explanatory variables and the list of countries, in the Appendix. In line with the finance and growth literature (see the survey by Valickova et al. (2015)), the measures of financial development are constructed as five-year averages over the period 2009–2013 to reduce the effects of possible one-off shocks to the data (even though several financial development indicators are persistent). The explanatory variables are based on data prior to 2009 (or are time-invariant such as geographical dummy variables). Therefore, we can say that we examine how past explanatory variables affect the current level of financial development. This approach of addressing the endogeneity concerns is applied, among others, by Christofides et al. (2016) to study the early warning signals of financial crisis as well as by Feldkircher et al. (2014), who examines whether the pre-crisis level of economic and financial variables help explain the exchange rate pressures during the crisis, or by Hasan et al. (2017), who examine the effect of finance on growth.

The choice of explanatory variables follows previous research on the cross-country determinants of long-term economic growth using BMA, such as Fernandez et al. (2001) or Hasan et al. (2017). Nevertheless, we update this dataset both in terms of time and country coverage[5]

[5]We update all explanatory variables using more recent data; see the Appendix for details. Our ambition was to have a rich cross-country database that included all major determinants of financial development. Although we have nearly 40 determinants of financial development, we see the scope for future research, for example, research focusing only on developed countries, which have more comprehensive indicators of financial stability and financial regulations.

and include additional variables that are specifically relevant to financial development. These additional variables are, to a certain extent, inspired by previous empirical evidence on the determinants of financial development (Baltagi et al. (2009a); Chinn and Ito (2006); Rajan and Zingales (2003a)). We also include measures assessing the extent of capital controls or bank regulations from Barth et al. (2013). In addition, we include the estimates of income inequality from the SWIID database and of wealth inequality from the Credit Suisse Wealth Report.[6] To our knowledge, this is novel to the literature on financial development.

We select 7 measures of financial development from the World Bank Global Financial Development Database (see Cihak et al. (2013) for a description of this database). We follow Cihak et al. (2013) in acknowledging the multidimensionality of financial systems and choose measures assessing the depth, access, stability and efficiency of financial intermediaries – for both banks and stock markets. We choose these 7 measures to have some representative indicators of financial development, which have sufficient country coverage. Specifically, we use the following measures of financial development and classify them into measures of depth, stability, efficiency and access in line with Cihak et al. (2013):

– Private sector credit to GDP: domestic private credit to the real sector to GDP, a measure of the depth of the banking sector.

– Stock market capitalization to GDP: value of listed shares to GDP, a measure of the depth of stock markets.

– Stock Market Total Value Traded to GDP: total number of shares traded multiplied by their respective matching prices, a measure of the depth of stock markets.

– Net interest margin: accounting value of banks' net interest revenue as a share of average interest-bearing assets, a measure of the efficiency of the banking sector.

– Stock market turnover ratio: stock market value traded to total market capitalization, a measure of the efficiency of stock markets.

– Bank Z-score: return on banks' assets plus the ratio of banks' equity to assets, divided by the standard deviation of the return on assets, a measure of the stability of the banking sector.

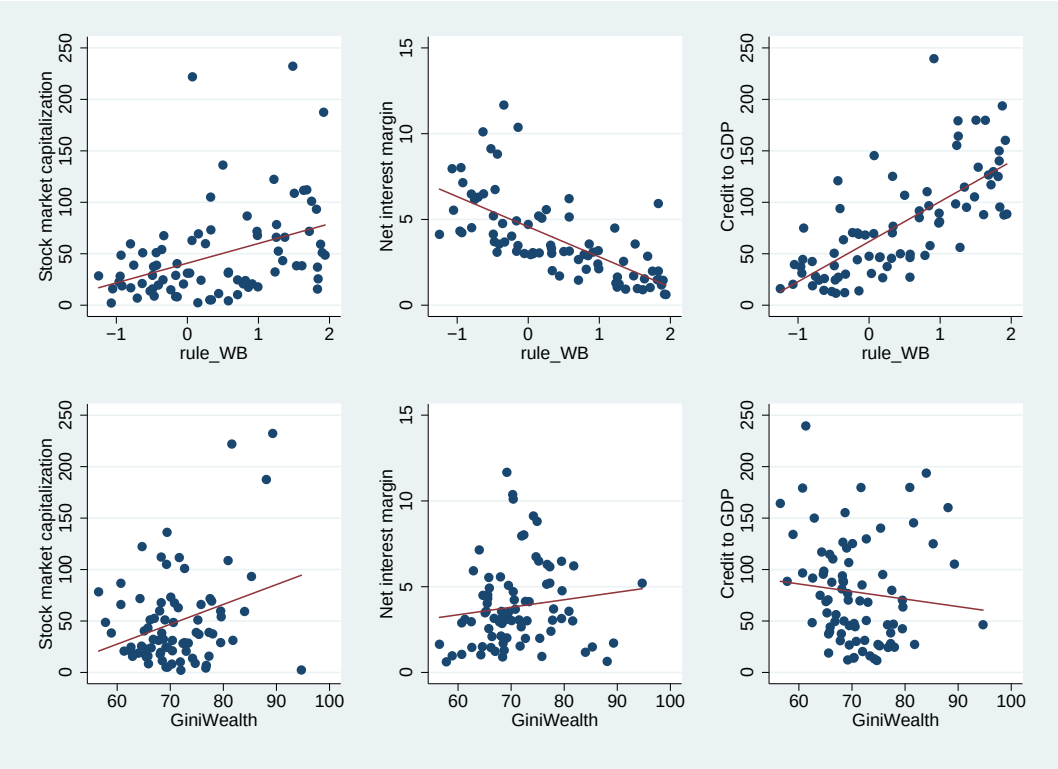
– ATMs: ATMs per 100,000 adults, a measure of the access to finance.

Table 1: **Measures of Financial Development: Correlations**

	St. mark. cap.	St. traded	St. turn.	ATMs	Credit	NIM	Z-score
St. mark. capital.	1						
Stocks traded	0.67	1					
Stock turnover	0.21	0.65	1				
ATMs	0.28	0.56	0.42	1			
Credit to GDP	0.47	0.57	0.36	0.56	1		
NIM	-0.36	-0.41	-0.33	-0.46	-0.63	1	
Z-score	0.36	0.25	0.11	0.05	0.1	-0.22	1

[6]Note that the SWIID database and Credit Suisse Wealth Report are the most comprehensive cross-country databases on income and wealth inequality, respectively.

Figure 1: **Financial Indicators, Rule of Law and Wealth Inequality**



Note: ruleWB and GiniWealth denote the rule of law measure from World Bank and wealth inequality from the Credit Suisse Wealth Report, respectively

Note that previous research examining the finance-growth nexus and the more scarce research on the determinants of financial development have largely focused on examining depth (e.g. Baltagi et al. (2009b), Rajan and Zingales (2003b)) or access to finance (Beck et al. (2007)) rather than the other characteristics such as efficiency and stability.[7] Examining different measures of financial development is appealing not only on theoretical but also on empirical grounds. We present Table 1 with the correlations among our measures of financial development. The measures are correlated but with values far from one.

Next, we present Figure 1, which provides scatter plots of selected financial development measures with the rule of law and wealth inequality. We choose 3 measures of financial development: stock market capitalization, net interest margin and credit to GDP. The rule of law is chosen because we find this variable to be highly relevant in the following regression analysis. Wealth inequality is chosen because of its novelty. We observe that the rule of law is strongly associated with all measures of financial development. Wealth inequality is positively linked to stock market capitalization. The link with the net interest margin is weaker. Wealth inequality is negatively related to credit to GDP. Other scatter plots are available upon request.

[7]There is a stream of literature emphasizing the non-linear effects of financial development – as measured by the credit-to-GDP ratio – on economic growth, which suggests that too much credit harms growth; see, for example, Beck et al. (2014). However, we focus on the determinants of financial development rather than examining its consequences for the real economy.

5 Results

We present the results on the determinants of financial development and organize this section into several sub-sections. We present the results for the determinants of 1) financial depth (both for banks and stock markets), 2) the efficiency of financial intermediaries (both for banks and stock markets), 3) financial stability and 4) access to finance. Robustness checks with different parameters and model priors follow.

We use the hyper-g parameter prior and a uniform model prior for our baseline results. In terms of the model prior, we follow Fernandez et al. (2001). In terms of the parameter prior, Fernandez et al. (2001) suggest using the BRIC prior. However, Feldkircher and Zeugner (2012) show that BRIC prior leads to excessively small models, as it skews the posterior model distribution, and propose a model-specific hyper-g prior to obtain more robust results. We sort the explanatory variables according to their PIPs. We use the Birth-death MC^3 sampler to approximate the PMP distribution and specify 5 million iterations with 1 million initial burn-ins to ensure the convergence of the sampler (we also considered 15 or 30 million iterations and 3 million burn-ins for selected specifications, but doing so had a minimal impact on the results).

5.1 The Determinants of Financial Depth

We present the results on the determinants of stock market capitalization to GDP in Table 2. We find that better rule of law and higher GDP[8] are both positively associated with stock market capitalization. Regarding the positive effect of the rule of law, the finding confirms previous evidence on the importance of institutional quality for financial development (Chinn and Ito, 2006). The British colony dummy is highly relevant and may well capture the effect of legal origin (La Porta et al., 1998). Outward orientation (i.e., net exports over GDP) and investment also exert positive effects on stock market development, a finding that is broadly in line with previous studies suggesting the role that trade openness and economic activity play in financial development (Baltagi et al., 2009a).

Finally, stock markets are more developed in countries with greater wealth and income inequality (however, wealth and income inequality are irrelevant for banking sector development, as our results suggest below).[9] This finding corroborates the results of Degryse et al. (2017), who show that limited voting rights available only to a wealthy elite has been conducive to stock market development over the last two centuries. It is very likely that the limited voting rights of the 19th century were associated with greater wealth inequality. In this regard, Piketty and Zucman (2014) report the private wealth-to-national income ratios for France, Germany, the UK and the US for 1700–2010 and show that wealth-to-income ratios declined dramatically in these countries since the beginning of 20th century. Interestingly, Turner and Zhan (2012) provide historical evidence showing that the London stock market reacted negatively to the 1867

[8]Note that, as an alternative we also used GDP per capita with the results largely unchanged, these results are available upon request.

[9]Even though the cross-country wealth inequality data are from 2010 because earlier data are not available with sufficient country coverage, Piketty and Zucman (2014) document for a series of countries that wealth inequality is highly persistent reducing therefore the endogeneity concerns.

suffrage reform in Britain, which extended voting rights to a greater share of the population, which might have reduced wealth inequality in the long term. Generally, our results on the effect of wealth inequality on stock market development also complement the results reported by Perotti and von Thadden (2006) and Perotti and Schwienbacher (2009), who show that greater wealth inequality in the past (caused by war-related inflationary shocks and subsequent devastation of savings) has been conducive to state-funded pension systems and lower investor protection.

The results on the effect of wealth inequality on stock market development are also broadly in line with Kumhof et al. (2015), who provide a theoretical model and empirical evidence of how income inequality causes credit booms. These credit booms may be associated with higher stock market returns, and consequently, with higher stock market capitalization. Interestingly, one may argue that wealth (or income) inequality is persistent and, therefore, that the estimated effect is not causal. To reduce these concerns somewhat, it is noteworthy that, according to our results, wealth inequality matters only for stock market development but not for banking sector development (as we show in the following subsections related to banks).

Other variables exhibit PIPs below 0.5 and, therefore, are not robustly related to the dependent variable. This is somewhat surprising for some variables such as capital controls or bank regulations, but it is worth mentioning that we employ a global sample, and it may well be the case that these variables matter more for some specific group of countries (as noted by Rajan and Zingales (2003a)) or simply that institutional characteristics (as captured by the rule of law) matter more.

Next, we examine the regression with the total stock market value traded to GDP as the dependent variable and present the results in Table 3. The results resemble those in Table 2 but not fully. Only GDP, the rule of law and wealth inequality are again robustly related to financial development. Therefore, we conclude that these three variables are the main determinants of the depth of stock markets around the globe.

Private credit to GDP is used to examine the determinants of the depth of financial institutions. We provide these results in the Table 4. As in both previous cases, the rule of law is a primary determinant of this measure of financial development. Overall, our results suggest that the rule of law is the most robust determinant of financial depth, both for the banking sector and stock markets, followed by the level of economic development. Wealth inequality also matters for financial depth but only for stock markets.

5.2 The Determinants of the Efficiency of Financial Intermediaries

Next, we examine the determinants of the efficiency of financial intermediaries according to two different indicators: 1) the net interest rate margin, which assesses bank efficiency, and 2) the stock market turnover ratio, which assesses stock market efficiency.

We present the results for the determinants of the net interest rate margin in Table 5. We again find that the rule of law is a primary driver of financial development, followed by some control variables and variables broadly capturing the level of economic development and cultural

affinity. Interestingly, our results comply with studies examining short-term fluctuations in net interest rate margins such as Demirguc-Kunt and Huizinga (1999), who find that institutional quality reduces the net interest margin. Demirguc-Kunt and Huizinga (1999) state that the reason that better rule of law is associated with lower margins is that an effective legal system reduces risk premia in bank lending.

An alternative to the net interest margin would be to examine the lending deposit spread, which is based on market data rather than on accounting data, as is the case for the net interest margin. However, this would reduce the number of observations, and therefore, we prefer an indicator with greater cross-country coverage.

Next, we analyze the determinants of the stock market turnover ratio and present the results in Table 6. We again find that the level of economic development and the rule of law are crucial factors that influence this indicator, proxying for stock market efficiency. Li (2007) examines panel data on 33 countries and also identifies the key role of institutions in allowing stock markets to operate at their full potential. Additionally, the measure of income inequality proves instrumental in explaining higher levels of the stock market turnover ratio, as was the case for the wealth inequality index in determining stock market depth.

Although we find that financial market regulations are not a robust determinant of the depth of financial markets, they do matter for the efficiency of stock markets. Greater stringency in capital requirements, as proxied by the capital regulatory index of Barth et al. (2013), is associated with lower efficiency. Interestingly, greater restrictiveness on forming financial conglomerates is conducive to stock market efficiency. The financial conglomerates restrictiveness index, developed by Barth et al. (2013), assesses the degree to which banks may own and control non-financial firms and vice versa and the extent to which non-bank financial firms may own and control banks. The theoretical and empirical literature provides heterogeneous results in terms of whether financial conglomerates are beneficial. Financial conglomerates might more easily diversify but are complex and much more difficult to value. Our finding that restrictions on financial conglomerates are beneficial for stock market efficiency is in line with Laeven and Levine (2007). Laeven and Levine (2007) examine individual banks in 43 countries and identify a diversification discount, i.e., financial markets value financial conglomerates less in comparison to specialized financial intermediaries.

5.3 The Determinants of Access to Finance and Financial Stability

We present the results on determinants of access to finance in Table 7. The measure of ATMs per 100,000 adults serves as a proxy for the access to finance dimension of financial development. We recognize that this is a somewhat crude measure of access to finance, as ATMs may also represent an indicator of technological advancement or an indicator of the quality of financial services. Therefore, we remain somewhat brief in our description of these results.[10]

[10]The concept of financial inclusion is closely related to the access to finance. Given the richness of recently developed Global Findex database by the World Bank, we aim to investigate the determinants of financial inclusion in a separate paper.

The results suggest that the size of an economy, measured either in terms of its economic output or land area, is associated with greater penetration of ATMs. Tertiary education and non-equipment investment dynamics both relate positively to access to financial services. These results broadly correspond to the findings in Beck et al. (2007). The rule of law has a positive effect on this measure of financial development, but the PIP is below 0.5, meaning that it is not robustly related.

The results on the determinants of financial stability are available in Table 8. Several characteristics are systematically important for the bank Z-score, which is introduced as a measure of financial stability. We find that greater restrictiveness on financial conglomerates is associated with a lower bank z-score and, hence, an increased probability of banking sector insolvency. In other words, fewer restrictions on forming financial conglomerates might actively promote greater diversification of banking sector activities, in turn leading to greater financial stability. Combined with the previous findings, our results suggest a potential trade-off. While restrictions on financial conglomerates support efficiency, they might harm overall stability.

In addition, our results show that better rule of law is associated with greater financial stability. As in the case of the previous indicators of financial development, several geographical and religious dummies exhibit high PIPs, suggesting that role of cultural aspects (e.g.,Stulz and Williamson (2003)) and colonial ties (e.g., Acemoglu et al. (2001), Beck et al. (2001) should not be easily dismissed. Our GDP variable exhibits a low PIP, which is likely to be a consequence of the global financial crisis, which frequently had more severe effects on developed countries than on many emerging market economies.

5.4 Robustness Checks

To assess the robustness of our findings, we use different structures of parameter and model priors. The results are available in the Appendix in Figures A1-A7. We present how the PIPs change with respect to different parameter and model prior structures. Namely, we use four different structures labelled Model 1–Model4: Model 1=hyper-g parameter prior, birth-death model prior; Model 2=hyper-g,reverse-jump; Model 3=UIP, birth-death; and Model 4=UIP, reverse-jump. We observe that the ranking of explanatory variables in terms of their PIPs remains largely unchanged while the PIPs are lower in some cases, which is not surprising given that we choose alternative prior structures that we prefer less than our baseline case. We also use the collinearity-adjusted dilution model prior without observing any major consequences for our results (these results are available upon request).

Table 2: **The Determinants of Stock Market Capitalization to GDP (%)**

	PIP	Post Mean	Post SD
Rule of law	1.00	25.35841	6.99792
Log GDP	1.00	7.67166	2.53851
British colony dummy	0.99	22.02539	8.98886
Wealth Inequality	0.99	1.47428	0.60249
Non-equipment investment	0.95	2.85978	1.42078
Size of the labor force	0.95	-0.09142	0.04684
Civil liberties	0.90	11.23297	5.95356
Ethnolinguistic fractionalization	0.84	22.96285	16.34634
Outward orientation	0.79	0.98702	0.77587
Income Inequality	0.76	0.75625	0.63283
Diversification index	0.24	2.16736	5.27928
Equipment investment	0.18	0.24035	0.74650
Political rights	0.16	0.78346	3.39692
Primary education	0.14	-0.05531	0.20544
Fraction Jewish	0.13	-0.04402	0.18084
Secondary education	0.12	0.04131	0.17789
Life expectancy	0.12	0.09126	0.40442
Financial conglomerate restrictiveness	0.11	-0.24331	1.12493
Fraction Muslim	0.11	-0.00817	0.04005
Capital regulatory index	0.10	0.16894	0.91485
Landlocked dummy	0.10	-0.71682	3.80540
Fraction Hindu	0.09	0.01706	0.09643
Revolutions and coups	0.08	-0.05430	0.32007
Sub-Sahara dummy	0.07	-0.60715	4.49950
Population growth	0.07	-0.19879	1.83122
French colony dummy	0.07	-0.36898	3.67080
Number of war years	0.07	-0.02191	0.22519
Area	0.06	0.012033	0.39681
Fraction Orthodox	0.06	-0.00465	0.05351
Fraction Catholic	0.06	0.00201	0.02978
Tertiary education	0.06	0.01420	0.21794
Ratio of workers to population	0.06	-0.00983	0.10414
Chinn-Ito index	0.05	-0.13128	3.70115
Fraction Buddhist	0.05	-0.00252	0.05355
Fraction Protestant	0.05	-0.00129	0.04162
Black market premium	0.05	0.00001	0.00015

Table 3: **The Determinants of Stock Market Total Value Traded to GDP (%)**

	PIP	Post Mean	Post SD
Log GDP	1.00	12.97662	1.91247
Rule of law	1.00	15.86420	5.44725
Wealth inequality	0.85	0.77531	0.49481
Fraction Catholic	0.72	-0.15280	0.12365
Tertiary education	0.67	1.23622	1.11844
Ratio of workers to population	0.51	0.31253	0.38441
Sub-Sahara dummy	0.38	7.48214	11.67904
Civil liberties	0.37	2.86706	4.45352
Fraction Jewish	0.37	-0.22337	0.35893
Primary education	0.35	-0.21361	0.35286
Equipment investment	0.21	0.37581	0.88025
Overall financial conglomerate restrictiveness	0.20	0.66881	1.62116
Political rights	0.16	0.74711	2.16967
French colony dummy	0.16	2.37886	7.01898
Fraction Orthodox	0.14	-0.03578	0.11127
Outward orientation	0.13	-0.10541	0.33843
Size of the labor force	0.12	0.00584	0.01991
British colony dummy	0.12	1.05568	3.71402
Area	0.11	0.22717	0.83136
Ethnolinguistic fractionalization	0.09	1.30398	5.37810
Population growth	0.08	0.43279	1.91667
Fraction Muslim	0.06	-0.00556	0.03053
Income inequality	0.06	0.02907	0.16011
Black market premium	0.05	-0.00004	0.00024
Fraction Buddhist	0.05	0.00948	0.05979
Landlocked dummy	0.05	0.39961	2.58286
Life expectancy	0.04	-0.02600	0.18529
Number of war years	0.04	-0.02215	0.16892
Fraction Hindu	0.03	0.00093	0.04148
Fraction Protestant	0.03	0.00207	0.02993
Capital regulatory index	0.02	0.02828	0.35296
Non-equipment investment	0.02	0.01488	0.18437
Diversification index	0.02	-0.02369	1.00064
Secondary education	0.02	0.00424	0.05961
Chinn-Ito index	0.02	0.12278	1.92299
Revolutions and coups	0.01	0.00053	0.09169

Table 4: **The Determinants of Private Credit to GDP (%)**

	PIP	Post Mean	Post SD
Rule of law	1.00	34.40369	5.92648
Fraction Orthodox	0.91	0.52698	0.28097
Ratio of workers to population	0.43	0.34445	0.49655
Log GDP	0.42	1.86484	2.66959
Size of the labor force	0.39	0.03135	0.04797
Secondary education	0.32	-0.21818	0.39919
Life expectancy	0.31	0.47896	0.87920
Landlocked dummy	0.31	-6.21045	11.37155
Fraction Catholic	0.29	-0.05610	0.10879
Non-equipment investment	0.26	0.52705	1.11960
French colony dummy	0.20	4.06646	10.22830
Tertiary education	0.19	0.26930	0.70877
Fraction Buddhist	0.18	0.06042	0.16403
Area	0.09	0.15985	0.71381
Financial conglomerate restrictiveness	0.07	0.17119	0.95302
Primary education	0.05	-0.02076	0.14778
Fraction Jewish	0.05	-0.01777	0.12719
Fraction Protestant	0.05	-0.00728	0.05833
Income inequality	0.04	0.01445	0.12962
Fraction Hindu	0.04	-0.00697	0.06257
Civil liberties	0.03	-0.07900	1.33055
Chinn-Ito index	0.03	-0.24141	3.29589
Political rights	0.03	0.04530	0.90222
Revolutions and coups	0.03	0.00493	0.18777
Fraction Muslim	0.03	-0.00015	0.01895
Number of war years	0.03	-0.01023	0.15919
Population growth	0.03	-0.00084	0.89501
Sub-Sahara dummy	0.03	0.01568	2.33191
Outward orientation	0.03	-0.00308	0.12212
Equipment investment	0.03	0.00066	0.22358
British colony dummy	0.03	0.04707	1.38441
Ethnolinguistic fractionalization	0.02	0.00462	2.30832
Diversification index	0.02	0.02599	1.33618
Black market premium	0.02	-0.00000	0.00012
Capital regulatory index	0.02	0.00628	0.41313
Wealth inequality	0.02	0.00171	0.08028

Table 5: **The Determinants of Bank Net Interest Margin (%)**

	PIP	Post Mean	Post SD
Rule of law	1.00	-1.59973	0.27000
British colony dummy	1.00	1.21570	0.39903
Sub-Sahara dummy	0.95	1.84333	0.76485
Ethnolinguistic fractionalization	0.95	-1.75390	0.76173
Ratio of workers to population	0.92	0.04830	0.02407
Fraction Protestant	0.51	0.00814	0.01016
Landlocked dummy	0.44	0.38128	0.53554
Revolutions and coups	0.37	0.02599	0.04214
Non-equipment investment	0.36	-0.03673	0.06015
Log GDP	0.32	-0.05166	0.09378
Fraction Hindu	0.26	-0.00482	0.01013
Primary education	0.17	0.00404	0.01163
Diversification index	0.16	-0.08804	0.25888
Size of the labor force	0.15	-0.00039	0.00117
French colony dummy	0.15	-0.11193	0.34704
Fraction Buddhist	0.14	-0.00180	0.00586
Fraction Catholic	0.13	0.00102	0.00331
Fraction Muslim	0.11	-0.00075	0.00272
Civil liberties	0.09	-0.02014	0.08522
Tertiary education	0.07	0.00270	0.01410
Political rights	0.07	-0.01084	0.05732
Chinn-Ito index	0.06	-0.03923	0.25037
Black market premium	0.04	-0.00000	0.00001
Life expectancy	0.04	0.00084	0.00876
Capital regulatory index	0.04	0.00265	0.02538
Outward orientation	0.03	-0.00057	0.00621
Area	0.03	-0.00107	0.01349
Income inequality	0.03	0.00026	0.00388
Secondary education	0.03	0.00003	0.00282
Population growth	0.03	0.00188	0.04040
Equipment investment	0.03	-0.00033	0.00926
Number of war years	0.02	-0.00036	0.00590
Wealth inequality	0.02	-0.00019	0.00364
Fraction Orthodox	0.02	0.00004	0.00151
Financial conglomerate restrictiveness	0.02	-0.00000	0.01830
Fraction Jewish	0.02	0.00004	0.00246

Table 6: **The Determinants of Stock Market Turnover Ratio (%)**

	PIP	Post Mean	Post SD
Log GDP	1.00	13.54549	3.29549
British colony dummy	1.00	-42.34344	11.57984
Sub-Sahara dummy	1.00	52.14916	18.80614
Rule of law	1.00	25.01907	7.50697
Financial conglomerate restrictiveness	0.97	7.64876	3.49957
Income inequality	0.97	1.51641	0.74475
Fraction Catholic	0.92	-0.32712	0.16743
Outward orientation	0.89	-1.53431	0.95219
Capital regulatory index	0.76	-4.24452	3.56762
Size of the labor force	0.75	0.08228	0.06748
Area	0.45	1.37798	2.08183
Ratio of workers to population	0.42	-0.33899	0.52476
Fraction Muslim	0.41	0.09320	0.14489
Population growth	0.40	-4.71612	7.64536
Primary education	0.27	0.18566	0.40800
Fraction Protestant	0.22	0.07213	0.18440
Fraction Orthodox	0.15	-0.04463	0.14939
Tertiary education	0.14	0.18948	0.65204
Fraction Buddhist	0.12	0.04385	0.16840
Wealth inequality	0.11	0.06789	0.30192
Fraction Hindu	0.10	-0.02593	0.12569
Diversification index	0.09	-0.67971	3.70608
Political rights	0.08	-0.23231	1.60137
Black market premium	0.07	0.00003	0.00029
Secondary education	0.06	0.01515	0.14879
Fraction Jewish	0.06	-0.01629	0.13942
Landlocked dummy	0.06	-0.45430	3.61361
Non-equipment investment	0.06	-0.03757	0.44797
Ethnolinguistic fractionalization	0.06	0.47302	4.71961
Revolutions and coups	0.05	-0.02781	0.29697
Life expectancy	0.05	-0.00459	0.26683
Chinn-Ito index	0.05	-0.38943	4.41625
Civil liberties	0.05	-0.03465	1.61760
Equipment investment	0.05	-0.02894	0.39674
French colony dummy	0.04	-0.13039	3.43169
Number of war years	0.04	-0.00920	0.20008

Table 7: **The Determinants of ATMs per 100,000 Adults**

	PIP	Post Mean	Post SD
Log GDP	1.00	8.65329	2.88759
Area	0.97	5.63019	2.826496
Size of the labor force	0.92	-0.13110	0.07068
Tertiary education	0.89	2.06473	1.23959
Non-equipment investment	0.77	2.31148	1.78380
Number of war years	0.49	-0.77511	1.02352
Population growth	0.46	-5.08103	6.91805
Wealth inequality	0.46	-0.44215	0.62145
Sub-Sahara dummy	0.46	13.70053	18.67324
Black market premium	0.39	-0.00065	0.00103
Equipment investment	0.37	0.81930	1.36968
Rule of law	0.28	2.87796	5.72735
Outward orientation	0.24	-0.26554	0.60130
Primary education	0.22	0.14648	0.35045
Fraction Muslim	0.22	-0.03486	0.08312
Political rights	0.21	-1.13595	2.89765
Fraction Protestant	0.11	-0.02620	0.09956
Diversification index	0.11	0.92520	3.77410
Fraction Catholic	0.10	0.01445	0.05861
Fraction Buddhist	0.10	0.02714	0.11572
Secondary education	0.10	-0.05377	0.23606
Fraction Jewish	0.09	0.04243	0.19487
Civil liberties	0.09	-0.34891	2.37605
Landlocked dummy	0.06	-0.60070	3.74412
Revolutions and coups	0.05	-0.03447	0.27753
British colony dummy	0.05	-0.35785	2.84693
Life expectancy	0.04	-0.00248	0.20481
Capital regulatory index	0.04	0.06668	0.64198
Income inequality	0.04	0.00336	0.13284
Fraction Hindu	0.03	-0.00485	0.06353
Chinn-Ito index	0.03	-0.18916	3.08869
Overall financial conglomerate restrictiveness	0.03	0.05940	0.62641
Fraction Orthodox	0.03	-0.00045	0.04326
Ratio of workers to population	0.03	-0.00223	0.08345
Ethnolinguistic fractionalization	0.02	-0.10088	2.59317
French colony dummy	0.02	0.03095	2.41884

Table 8: **The Determinants of Bank Z-Score**

	PIP	Post Mean	Post SD
French colony dummy	1.00	5.92283	2.40671
Ratio of workers to population	1.00	-0.20721	0.08193
Population growth	0.98	2.79672	1.14880
Size of the labor force	0.97	0.01544	0.00795
Financial conglomerate restrictiveness	0.93	-0.95709	0.57221
Sub-Sahara dummy	0.71	-3.15695	3.01853
British colony dummy	0.69	1.87665	1.85436
Fraction Orthodox	0.66	-0.04122	0.04377
Rule of law	0.62	1.22561	1.34357
Fraction Jewish	0.58	0.06279	0.07729
Non-equipment investment	0.55	0.21560	0.26716
Ethnolinguistic fractionalization	0.38	1.27652	2.33913
Equipment investment	0.38	0.12170	0.21498
Outward orientation	0.33	-0.04486	0.09326
Number of war years	0.28	-0.04601	0.10617
Chinn-Ito index	0.27	0.84872	1.99700
Fraction Catholic	0.24	0.00601	0.01511
Landlocked dummy	0.20	0.40812	1.21666
Civil liberties	0.19	0.16365	0.57435
Fraction Muslim	0.19	-0.00337	0.01116
Diversification index	0.18	0.23577	0.78575
Wealth inequality	0.17	0.01526	0.05202
Capital regulatory index	0.15	-0.05406	0.21532
Income inequality	0.15	0.01426	0.05259
Fraction Protestant	0.13	-0.00338	0.01556
Revolutions and coups	0.10	-0.00970	0.06311
Life expectancy	0.09	0.01284	0.06421
Tertiary education	0.09	0.00893	0.05790
Political rights	0.08	0.00209	0.30168
Primary education	0.06	-0.00208	0.02023
Log GDP	0.06	0.00094	0.11834
Black market premium	0.06	0.00000	0.00003
Secondary education	0.06	-0.00053	0.01736
Area	0.05	-0.00480	0.07113
Fraction Buddhist	0.05	0.00056	0.01084
Fraction Hindu	0.05	0.00051	0.01063

6 Conclusions

We examine in this paper why financial development varies dramatically across countries. Previous studies have suggested different explanations for why some countries exhibit more developed financial systems than others. Rajan and Zingales (2003a), Chinn and Ito (2006) and Baltagi et al. (2009a) emphasize trade and financial openness, La Porta et al. (1998) stress the legal aspects of financial development, Guiso et al. (2004) demonstrate the role of cultural factors, and Huang (2010) argues that political institutions matter.

We take these different theories and examine their importance within a unifying BMA framework. We examine the determinants of financial development in 80 countries using nearly 40 different explanatory variables and 7 different measures of financial development. To extend the previous literature, we consider a richer set of financial development measures that assess not only financial depth (as is typical of the bulk of previous studies) but also efficiency, access and stability.

We find that the rule of law is a major factor influencing financial development regardless of the measure of financial development that we use. Therefore, higher institutional quality is associated with greater financial development. As a consequence, our results provide the greatest support for studies that emphasize the law-finance nexus (La Porta et al., 1998). We also find that the level of economic development matters and that more developed countries demand more developed financial markets. Next, our results suggest that greater wealth inequality is associated with greater stock market depth. However, wealth inequality does not matter for the development of the banking sector or for the efficiency of stock markets and banks. The results regarding wealth inequality are novel; to our knowledge, the effects of wealth inequality have yet to be examined. Financial market regulations, especially the financial conglomerate restrictions index developed by Barth et al. (2013), are relevant for some aspects of financial development. Specifically, we find that more restrictions on forming financial conglomerates are conducive to greater stock market efficiency, which accords with the findings reported by Laeven and Levine (2007) on the diversification discount of financial conglomerates, but they are not conducive to financial stability.

In terms of future research, we believe it would be worthwhile to employ panel data instead of cross-sectional data to appreciate unobserved heterogeneity in a fuller manner (even though we already include a number of religious and cultural variables to capture some of this heterogeneity). However, this is not possible with the current data yet. Wealth inequality data with sufficient cross-sectional coverage became available only recently and time series evidence on wealth inequality is still work in progress with the data being available only for a handful of countries.

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Appendix

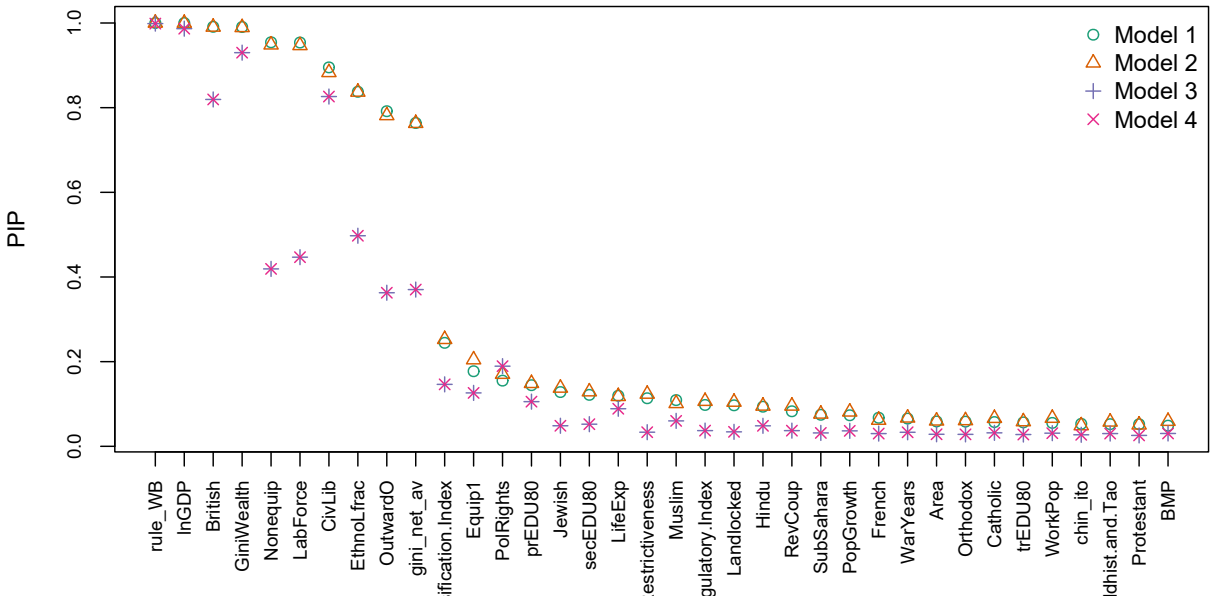

Figure A1: Model comparison with stock market capitalization, Model 1=hyper-g, birth-death; Model 2=hyper-g, reverse-jump; Model 3=UIP, birth-death; and Model 4=UIP, reverse-jump

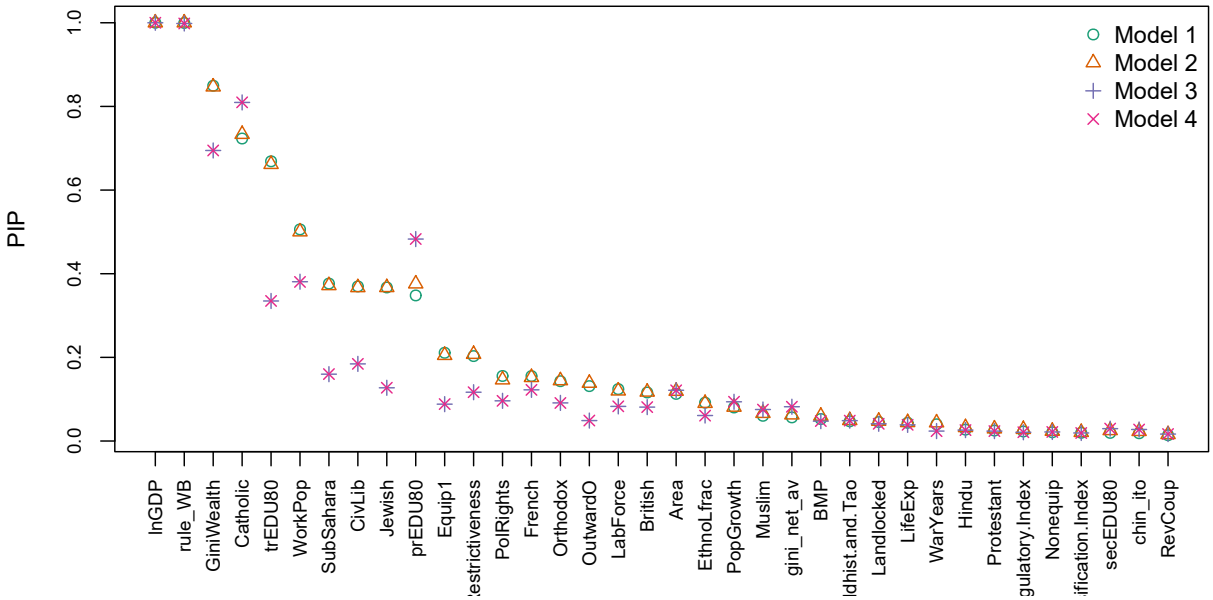

Figure A2: Model comparison with value traded, Model 1=hyper-g, birth-death; Model 2=hyper-g, reverse-jump; Model 3=UIP, birth-death; and Model 4=UIP, reverse-jump

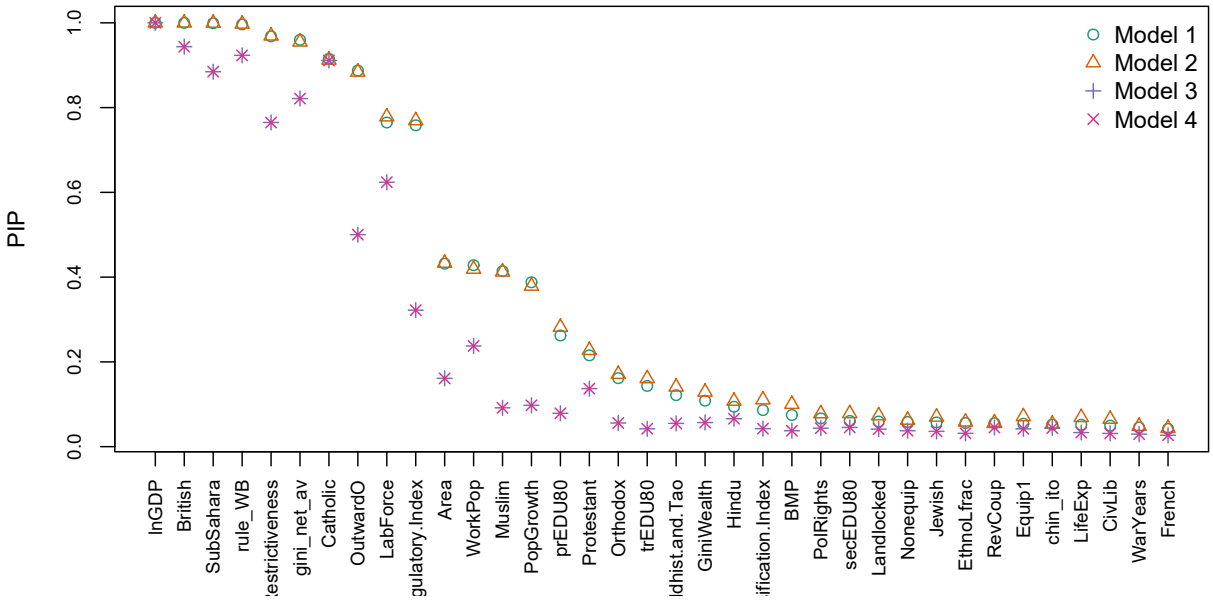

Figure A3: Model comparison with market turnover, Model 1=hyper-g, birth-death; Model 2=hyper-g, reverse-jump; Model 3=UIP, birth-death; and Model 4=UIP, reverse-jump

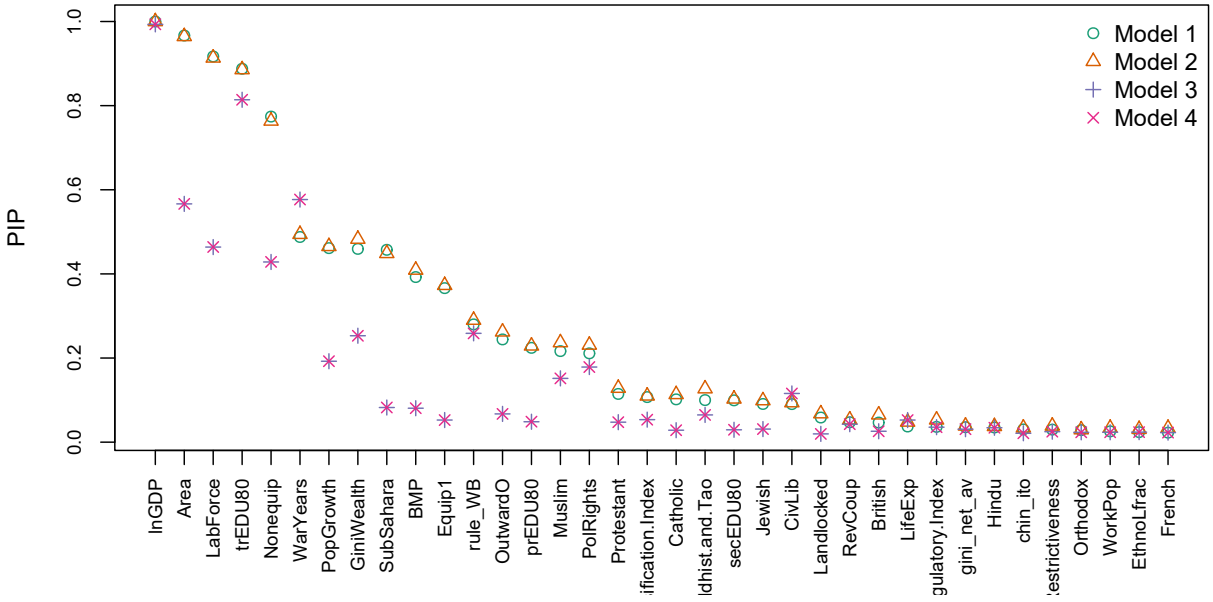

Figure A4: Model comparison with ATMs, Model 1=hyper-g, birth-death; Model 2=hyper-g, reverse-jump; Model 3=UIP, birth-death; and Model 4=UIP, reverse-jump

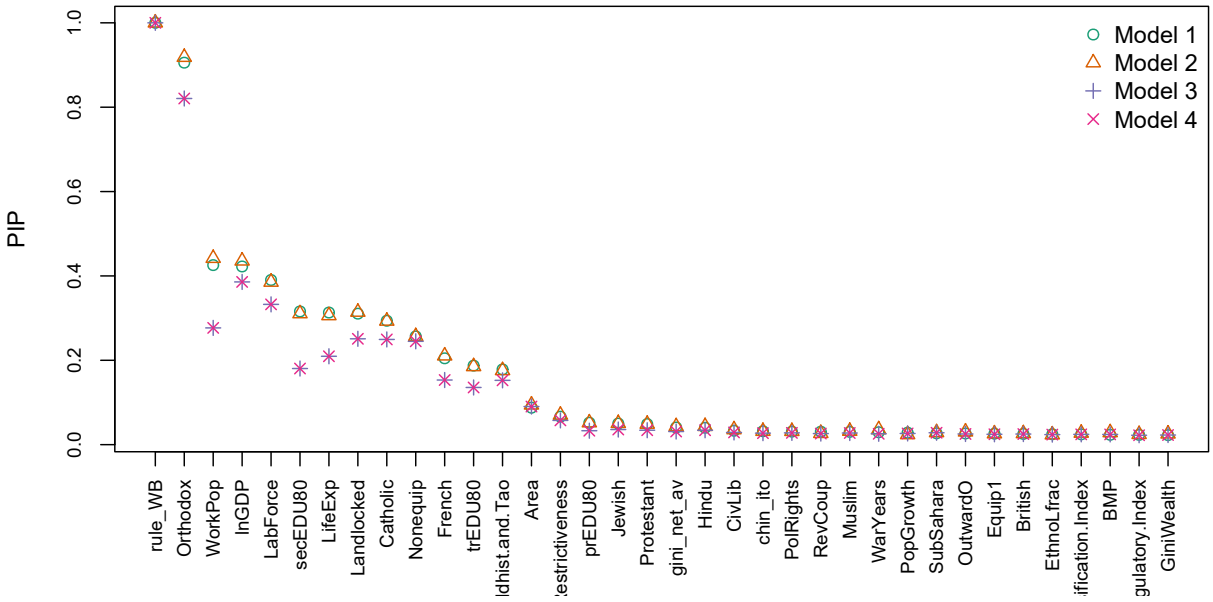

Figure A5: Model comparison with private credit, Model 1=hyper-g, birth-death; Model 2=hyper-g, reverse-jump; Model 3=UIP, birth-death; and Model 4=UIP, reverse-jump

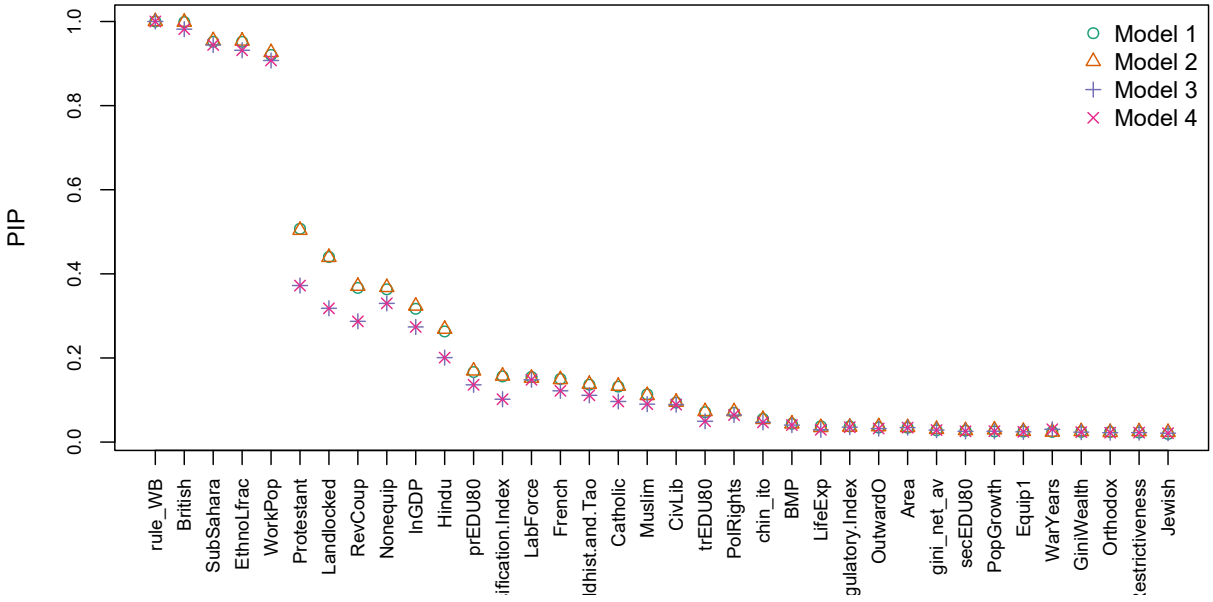

Figure A6: Model comparison with net interest margin, Model 1=hyper-g, birth-death; Model 2=hyper-g, reverse-jump; Model 3=UIP, birth-death; and Model 4=UIP, reverse-jump

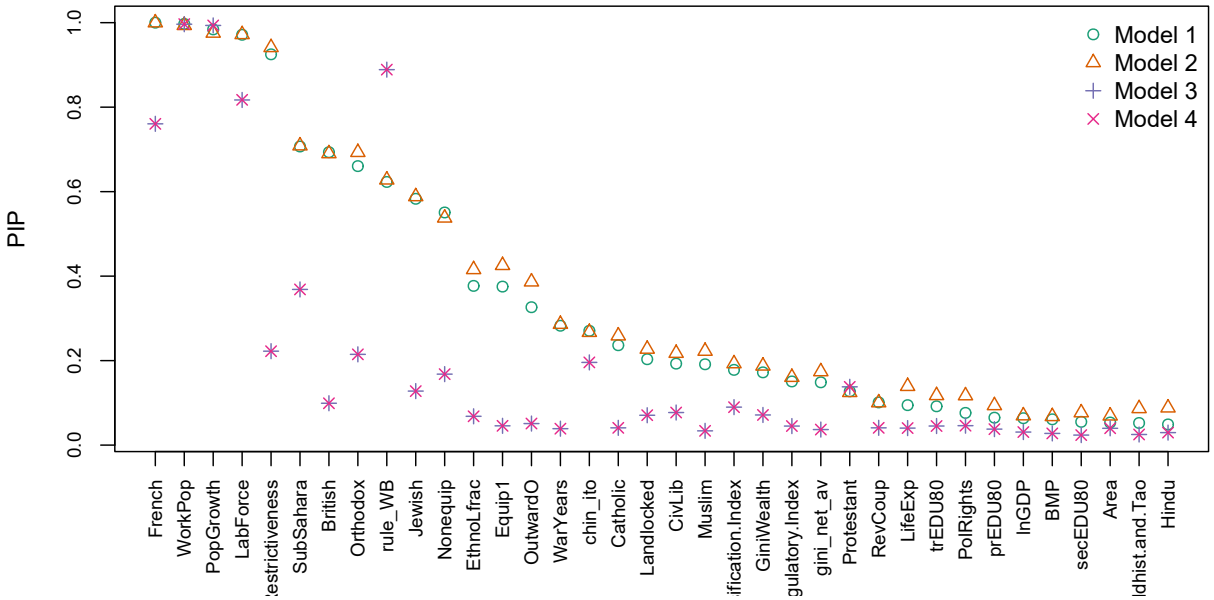

Figure A7: Model comparison with bank Z-score, Model 1=hyper-g, birth-death; Model 2=hyper-g, reverse-jump; Model 3=UIP, birth-death; and Model 4=UIP, reverse-jump

Data Definitions

Dependent variables:

ATMs per 100,000 adults Average value for the 2009–2013 period (at least 3 observations available). World Bank.

Private credit to GDP Average value for the 2009–2013 period (at least 3 observations available). World Bank.

Stock market capitalization to GDP Average value for the 2009–2013 period (at least 3 observations available). World Bank.

Stock market total value traded to GDP Average value for the 2009–2013 period (at least 3 observations available). World Bank.

Stock market turnover ratio Average value for the 2009–2013 period (at least 3 observations available). World Bank.

Bank net interest margin Average value for the 2009–2013 period (at least 3 observations available). World Bank.

Bank Z-score Average value for the 2009–2013 period (at least 3 observations available). World Bank.

Explanatory variables:

Area Land area (sq. km). World Bank.

BMP Black Market Premium from "Lost decades dataset". Average 1980–1999. Easterly (2001).

British Colonized by the British. Mayer and Zignago (2011).

Buddhist Share of Buddhist and Taoist population. As of 2001. Alesina et al. (2003).

Capital Regulatory Index Index consisting of three sub-indices measuring (i) whether the capital requirement reflects certain risk elements and deducts certain market-value losses from capital before minimum capital adequacy is determined; (ii) whether certain funds may be used to initially capitalize a bank. Higher values indicate greater stringency. Average score of three rounds of surveys on banking regulation conducted in 1999, 2003 and 2007. Barth, Caprio and Levine (2015).

Catholic Share of Catholic population. As of 2001. Alesina et al. (2003).

CivLib Civil liberties. Average 1980–2005. Freedom House.

Diversification Index Index measuring whether there are explicit, verifiable, quantifiable guidelines for asset diversification, and banks are allowed to make loans abroad. Higher values indicate more diversification. Average score of three rounds of surveys on banking regulation conducted in 1999, 2003 and 2007. Barth, Caprio and Levine (2015).

Equip1 Share of equipment investment in GDP. Average 1980–2005. Penn World Tables v.9.

EthnoLfrac Ethnolinguistic fractionalization Desmet, Ortuno-Ortin and Wacziarg (2009).

Financial conglomerate restrictiveness Index assessing the overall financial restrictiveness of regulations on conglomerates, consisting of three sub-indices measuring (i) the extent to which banks may engage in underwriting, brokering and dealing in securities, and all aspects of the mutual fund industry; (ii) the extent to which banks may engage in insurance underwriting and selling; and (iii) the extent to which banks may engage in real estate investment, development and management. Higher values indicate more restrictive regulation. Average score of three rounds of surveys on banking regulation conducted in 1999, 2003 and 2007. Barth, Caprio and Levine (2015).

French Colonized by the French. Mayer and Zignago (2011).

gininetav Estimate of the Gini index of inequality in equivalized (square root scale) household disposable (post-tax, post-transfer) income, using Luxembourg Income Study data as the

standard. SWIID database (standardized world income inequality). Average 1980–2005. Solt (2016).
GiniWealth Gini coefficient for wealth inequality. As of 2010. Credit Suisse Wealth Report.
Hindu Share of Hindu population. As of 2001. Alesina et al. (2003).
chinnito The Chinn-Ito index is an index measuring a country's degree of capital account openness. The index is normalized to range b/w zero and one. Average 1980–2005. Chinn and Ito (2006).
Jewish Share of Jewish population. As of 2001. Alesina et al. (2003).
LabForce Total labor force comprises people ages 15 and older who meet the International Labour Organization definition of the economically active population. As of 2000. World Bank.
Landlocked Dummy variable indicating whether the country is landlocked. Mayer and Zignago. (2011).
LifeExp Life expectancy at birth in 1980. World Bank.
lnGDP Logarithm of 2000 GDP at purchaser prices. World Bank.
Muslim Share of Muslim population. As of 2001. Alesina et al. (2003).
Nonequip Share of non-equipment investment in GDP. Average 1980-2005. Penn World Tables v.9.
Orthodox Share of Orthodox population. As of 2001. Alesina et al. (2003).
OutwardO Measure of outward orientation derived as net exports/GDP. Average 1980–2005. Penn World Tables v.9.
PolRights Political rights. Average 1980–2005. Freedom House.
PopGrowth Annual population growth 1960–2005 World Bank.
prEDU80 Share of 25+ population who have completed primary education. Average 1980–2005. Barro and Lee (2013), v. 2.1, Feb. 2016.
Protestant Share of Protestant population. As of 2001. Alesina et al. (2003).
RevCoups Revolutions and coups. Total instances during the period 1952–2005. Powel and Thyne (2011).
ruleWB Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society and, in particular, the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Average 1996–2005. World Bank.
secEDU80 Share of 25+ population who have completed secondary education. Average 1980–2005. Barro and Lee (2013), v. 2.1, Feb. 2016.
SubSahara Dummy variable for Sub-Saharan countries. World Bank.
trEDU80 Share of 25+ population who have completed tertiary education. Average 1980–2005. Barro and Lee (2013), v. 2.1, Feb. 2016.
WarYears Number of war years as defined in the UCDP dataset between 1946 and 2005. UCDP.
WorkPop The employment to population ratio is the proportion of a country's population that is employed. Average 1990–2005 (at least 6 observations available). World Bank.

List of Countries

Argentina; Australia; Austria; Bangladesh; Belgium; Bolivia; Botswana; Brazil; Bulgaria; Canada; Chile; China; Colombia; Costa Rica; Cote d'Ivoire; Croatia; Cyprus; Czech Republic; Denmark; Ecuador; Egypt, Arab Rep.; Estonia; Finland; France; Germany; Ghana; Greece; Hungary; Iceland; India; Indonesia; Ireland; Israel; Italy; Jamaica; Japan; Jordan; Kazakhstan; Kenya; Korea, Rep.; Latvia; Lithuania; Malawi; Malaysia; Malta; Mauritius; Mexico; Morocco; Namibia; Nepal; Netherlands; New Zealand; Norway; Pakistan; Panama; Peru; Philippines; Poland; Portugal; Romania; Russian Federation; Singapore; Slovak Republic; Slovenia; South Africa; Spain; Sri Lanka; Sweden; Switzerland; Thailand; Trinidad and Tobago; Tunisia; Turkey; Uganda; Ukraine; United Kingdom; United States; Venezuela, RB; Vietnam; Zambia.

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ISSN 1456-4564 (print) // ISSN 1456-5889 (online)