DEPARTMENT OF AGRICULTURAL ECONOMICS
AND ECONOMICS

The Effects of Institutional Development Upon Costs of Country Level Private Borrowing

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STAFF PAPER 2020-2

COLLEGE OF AGRICULTURE
COLLEGE OF LETTERS AND SCIENCE

MONTANA
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Abstract

We examine relationships between country level private lending rates and four metrics of institutional development: the *Economic Freedom of the World* (EFW), the *Worldwide Governance Indicators* (WGI), the *Index of Economic Freedom* (IEF), and the *Freedom in the World Index* (FWI). We find the EFW, WGI, and IEF metrics are largely consistent but anomalies exist between FWI and other indices. Robust regressions indicate that higher institutional metrics are associated with lower domestic lending rates. The effects a country's institutional metric upon nominal domestic interest rates is of similar magnitude or exceeds the effects of shocks in inflation.

Introduction

Assessing the reasons for differences in country level economic performance is a complicated endeavor. While researchers have examined various potential explanatory factors contributing to improvements in a country's economic performance, we posit that an important factor is likely to be sustained internal private investment. The level of internal private investment is likely to be determined by numerous factors including investment opportunities, the ability to pursue recognized opportunities, the risks faced by investors (including the ability to retain a profitable proportion of their investment's returns) and the costs and availability of investment funds.

Empirical information with respect to domestic private investment opportunities and their associated risk/returns information are difficult to obtain and are likely to be heterogeneous within and across countries. However, information with respect to a country's private sector cost of borrowing are available as the International Monetary Fund publishes information with respect to country level private interest rates. Private sector interest rates likely contain useful

information with respect to lender-perceived investor opportunities and risks faced by investors in that market-based interest rates should contain sufficient risk premiums to cover risk induced loan defaults. Market-based nominal interest rates should contain at least three types of information: (1) an expected base or real risk-free component reflecting the opportunity costs of domestic funds, (2) an inflation premium sufficient to cover or compensate lender anticipated losses in purchasing power due to inflation, and (3) a risk premium sufficient to cover loan losses due to default events and unanticipated shocks to inflation.

While disentangling the three components of nominal interest rates is difficult, it is likely that all three components are influenced by the country's internal economic, political, and institutional structure. For example, a country's rule of law, protection of property rights, and rewards to individual initiative are likely to influence the opportunity cost rate of return for both borrowers and lenders. A country's rule of law, protection of property rights, and institutional stability are also likely to influence the probability and severity of defaults. Additionally, the type and predictability of a country's fiscal policies influence potential inflation levels thus affecting both the anticipated inflation and risk premium component of domestic interest rates.

We anticipate that a less favorable institutional setting is likely to increase the inflation and risk premium components of a country's domestic lending rate. To the extent that a country's institutional setting leads to substantive increases in a country's domestic lending rate the institutional setting will make sustainable internal investment more difficult. The historical literature has theoretically discussed the potential role of country's institutional environment or setting upon the country's economic performance but empirically testing or estimating the degree to which a country's institutional environment and economic policies affect economic

performance has been historically difficult due to the lack of empirical metrics of a given country's institutional environment.

A body of literature has examined the relationship between various aspects of country level institutions and their economic performance using several institutional metrics or indexes. The relationship between institutional development and investment have been examined in numerous studies. Barro (1991) found that institutional instability has adverse effects on investment - primarily through uncertainty. Additional studies found that even moderate levels of institutional uncertainty can have significant effects on investment (Rodrick, 1991; Aryeetey, 1994; Mauro, 1995; Serven 1997; La Porta et al., 1998; Campos et al. 1999; Bruenetti & Weber, 1998; Le, 2004;). A set of studies also found that the security of property rights has a positive effect on investment. (Besley, 1995; Svensson, 1998; Clague et al., 1999).

Contract enforcement and creditor preference in legal and regulatory systems were found to have a positive effect on investment (Levine, 1999; Jappelli & Pagano, 2002; Djankov et al., 2007). Studies have found that institutional instability has differing effects on foreign direct investment inflows and outflows (Schneider & Frey, 1985; Globerman & Shapiro, 2002; Brusse, 2003; Jensen, 2003; Li & Resnick, 2003; Jackobsen and De Soysa, 2006; Brusse & Hefeker. 2007; Li, 2009; Asiedu & Lien, 2011). Other studies found that an increase in metrics of institutional development is positively associated with an increase in sovereign credit ratings (Brewer & Rivoli, 1990; Jensen, 2003; Butler & Fauver, 2006). In an unpublished master thesis Calderon (2014) conducted a preliminary analysis examining the relationship between private lending rates and institutional development. Calderon examined two of the four institutional variables discussed in this paper and found that on average a higher level of institutional development is associated with lower domestic interest rates.

In this study we empirically examine the relationship between the country's private market loan interest rates and several metrics of institutional development. As no single institutional index is likely to be ideal (due to differing institutional emphasis areas and index construction methods), we examine the relationships between domestic interest rates and four of the most commonly used institutional indices: (1) the Economic Freedom of the World (EFW) index produced by the Fraser Institute, (2) the Worldwide Governance Indicators (WGI) produced by the World Bank and Brookings Institute, (3) the Index of Economic Freedom (IEF) produced by the Heritage Foundation, and (4) the Freedom in the World (FWI) index produced by Freedom House. In the following we: (1) present the empirical model used in the study, (2) briefly discuss the regression data including a comparison of the four indexes utilizing summary statistics and visual data contrasts, (3) present and discuss regression results, and (4) summarize the results and discuss conclusions.

Methodology and Data

This study examines the relationships between a country's private borrowing interest rates and several metrics or indexes of the country's institutional/government structure. The study introduces controls for other aspects of a country's and the world economy that might affect such interest rates.

The regression models we use in this study are of the form:

(1) $NIR_{i,t} = \alpha + \beta_0\, I\_Index_{i,t} + \beta_1 GDPK_{i,t} + \beta_2 L1INF_{i,t} + \beta_3 US10NIR_{i,t} + \epsilon_{it}$

where NIR denotes the nominal private borrowing interest rate, I_Index denotes an Institutional Index, $GDPK$ denotes per capita GDP in thousands of 2010 US dollars, $L1INF$ is a lagged

inflation index, and $US10NIR$ denotes the nominal interest rates on US 10 year treasury bonds. The subscript notation refers to the level of the variables for country *i* in year *t*.

Private Financing Interest Rates

The dependent variable is a country's private nominal interest rate (*NIR*) obtained from the International Monetary Fund (IMF)'s International Financial Statistics Database. This variable is defined as the average national bank rate that usually meets the short-term and medium-term financing needs of the private sector. The units for this variable are percentage points. An examination of the *NIR* data revealed several anomalies. A set of eight countries belonging to the West African Economic and Monetary Union reported interest rates that were among the lowest interest rates reported across all countries and contained identical observations across the countries within a given year. The decision was made by the authors to remove these observations due to the low values and irregular nature of the observations. Additionally, extremely high interest rates were reported for some observations (as high as 4775%). As we discuss in more detail below, we experimented with various procedures for dealing with the abnormally high interest and inflation rate observations. In the following analysis we report the results from two sets of robust regressions. In both sets of regressions, we first eliminated observations whose interest and inflation levels exceeded their respective 99.5% quantile levels[1].

[1] Leaving the large interest rate and inflation observations in the data set resulted in large, highly significant, but erratic institutional index effect estimates. The results reported below were robust to various levels of quantile exclusions including 99% and 99.5% or excluding all interest rate and inflation observations exceeding 100%.

Institutional Indexes

Four institutional metrics or indexes are used in this study: (1) the Economic Freedom of the World (EFW) index produced by the Fraser Institute, (2) the Worldwide Governance Indicators (WGI) produced by the World Bank and Brookings Institute, (3) the Index of Economic Freedom (IEF) produced by the Heritage Foundation, and (4) the Freedom in the World (FWI) index produced by Freedom House.

Economic Freedom of the World (EFW)

The EFW dataset consist of five key areas, with each area consisting of set of sub-components. The five areas are: Size of Government, Legal System, Property Rights, Sound Money, and Freedom to Trade Internationally. Each area score is an average of its underlying component scores. The five area scores are then averaged to obtain the overall EFW index. The components, areas and the overall index are scored on a scale of zero to ten with ten indicating a country with a highest level of institutional development. The EFW panel dataset covers the time periods 1990-2000 (every five years) and 2000-2017 (annual observations). In this study we use the annual EFW data set covering the time period 2000-2017.

Worldwide Governance Indicators (WGI)

The WGI dataset consist of six sub indicators that measure the perception of governance: voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption. The sub indictors are then aggregated to construct a summary index ranging between -12 and 12 with a higher score representing a more desirable outcome. The WGI data covers the time periods 1996-2002 (every

two years) and 2002-2018 (annual observations). In this study we use the annual WGI data covering the time period 2002-2018.

Index of Economic Freedom (IEF)

The IEF dataset consist of four components: rule of law, government size, regulatory efficiency and open markets. Each of the components consist of three sub-components. The twelve sub-components are averaged in order to derive a summary index. The IEF index ranges between 35 and 90 with a higher score representing a more desirable outcome. The IEF's annual data covers the years 2012-2018.

Freedom in the World Index (FWI)

The FWI index consist of compiling a score based on news articles, academic analysis, reports from nongovernment organizations and individual professional contracts. The index uses these sources to measure the electoral process, political pluralism and participation, functioning government, freedom of expression of belief, associational and organizational rights, rule of law and personal autonomy and individual rights. This information is then used to derive a rank score between one and seven with one representing the most desirable outcome. Prior to 2005, the rank scores were constructed from unpublished underlying aggregate scores ranging between 0 and 100 with 100 denoting the most desirable outcome. In 2005 Freedom House began providing the underlying aggregate scores within their datasets. The aggregate scores have been used in this study as there is less loss of information and a higher score indicates an improved outcome. The FWI index consists of annual observations covering the time period 2005-2018.

Other Regression Variables

A set of economic controls are also included in the regression models in order to account for the cross sectional and intertemporal variability in the country and world macroeconomic environment. The controls used in this study are: (1) a country's per capita National Gross Domestic Product (*GDPK*), (2) the one-year lag of a country's inflation (*L1INF*), and (3) the annual 10-year U.S. treasury note nominal interest rate (*US10NIR*). The *GDPK* and inflation data was obtained from (or constructed from) the World Development Indicators (WDI) database compiled by the World Bank. The annual *US10NIR* levels are obtained from the US Federal Reserve.

The variable *GDPK* is included as a measure of a country's overall economic development. GDPK is calculated as a country's per capita gross domestic product (measured in thousands of 2010 U.S. dollars) divided by midyear population. The variable *L1INF* represents the one-year lag of inflation *INF*, as measured by the annual growth rate of the country's GDP implicit price deflator. We use lagged inflation rather than ex-post realized inflation *INF* to instrument the anticipated inflation component of nominal interest rates given that ex-post or realized inflation is not known at the loan origination date. The units of *L1INF* are percentage points. The data contained extremely high inflation rates for some observations (as high as 26740% for one country in one year). As discussed above with respect to nominal interest rates, we experimented with various procedures for dealing with abnormally high inflation rates. We report two sets of robust regression results in the following discussion. Both sets of reported regressions use data with observations deleted when interest or inflation rates exceeded their respective 99.5% quantile levels. Finally we use the 10-year treasury rate (*US10NIR)* to

instrument the world macroeconomic interest rate environment. *US10NIR* is the average annual nominal interest rate for 10-year U.S. Treasury bank notes, given in percentage points.

Summarizing and Examining the Data

Table 1, Figure 1, and Figure 2 present summary statistics and comparative pairs plots of the data used in the regressions. We first discuss Figure 1 which visually contrasts the four institutional indexes. We then proceed to a discussion of the entire set of variables.

EFW, WGI, IEF, and FWI Comparisons

Figure one presents pairs plots of the four institutional indexes as well as correlation information between pairs of variables. The pairs plots present either histograms or data points for a given pair of indexes. The diagonal plots are histograms of the individual indexes. The plots above the diagonal are conventional pairs plots with vertical axes representing the level of the variable listed on the diagonal to the left of the plot and the horizontal axis representing the variable on the diagonal below the plot. The plots below the diagonal are pairwise empirical copula plots[2] with "cupola rank" values ranging between zero and one. Corresponding plots above and below the diagonal plot variable information on the same axes[3]. Headers on the copula plots list the Spearman-rank correlation (SCOR) between the given data pair.

The EFW, WGI, and IEF indexes are positively dependent or "correlated" with Spearman rank correlations varying between 0.744 and 0.848. The EFW index has a small number of

[2] The empirical copula values are constructed by assigning ranks to each observation and dividing each observation's rank by the number of observations N. The resulting values lie between 0 and 1. Pairwise empirical copula plots reveal dependency patterns between variables that are not affected by the scales of the underlying variables and that may not be accurately represented by a single dependency metric such as correlation or Spearman rank correlation.

[3] For example, pairs plots (1,2) and (2,1) respectively plot EFW indexes or "copula ranks" on the vertical axis and WGI data or "copula ranks" on the horizontal axis.

outlying low values relative to the WGI, IEF, and FWI indexes. A visual examination of the histograms indicate that the FWI exhibits greater dispersion and less central tendency than the EFW, WGI, and IEF indexes. The FWI index is also less "correlated" with the other institutional indexes in the lower range of the FWI scores while being positively "correlated" in the upper range of the FWI scores. This is evident in the FWI copula comparison plots, as the pattern of points associated with below-average FWI scores are similar to those from an "independence copula" while the points associated with above-average FWI scores exhibit "positive dependency" patterns with the other institutional indexes. A closer examination of the plots suggests that the FWI data may be a mixture of two data populations. The FWI histogram exhibits an apparent "step" in the frequency counts at an FWI index level between 40 and 50. Looking straight up from the histogram step we see that FWI points to the left of the "step" exhibit low "correlation" relative to the other indexes, while points to the right of the "step" exhibit a positive "correlation" with the other indexes.

Table 1 and Figure 2 present summary statistics and comparative pairs plots of the data used in the regressions. Table 1 contains sub-tables summarizing the regression variables for each of the institutional indexes[4] after deleting interest and inflation levels exceeding their respective 99.5% quantile. The reader will note that even after the 99.5% trimming there is a substantial range of interest and inflation rates with interest rates varying between 0.5% and 97.3%, and lagged inflation levels ranging between -36.57% and 112.69%.

Figure 2 presents comparative pairs and empirical copula plots for all regression variables. The nominal interest rate (NIR) pair-plots in the first row and column indicate mostly negative

[4]A separate table for each index is presented due to the differing number of years involved in a given index's regression.

dependencies between nominal interest rates and the institutional indexes but with clusters of high interest rates for some countries that have below average institutional indexes. The negative relationship between NIR and FWI is not as apparent in plot (1, 5) but is more observable in the corresponding copula plot (5,1) where many of the points appear to lie close to the upper-left to lower-right diagonal[5]. The rank correlation between NIR and FWI of -0.33 also indicates a negative pairwise relationship between NIR and FWI.

The per-capita gross domestic product (GDPK) data exhibits several interesting patterns when contrasted with the other variables. The relationship between nominal interest rates (NIR) and (GDPK) appear to be negative, on average, but with a large positive dispersion of NIR for countries with lower per capita income. The GDPK variable displays several sets of outlying data when contrasted to the institutional variables. GDPK exhibits a greater level of dispersion at higher levels of each the institutional indexes. However, there is a cluster of FWI-GDPK observations with low FWI values and higher GDPK scores. Although not as apparent in the WGI-GDPK and IEF-GDPK levels plots, the empirical copula plots demonstrate that a similar pattern exists with the WGI and IEF data. As discussed later in the paper, the presence of this group of observations may explain why the GDPK variable is not significant in the year-country fixed effect regressions.

Patterns between the lagged inflation variable (L1INF) and other variables are difficult to identify in the levels plots. L1INF exhibits no visually clear pattern in the levels plot (1,7) but

[5] The NIR-FWI comparison demonstrates an advantage of using empirical copula plots to visually examine *dependency* between pairs of variables in that the copula plots are unitless. The resulting copula plots are not influenced by the relative scales or magnitudes of the variables. In practice, we find both type of pairs plots to be valuable as copula plots do not demonstrate potential data outliers as clearly as is demonstrated by the upper-right levels plots.

copula plot (7,1) indicates a positive relationship with a Spearman rank correlation of 0.48. The copula plots indicate that L1INF is negatively related to each of the institutional indexes having Spearman rank correlations from -0.33 to -0.42.

We conclude this discussion by noting two points. Pairs-plot comparisons contain valuable information with respect to possible relationships between variables as well as potential data outliers but they can also be somewhat misleading with respect to higher-order inference and interactions between explanatory variables. The regression technique is a preferable inference mechanism due to its ability to control for joint explanatory variable effects. However, we also note that the levels and statistical significance of the regression's parameter estimates are often sensitive to outlying data observations revealed by pairwise data plots. When running the following regressions we initially used traditional ordinary least squares (OLS) but found that the resulting parameter estimates were sensitive to the procedures used to identify and eliminate outlier data. Leaving the large interest rate and inflation observations in the data set resulted in large, highly significant, but erratic institutional index effect parameter estimates. We found that the regression results were more stable if we used robust regression methods.

Procedures and Results

As stated previously the regression models we use in this study are of the general form[6]:

(2) $NIR_{i,t} = \alpha + \beta_0\, I\_Index_{i,t} + \beta_1 GDPK_{i,t} + \beta_2 L1INF_{i,t} + \beta_3 US10NIR_{i,t} + \epsilon_{it}$

For each of the four institutional indexes, we completed four sets of regressions: (1) a pooled (Pooled) regression, (2) a year fixed-effect (FE_Year) regression, (3) a country fixed-effect

[6] The US10NIR variable is not included in the models with year-fixed effects due to collinearity between the US10NIR and year dummy variables.

(FE_Ctry) regression and (4) a year-country fixed-effect (FE_Year_Ctry) regression. We found that OLS-based parameter estimates were sensitive to the approach used to address outlying observations. We experimented with various procedures for identifying and eliminating outlier observations. When all observations were retained[7], regression results were highly erratic. After extremal observations (with interest and inflation rates exceeding their respective 99% or 99.5% quantile levels) were eliminated, the signs and significance of the OLS parameter estimates were largely consistent with the results reported below but the magnitude of the OLS institutional index parameter estimates varied substantially depending upon the data trimming procedures used. We then estimated the regressions using two robust regression methods. With robust estimation procedures, the parameter estimates were less sensitive to the quantile trimming percentages applied to the interest rate and inflation variables. The results reported below are robust regression results after trimming at the 99.5 percentile.

We estimated the parameters using two robust regression techniques that have been implemented in R: (1) the robust linear model (*rlm*) and (2) quantile regression[8]. The *rlm* function is available in the *MASS* R package created by Venabels and Ripley (2002). As the *rlm* implementation in R does not provide p-value information, we used the *f.robtest* function in the *sfsmisc* R package created by Machler (2020) to obtain p-value estimates for the *rlm* parameters. The *f.robtest* function calculates p-values utilizing an F-statistic and F-test for each variable. As a result, we report the F statistic and required degrees of freedom in the *rlm*-based regression result tables.

[7] As reported earlier, the data had interest rate and inflation rate observations as high as 4775% and 26740% respectively.

[8] All data and R code used in this study are available from the authors upon request.

As a "robustness check" of the *rlm* results, we also estimated the models using quantile regression (Koenker (2001)) and the *Quantreg* R package created by Koenker (2019). In the following, we primarily discuss results from the *rlm* regressions but also provide tables with standardized quantile regression results for comparison purposes. We also present and discuss quantile regression results examining the sensitivity of interest rates to institutional index shocks at several interest rate quantiles.

Results

Table 2 presents four sets of *rlm* regression results, one for each of the institutional indexes EFW, WGI, IEF, and FWI. The sub-tables in Table 2 present the *rlm* parameter estimates, each parameter's *f.robtest* Robust Wald F statistic (in square brackets), the number of observations, and the degrees of freedom for the parameters' F-tests. Parameter estimate significance is indicated with the conventional "star" notation.

The results presented in Table 2 indicate that the institutional index parameters have the expected negative sign for all regressions and for all institutional indexes implying that higher levels of institutional development are associated with lower nominal interest rates. The institutional parameter estimates are significant at the 5% level or lower across all model specifications with the exception of the 10% significance level for the EFW year-country fixed effects regression.

In the majority of models, the *GDPK* parameter is negative indicating that countries with lower per-capita gross domestic product tend to have higher interest rates. However, *with year and country fixed effects*, the GDPK variable is not statistically significantly related to interest

rates in any regression. As discussed previously, this is likely a consequence of the cluster of high GDPK-low institutional index observations.

The inflation parameter *L1INF* estimates have the expected positive sign and are significant in all regressions indicating that countries with a higher recent inflation history have higher nominal interest rates. The *US10NIR* parameter in the pooled and country-fixed defects models[9] have the expected positive sign and are significant in all but the IEF institution regressions where the *US10NIR* parameters are not statistically significant[10].

The results in Table 2 provide evidence that higher levels of the institutional indexes are negatively and statistically significantly associated with lower nominal interest rates. However, due to the differing scales of the institutional indexes, the magnitude of parameter estimates in Table 2 are not directly comparable - either within or across models. To obtain comparable parameter estimates we completed additional sets of regressions using traditional standardized regressors. For example a standardized EFW index variable $zEFW$ was constructed as:

$$(3)\ zEFW = \frac{EFW - mean(EFW)}{sd(EFW)}$$

where mean() and sd() stand for sample average and sample standard deviation respectively.

The same standardization process was applied to all variables except the fixed-effect dummy variables.

[9] The US10NIR variable is not included in the year fixed effect models. The year "dummy variables" and US10NIR are collinear given that the US10NIR observations are identical across all countries in a given year.

[10] The lack of US10NIR in the IEF regression results may result from the lower variability in recent US10NIR rates as a result of US stimulatory policy.

The standardized regression results presented in Tables 3 and 4 respectively present *rlm* and quantile regression interest rate standard deviation response estimates with respect to one standard deviation changes in the independent variables. The signs and significance levels are consistent with the Table 2 results but the magnitude of the institutional index parameter estimates are now comparable within and across institutional models. An examination of Tables 3 and 4 reveal that all institutional parameter estimates are now comparable in magnitude and are negative and statistically significant indicating that higher levels of the institutional index is associated with lower interest rates. The WGI index appears to be the best predictor of nominal interest rates as a one standard deviation change in the WGI is associated with an 7.4% to 16.1% difference in the standard deviation of nominal interest rates. The magnitude of the nominal interest rate-institutional index response is similar for the IEF and FWI models ranging from 5.8% to 10.5%.

All models in Tables 3 and 4 are robust and exhibit a similar pattern with respect to the effects of the lagged inflation variable. For the pooled and year fixed effect models, the lagged inflation variable is significant and in the 20% range across all institutional index models. The introduction of country fixed effects allow each country's intercept to incorporate average country level interest rates to be incorporated into the country's intercept. The year-country fixed effect results imply that, with the exception of the EFW index, a one-standard deviation shock or change in a country's institutional environment index has a larger effect than a one standard deviation shock in a country's inflation rate.

To examine the robustness of these results for countries with higher interest rates, we estimated a set of quantile regressions at various quantiles of the country level interest rates. Table 5 presents the results of quantile regressions at the 75% quantile of interest rates. The

EFW and WGI results indicate that a one standard deviation change in the institutional index has a greater effect upon interest rates in country's with higher-than-average interest rates[11]. The 75% quantile results are largely unchanged for the IEF index. Paradoxically, the 75% quantile estimates are less responsive to FWI shocks than the 50% quantile results. We believe that this is likely due to the anomalous structure of the "lower than average" FWI scores as noted in our discussion of Figures 1 and 2.

Summary and Conclusions

In this paper we have examined the relationships between four different but commonly used country level institutional metrics (EFW, WGI, IEF, and FWI) and the relationships of the institutional metrics with country level private lending rates.

When contrasting the institutional development metrics we found that the EFW, WGI, and IEF metrics were largely consistent but that anomalies exist between FWI and other indices. When contrasting the FWI with the other indexes, we found a positive relationship between "above average" FWI values and the values of the other three indexes. However, there is no observable relationship between the FWI and other institutional index values for countries with "below average" FWI values. The magnitude of the observed anomalies raise questions as to the usefulness or reliability of the FWI index.

Several sets of robust regressions indicate that that higher levels of institutional development metrics are associated with lower domestic lending rates and that the negative relationship between institutional indexes and domestic interest rates is stronger for countries with higher interest rates. With year and country fixed effects, the relationship between changes in a

[11] The index responses were even higher with the 90% interest rate quantile.

country's institutional framework have non-trivial effect upon a country's domestic interest rates exceeding the effects of shocks in inflation upon nominal interest rates.

As stated in the paper's introduction, assessing the reasons for differences in country level economic performance is a complicated endeavor. We posit that an important factor is likely to be sustained internal private investment. The level of internal private investment is likely to be determined by numerous factors including the costs of domestic borrowing i.e. domestic borrowing interest rates. To the extent that a country's institutional setting leads to substantive increases in a country's domestic lending rate, the institutional environment and the resulting higher domestic borrowing rates will make sustainable internal investment more difficult.

Conversely, we have shown that improvements in a country's institutional metrics (especially the EFW or the WGI metrics) are associated with lower domestic costs of borrowing making sustained domestic investment less costly. We posit that if a poorly performing country's leadership wishes to improve their country's economic performance, examining and attempting to improve the institutional components included in the WGI and EFW metrics could be valuable.

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Figure 1: Pairs Plot of Institutional Indexes.

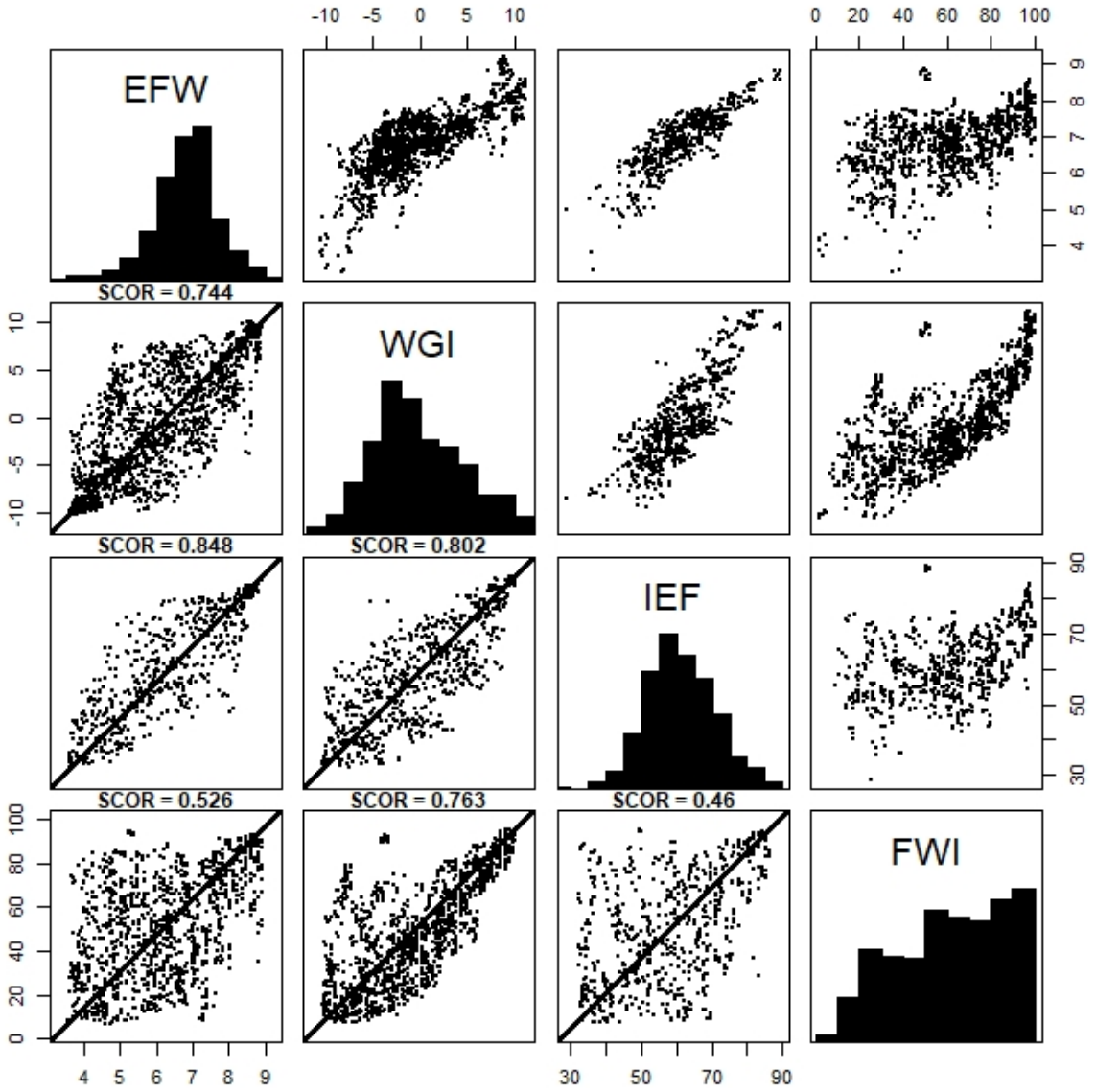
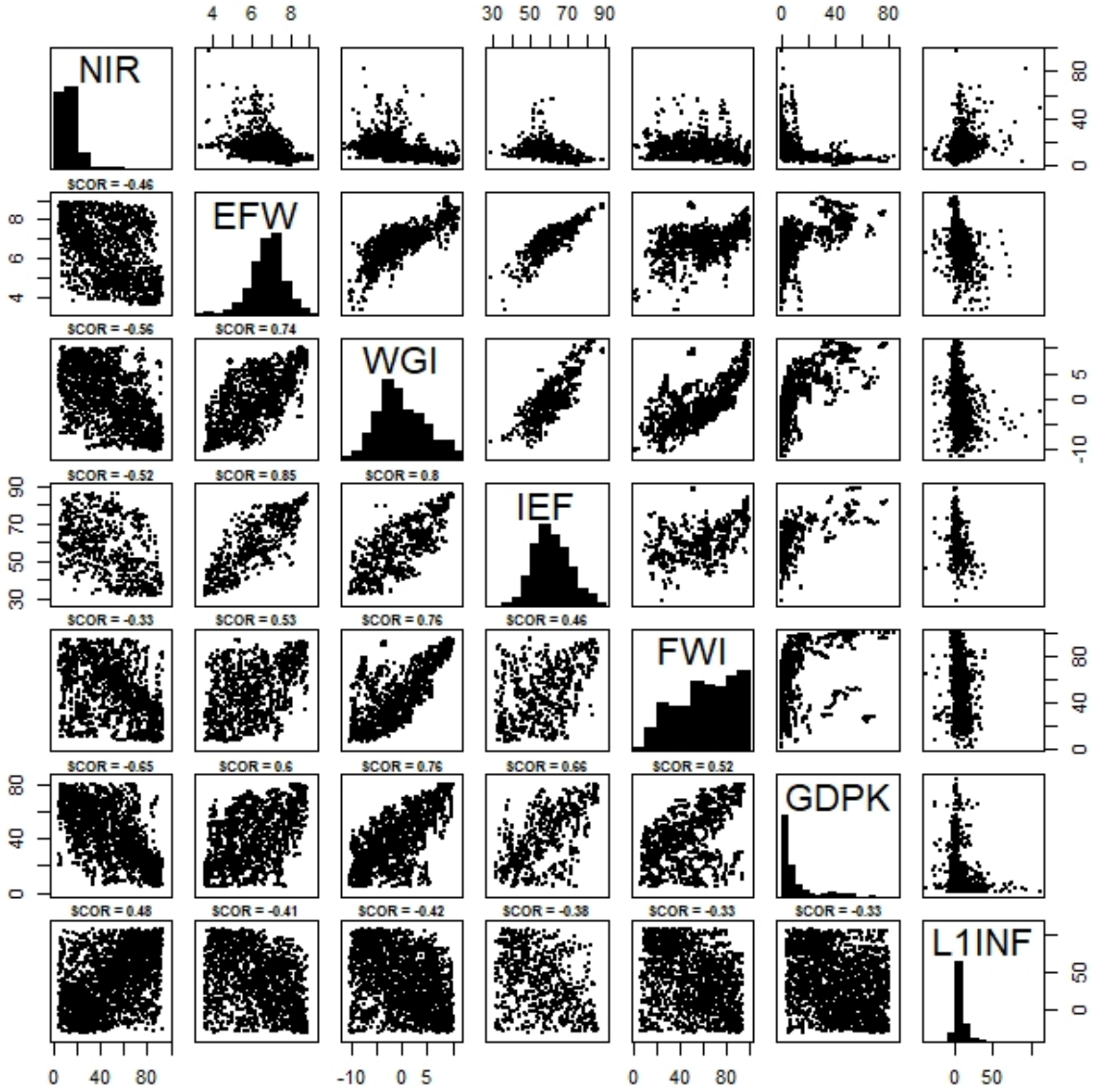


Figure 2: Pairs Plot of Regression Variables.



Note: The plot does not contain the US10NIR variable as the US10NIR variable is constant across all countries in a given year.

Table 1: Data Summary Statistics by Institutional Index

			EFW				
Variable	Min	Q25	Median	Mean	Stdev	Q75	Max
EFW	3.28	6.30	6.88	6.81	0.89	7.35	9.19
NIR	0.50	7.26	11.61	13.56	9.76	16.98	97.29
GDPK	0.21	1.87	4.83	11.63	15.35	13.37	77.45
L1INF	-36.57	2.09	4.96	6.71	8.60	9.18	73.84
US10NIR	1.78	2.27	3.30	3.30	1.09	4.25	5.12
yr	2000	2005	2009	2009	5.056	2013	2017
			WGI				
Variable	Min	Q25	Median	Mean	Stdev	Q75	Max
WGI	-11.41	-3.59	-0.99	-0.16	4.79	3.18	11.17
NIR	0.50	7.47	10.89	12.73	8.41	15.83	82.33
GDPK	0.20	1.87	4.88	11.19	15.09	12.49	78.82
L1INF	-27.63	1.98	4.64	6.63	9.20	8.85	112.69
US10NIR	1.78	2.27	3.04	3.16	0.96	4.04	4.71
yr	2002	2006	2010	2009.88	4.776	2014	2018
			IEF				
Variable	Min	Q25	Median	Mean	Stdev	Q75	Max
IEF	28.60	54.60	60.80	61.28	9.60	67.70	89.40
NIR	0.50	6.38	10.10	11.34	7.33	14.22	56.72
GDPK	0.21	2.10	4.87	11.51	16.31	11.37	78.82
L1INF	-36.57	1.65	3.64	4.90	6.47	6.93	40.28
US10NIR	1.78	2.17	2.40	2.39	0.38	2.69	3.04
yr	2012	2013	2015	2014.87	1.976	2017	2018
			FWI				
Variable	Min	Q25	Median	Mean	Stdev	Q75	Max
FWI	2.00	42.00	64.00	62.23	24.93	83.00	100.00
NIR	0.50	7.50	10.75	12.30	7.64	15.48	58.98
GDPK	0.21	1.91	4.86	11.33	15.72	11.95	84.56
L1INF	-36.57	2.00	4.68	6.27	7.54	9.05	41.12
US10NIR	1.78	2.25	2.69	2.96	0.94	3.85	4.71
yr	2005	2008	2011	2011.31	3.957	2015	2018

Table 2: Robust LM Regression Results by Institutional Index

	EFW Regression Results			
Variable	Pooled	FE_Year	FE_Ctry	FE_Year_Ctry
EFW	-0.459**	-0.417**	-0.853***	-0.333*
	[6.337]	[5.097]	[19.253]	[3.262]
GDPK	-0.188***	-0.188***	-0.123***	0.056
	[363.727]	[357.569]	[12.572]	[2.629]
L1INF	0.227***	0.24***	0.079***	0.058***
	[181.741]	[178.265]	[87.161]	[48.014]
US10NIR	0.708***	NA	0.889***	NA
	[36.334]	NA	[235.861]	NA
N	1664	1664	1664	1664
[F-stat] dof1	1	1	1	1
[F-stat] dof2	1659	1643	1549	1533
Robust Wald Test Significance -- *(10%), **(5%), ***(1%)				

	WGI Regression Results			
Variable	Pooled	FE_Year	FE_Ctry	FE_Year_Ctry
WGI	-0.258***	-0.26***	-0.193***	-0.206***
	[67.358]	[67.252]	[14.042]	[18.042]
GDPK	-0.128***	-0.125***	-0.06***	0.025
	[181.841]	[173.07]	[8.321]	[1.532]
L1INF	0.184***	0.192***	0.057***	0.042***
	[206.464]	[203.201]	[86.135]	[47.668]
US10NIR	0.518***	NA	0.634***	NA
	[24.144]	NA	[204.799]	NA
N	2008	2008	2008	2008
[F-stat] dof1	1	1	1	1
[F-stat] dof2	2003	1988	1877	1862
Robust Wald Test Significance -- *(10%), **(5%), ***(1%)				

	IEF Regression Results			
Variable	Pooled	FE_Year	FE_Ctry	FE_Year_Ctry
IEF	-0.056**	-0.054**	-0.08***	-0.057***
	[5.967]	[5.543]	[15.472]	[7.68]
GDPK	-0.128***	-0.127***	-0.096**	-0.066
	[97.516]	[96.689]	[5.697]	[2.645]
L1INF	0.263***	0.281***	0.026***	0.021**
	[86.957]	[91.842]	[8.626]	[4.904]
US10NIR	0.147	NA	-0.181	NA
	[0.115]	NA	[2.582]	NA
N	711	711	711	711
[F-stat] dof1	1	1	1	1
[F-stat] dof2	706	701	596	591
Robust Wald Test Significance -- *(10%), **(5%), ***(1%)				

	FWI Regression Results			
Variable	Pooled	FE_Year	FE_Ctry	FE_Year_Ctry
FWI	-0.018***	-0.018***	-0.022**	-0.03***
	[13.031]	[13.146]	[5.181]	[11.184]
GDPK	-0.159***	-0.158***	-0.042	0.008
	[431.975]	[430.098]	[2.65]	[0.123]
L1INF	0.213***	0.214***	0.057***	0.03***
	[175.782]	[156.22]	[68]	[17.831]
US10NIR	0.317***	NA	0.518***	NA
	[6.829]	NA	[129.45]	NA
N	1613	1613	1613	1613
[F-stat] dof1	1	1	1	1
[F-stat] dof2	1608	1596	1485	1473
Robust Wald Test Significance -- *(10%), **(5%), ***(1%)				

Table 3: Standardized Variable Robust Regression Results by Institutional Index

	EFW Regression Results			
Variable	Pooled	FE_Year	FE_Ctry	FE_Year_Ctry
zEFW	-0.042**	-0.038**	-0.078***	-0.03*
	[6.337]	[5.097]	[19.253]	[3.262]
zGDPK	-0.296***	-0.296***	-0.193***	0.088
	[363.727]	[357.569]	[12.572]	[2.629]
zL1INF	0.2***	0.212***	0.069***	0.051***
	[181.741]	[178.265]	[87.161]	[48.014]
zUS10NIR	0.079***	NA	0.099***	NA
	[36.334]	NA	[235.861]	NA
N	1664	1664	1664	1664
[F-stat] dof1	1	1	1	1
[F-stat] dof2	1659	1643	1549	1533
Robust Wald Test Significance -- *(10%), **(5%), ***(1%)				

	WGI Regression Results			
Variable	Pooled	FE_Year	FE_Ctry	FE_Year_Ctry
zWGI	-0.147***	-0.148***	-0.11***	-0.117***
	[67.358]	[67.252]	[14.042]	[18.042]
zGDPK	-0.229***	-0.225***	-0.108***	0.045
	[181.841]	[173.07]	[8.321]	[1.532]
zL1INF	0.201***	0.209***	0.062***	0.046***
	[206.464]	[203.201]	[86.135]	[47.668]
zUS10NIR	0.059***	NA	0.073***	NA
	[24.144]	NA	[204.799]	NA
N	2008	2008	2008	2008
[F-stat] dof1	1	1	1	1
[F-stat] dof2	2003	1988	1877	1862
Robust Wald Test Significance -- *(10%), **(5%), ***(1%)				

	IEF Regression Results			
Variable	Pooled	FE_Year	FE_Ctry	FE_Year_Ctry
zIEF	-0.073**	-0.07**	-0.105***	-0.075***
	[5.967]	[5.543]	[15.472]	[7.68]
zGDPK	-0.284***	-0.282***	-0.214**	-0.146
	[97.516]	[96.689]	[5.697]	[2.645]
zL1INF	0.232***	0.249***	0.023***	0.018**
	[86.957]	[91.842]	[8.626]	[4.904]
zUS10NIR	0.008	NA	-0.009	NA
	[0.115]	NA	[2.582]	NA
N	711	711	711	711
[F-stat] dof1	1	1	1	1
[F-stat] dof2	706	701	596	591
Robust Wald Test Significance -- *(10%), **(5%), ***(1%)				

	FWI Regression Results			
Variable	Pooled	FE_Year	FE_Ctry	FE_Year_Ctry
zFWI	-0.058***	-0.058***	-0.071**	-0.099***
	[13.031]	[13.146]	[5.181]	[11.184]
zGDPK	-0.326***	-0.325***	-0.086	0.017
	[431.975]	[430.098]	[2.65]	[0.123]
zL1INF	0.21***	0.212***	0.056***	0.03***
	[175.782]	[156.22]	[68]	[17.831]
zUS10NIR	0.039***	NA	0.063***	NA
	[6.829]	NA	[129.45]	NA
N	1613	1613	1613	1613
[F-stat] dof1	1	1	1	1
[F-stat] dof2	1608	1596	1485	1473
Robust Wald Test Significance -- *(10%), **(5%), ***(1%)				

Table 4: Standardized Quantile Regression Results by Institutional Index – 50% Quantile

EFW Regression Results				
Variable	OLS	FE_Year	FE_Ctry	FE_Year_Ctry
zEFW	-0.034**	-0.04**	-0.063***	-0.024*
	(0.014)	(0.018)	(0.014)	(0.013)
zGDPK	-0.278***	-0.273***	-0.154***	0.13***
	(0.014)	(0.017)	(0.048)	(0.046)
zL1INF	0.208***	0.212***	0.057***	0.038***
	(0.013)	(0.016)	(0.006)	(0.005)
zUS10NIR	0.064***	NA	0.078***	NA
	(0.012)	NA	(0.005)	NA
N	1664	1664	1664	1664
tau	0.5	0.5	0.5	0.5
Significance -- *(10%), **(5%), ***(1%)				

WGI Regression Results				
Variable	OLS	FE_Year	FE_Ctry	FE_Year_Ctry
zWGI	-0.152***	-0.161***	-0.074***	-0.102***
	(0.016)	(0.017)	(0.025)	(0.022)
zGDPK	-0.205***	-0.2***	-0.078**	0.017
	(0.016)	(0.016)	(0.035)	(0.031)
zL1INF	0.192***	0.194***	0.049***	0.034***
	(0.012)	(0.012)	(0.005)	(0.005)
zUS10NIR	0.054***	NA	0.062***	NA
	(0.011)	NA	(0.005)	NA
N	2008	2008	2008	2008
tau	0.5	0.5	0.5	0.5
Significance -- *(10%), **(5%), ***(1%)				

IEF Regression Results				
Variable	OLS	FE_Year	FE_Ctry	FE_Year_Ctry
zIEF	-0.067**	-0.082**	-0.067***	-0.043*
	(0.031)	(0.035)	(0.022)	(0.024)
zGDPK	-0.234***	-0.227***	-0.139*	-0.089
	(0.029)	(0.034)	(0.077)	(0.085)
zL1INF	0.254***	0.26***	0.024***	0.018**
	(0.024)	(0.029)	(0.006)	(0.007)
zUS10NIR	0.03	NA	-0.005	NA
	(0.023)	NA	(0.005)	NA
N	711	711	711	711
tau	0.5	0.5	0.5	0.5
Significance -- *(10%), **(5%), ***(1%)				

FWI Regression Results				
Variable	OLS	FE_Year	FE_Ctry	FE_Year_Ctry
zFWI	-0.096***	-0.098***	-0.067**	-0.085***
	(0.016)	(0.015)	(0.027)	(0.025)
zGDPK	-0.303***	-0.298***	-0.126***	-0.009
	(0.016)	(0.015)	(0.045)	(0.043)
zL1INF	0.211***	0.212***	0.046***	0.02***
	(0.016)	(0.016)	(0.006)	(0.006)
zUS10NIR	0.031**	NA	0.054***	NA
	(0.015)	NA	(0.005)	NA
N	1613	1613	1613	1613
tau	0.5	0.5	0.5	0.5
Significance -- *(10%), **(5%), ***(1%)				

Table 5: Standardized Quantile Regression Results by Institutional Index – 75% Quantile

	EFW Regression Results			
Variable	OLS	FE_Year	FE_Ctry	FE_Year_Ctry
zEFW	-0.102***	-0.065*	-0.126***	-0.068***
	-0.033	-0.034	-0.018	-0.012
zGDPK	-0.318***	-0.323***	-0.187***	0.119***
	-0.031	-0.033	-0.061	-0.042
zL1INF	0.277***	0.335***	0.073***	0.044***
	-0.028	-0.031	-0.007	-0.005
zUS10NIR	0.089***	NA	0.094***	NA
	-0.026	NA	-0.007	NA
N	1664	1664	1664	1664
tau	0.75	0.75	0.75	0.75
Significance -- *(10%), **(5%), ***(1%)				

	WGI Regression Results			
Variable	OLS	FE_Year	FE_Ctry	FE_Year_Ctry
zWGI	-0.262***	-0.223***	-0.136***	-0.145***
	-0.031	-0.033	-0.032	-0.023
zGDPK	-0.199***	-0.209***	-0.089**	0.067**
	-0.03	-0.032	-0.044	-0.032
zL1INF	0.272***	0.299***	0.064***	0.042***
	-0.022	-0.024	-0.007	-0.005
zUS10NIR	0.067***	NA	0.071***	NA
	-0.021	NA	-0.006	NA
N	2008	2008	2008	2008
tau	0.75	0.75	0.75	0.75
Significance -- *(10%), **(5%), ***(1%)				

	IEF Regression Results			
Variable	POOLED	FE_Year	FE_Ctry	FE_Year_Ctry
zIEF	-0.065*	-0.044	-0.061***	-0.04**
	-0.035	-0.042	-0.019	-0.018
zGDPK	-0.299***	-0.306***	-0.068	-0.102
	-0.033	-0.04	-0.069	-0.063
zL1INF	0.23***	0.261***	0.025***	0.003
	-0.027	-0.034	-0.006	-0.005
zUS10NIR	0.003	NA	-0.001	NA
	-0.026	NA	-0.004	NA
N	711	711	711	711
tau	0.75	0.75	0.75	0.75
Significance -- *(10%), **(5%), ***(1%)				

	FWI Regression Results			
Variable	POOLED	FE_Year	FE_Ctry	FE_Year_Ctry
zFWI	-0.197***	-0.173***	0.014	-0.046*
	-0.03	-0.022	-0.033	-0.025
zGDPK	-0.309***	-0.315***	-0.06	-0.021
	-0.03	-0.021	-0.055	-0.043
zL1INF	0.255***	0.289***	0.057***	0.035***
	-0.029	-0.022	-0.007	-0.006
zUS10NIR	0.064**	NA	0.061***	NA
	-0.028	NA	-0.006	NA
N	1613	1613	1613	1613
tau	0.75	0.75	0.75	0.75
Significance -- *(10%), **(5%), ***(1%)				