

Financial Intermediation and Growth: Causality and Causes*

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Additional Tables and Figures

Figure 4: Partial Scatter Plot of Growth vs Commercial-Central Bank

Discussion:

As shown in Figure 4, which follows this page, the relationship between Growth and Commercial-Central Bank is not as smooth as the relationship between Growth and Private Credit. In particular, Haiti's level of financial development is much less than predicted by its country characteristics. Nonetheless, removing Haiti increases the estimated coefficient on Commercial-Central Bank to 13.4 without changing its t-statistic (3.35). Also, when removing other potential outliers such as Korea, Niger, and Peru, the results are not substantively changed (coefficient estimate of 9.6 on Commercial-Central Bank and a t-statistic of 2.44). We also examined the GMM residuals. We found that Niger, Honduras, Jamaica, Korea, Mauritius, Pakistan, Senegal, and Taiwan are more than two-standard deviations away from zero. Removing these countries produces an estimated coefficient of 7.71 on Commercial-Central Bank, with a t-statistic of 2.92, and the regression passes the battery of diagnostic tests discussed in the text.

Figure 5: Partial Scatter Plot of Growth vs Liquid Liabilities

Discussion:

The relationship between Growth and Liquid Liabilities, which is illustrated on the next page, suggests a strong relationship without the huge outlier (Haiti) that was observed in Figure 4 with Commercial-Central Bank. The partial scatter plot points to Niger and Korea as potential outliers. Removing these countries, however, does not affect the results (The new coefficient estimate on Liquid Liabilities is 2.24 and it enters with a t-statistic of 2.71). Similarly, when using the GMM residual criteria, Korea, Jamaica, Switzerland, Taiwan, and Zaire fall more than two standard deviations away from zero. Removing these countries produces a coefficient estimate of 2.63 on Liquid Liabilities, with a t-statistic of 4.24, and the regression passes the diagnostic tests specified in the paper.

Figure 4: Partial Scatter Plot of Growth vs Commercial-Central Bank

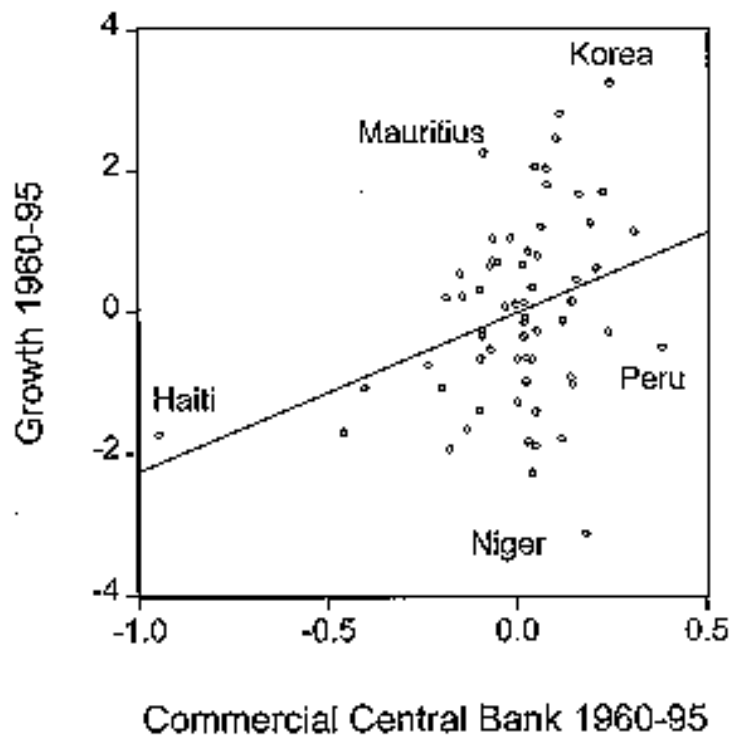
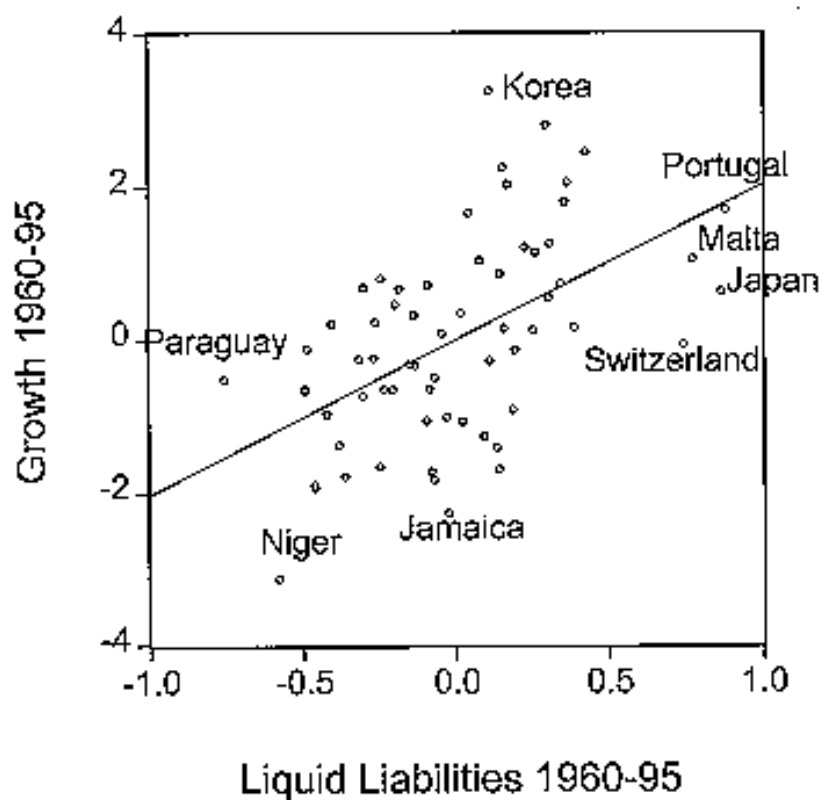


Figure 5: Partial Scatter Plot of Growth vs Liquid Liabilities



Extra Sensitivity Checks on: Financial Intermediation and Growth: Causality and Causes

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Table I: Financial Intermediation and Growth: Cross-Section Regressions; Expanded Instruments

Dependent variable: Real Per Capita GDP Growth, 1960-95

Original Instrumental variables: Legal Origin Dummy variables

Extra instruments: Percent of population Protestant, Catholic, and Muslim respectively; ethnic diversity; and latitude

full conditioning information set

Explanatory Variable	coefficient	standard error	t-statistic	P-value	Number of Observations	J-Statistic	Hansen-test OIR
PRIVATE CREDIT	3.621	0.827	4.378	0.000	62	0.12	7.69
COMMERCIAL-CENTRAL BANK	7.428	2.260	3.286	0.002	62	0.20	12.52
LIQUID LIABILITIES	3.050	0.668	4.562	0.000	62	0.13	8.32

Critical values for Hansen-Test Over Identifying Restrictions (6 d.f.): 10% 10.64; 5%=12.59

Note: Regressions use full conditioning information set. Similar results obtain with simple and policy sets.

Note: Using different combinations of the religion, latitude, and ethnic diversity instruments did not change the results

Simple conditioning information set: logarithm of initial income per capita and schooling

Policy conditioning information set: simple set, plus government size, inflation, black market premium, and openness to trade.

Full conditioning information set: policy set, plus indicators of revolutions and coups, political assassinations, and ethnic diversity.

LIQUID LIABILITIES = liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP, times 100.

COMMERCIAL-CENTRAL BANK = assets of deposit money banks divided by assets of deposit money banks plus central bank assets, times 100.

PRIVATE CREDIT = credit by deposit money banks and other financial institutions to the private sector divided by GDP, times 100.

Table II: Financial Intermediation and Growth: Cross-Section Regressions, 1960-95

Dependent variable: Real Per Capita GDP Growth, 1960-95

Instrumental variables: Legal Environment variables (CREDITOR, ENFORCE, & ACCOUNT)

Regression #1: simple conditioning information set

Explanatory Variable	coefficient	standard error	t-statistic	P-value	Number of Observations	J-Statistic	Hansen-test OIR
PRIVATE CREDIT	2.097	0.298	7.032	0.000	35	0.08	2.80
COMMERCIAL-CENTRAL BANK	12.734	4.686	2.718	0.011	35	0.07	2.56
LIQUID LIABILITIES	2.935	0.499	5.887	0.000	35	0.04	1.41

Regression #2: full conditioning information set

Explanatory Variable	coefficient	standard error	t-statistic	P-value	Number of Observations	J-Statistic	Hansen-test OIR
PRIVATE CREDIT	3.325	0.852	3.903	0.001	35	0.03	2.33
COMMERCIAL-CENTRAL BANK	8.400	5.008	1.677	0.107	35	0.08	3.31
LIQUID LIABILITIES	2.734	0.802	3.410	0.002	35	0.10	2.73

Critical values for Hansen-Test Over Identifying Restrictions (2 d.f.): 10% 4.61; 5%=5.99

Simple conditioning information set: logarithm of initial income per capita and schooling

Full conditioning information set: simple set, plus government size, inflation, black market premium, and openness to trade, and indicators of revolutions and coups, political assassinations, and ethnic diversity.

LIQUID LIABILITIES = liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP, times 100.

COMMERCIAL-CENTRAL BANK = assets of deposit money banks divided by assets of deposit money banks plus central bank assets, times 100.

PRIVATE CREDIT = credit by deposit money banks and other financial institutions to the private sector divided by GDP, times 100.

CREDITOR = index of secured creditor rights.

ENFORCE = index of law and contract enforcement.

ACCOUNT = index of the comprehensiveness and quality of company reports

Table III: Financial Intermediation and Growth: Cross-Section Regressions, Controlling for other variables**Dependent variable: Real Per Capita GDP Growth, 1960-95****Instrumental variables: Legal Origin Dummy variables***full conditioning information set + corruption*

Explanatory Variable	coefficient	standard error	t-statistic	P-value	Number of Observations	J-Statistic	Hansen-test OIR
PRIVATE CREDIT	2.833	1.040	2.724	0.009	61	0.06	3.85
COMMERCIAL-CENTRAL BANK	11.289	3.258	3.465	0.001	61	0.03	1.54
LIQUID LIABILITIES	2.723	0.845	3.222	0.002	61	0.04	2.47

full conditioning information set + state owned enterprise role in the economy

Explanatory Variable	coefficient	standard error	t-statistic	P-value	Number of Observations	J-Statistic	Hansen-test OIR
PRIVATE CREDIT	2.504	0.847	2.958	0.005	60	0.02	1.14
COMMERCIAL-CENTRAL BANK	9.575	2.813	3.403	0.001	60	0.00	0.02
LIQUID LIABILITIES	2.091	0.798	2.621	0.012	60	0.02	0.98

full conditioning information set + property rights index

Explanatory Variable	coefficient	standard error	t-statistic	P-value	Number of Observations	J-Statistic	Hansen-test OIR
PRIVATE CREDIT	1.960	0.949	2.066	0.044	59	0.06	3.57
COMMERCIAL-CENTRAL BANK	12.328	6.800	1.813	0.076	59	0.01	0.86
LIQUID LIABILITIES	2.389	0.820	2.912	0.006	59	0.04	2.55

full conditioning information set + business regulation index

Explanatory Variable	coefficient	standard error	t-statistic	P-value	Number of Observations	J-Statistic	Hansen-test OIR
PRIVATE CREDIT	2.197	0.861	2.551	0.014	59	0.08	4.52
COMMERCIAL-CENTRAL BANK	10.367	3.359	3.086	0.003	59	0.02	0.91
LIQUID LIABILITIES	2.807	0.979	2.869	0.006	59	0.05	3.06

Critical values for Hansen-Test Over Identifying Restrictions (2 d.f.): 10% 4.61; 5%=5.99

Full conditioning information set: policy set, plus indicators of revolutions and coups, political assassinations, and ethnic diversity.

LIQUID LIABILITIES = liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP, times 100.

COMMERCIAL-CENTRAL BANK = assets of deposit money banks divided by assets of deposit money banks plus central bank assets, times 100.

PRIVATE CREDIT = credit by deposit money banks and other financial institutions to the private sector divided by GDP, times 100.

Note: Similar results obtain with the simple and policy conditioning information sets.

Table IV: Financial Intermediation and Growth: Cross-Section Regressions, Controlling for other variables**Dependent variable: Real Per Capita GDP Growth, 1960-95****Instrumental variables: Legal Origin Dummy variables***full conditioning information set + bureaucratic efficiency*

Explanatory Variable	coefficient	standard error	t-statistic	P-value	Number of Observations	J-Statistic	Hansen-test OIR
PRIVATE CREDIT	2.063	0.740	2.786	0.010	38	0.04025	1.53
COMMERCIAL-CENTRAL BANK	7.446	3.302	2.255	0.033	38	0.11767	4.47
LIQUID LIABILITIES	2.548	0.993	2.566	0.016	38	0.03014	1.15

full conditioning information set + risk of expropriation by government

Explanatory Variable	coefficient	standard error	t-statistic	P-value	Number of Observations	J-Statistic	Hansen-test OIR
PRIVATE CREDIT	1.506	0.657	2.294	0.029	42	0.03	1.14
COMMERCIAL-CENTRAL BANK	5.330	2.231	2.390	0.023	42	0.02	0.85
LIQUID LIABILITIES	1.685	0.753	2.237	0.033	42	0.01	0.39

full conditioning information set + rule of law index

Explanatory Variable	coefficient	standard error	t-statistic	P-value	Number of Observations	J-Statistic	Hansen-test OIR
PRIVATE CREDIT	1.817	0.591	3.075	0.005	42	0.05	1.93
COMMERCIAL-CENTRAL BANK	6.899	2.223	3.103	0.004	42	0.04	1.66
LIQUID LIABILITIES	2.317	0.763	3.036	0.005	42	0.01	0.34

full conditioning information set + accounting standards

Explanatory Variable	coefficient	standard error	t-statistic	P-value	Number of Observations	J-Statistic	Hansen-test OIR
PRIVATE CREDIT	2.089	0.540	3.866	0.001	36	0.03	1.23
COMMERCIAL-CENTRAL BANK	8.967	2.656	3.377	0.003	36	0.08	2.94
LIQUID LIABILITIES	2.941	0.926	3.176	0.004	36	0.00	0.01

Critical values for Hansen-Test Over Identifying Restrictions (2 d.f.): 10% 4.61; 5%=5.99

Full conditioning information set: policy set, plus indicators of revolutions and coups, political assassinations, and ethnic diversity.

LIQUID LIABILITIES = liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP, times 100.

COMMERCIAL-CENTRAL BANK = assets of deposit money banks divided by assets of deposit money banks plus central bank assets, times 100.

PRIVATE CREDIT = credit by deposit money banks and other financial institutions to the private sector divided by GDP, times 100.

Note: Similar results obtain with the simple and policy conditioning information sets.

Table V: Financial Intermediation and Growth:1960-95, Initial Values

Ordinary Least Squares

Dependent variable: Real Per Capita GDP Growth, 1960-95

Financial Variables measured in 1960

simple conditioning information set

Explanatory Variable	coefficient	standard error	t-statistic	P-value	countries
PRIVATE CREDIT	0.691	0.299	2.315	0.025	57
COMMERCIAL-CENTRAL BANK	1.359	0.475	2.863	0.006	57
LIQUID LIABILITIES	1.118	0.399	2.799	0.007	57

Financial Variables measured in 1960

simple conditioning information, plus religion, legal origin, ethnic diversity, geographical latitude

Explanatory Variable	coefficient	standard error	t-statistic	P-value	countries
PRIVATE CREDIT	0.512	0.210	2.442	0.019	56
COMMERCIAL-CENTRAL BANK	0.989	0.277	3.564	0.001	56
LIQUID LIABILITIES	0.748	0.286	2.615	0.012	56

Simple conditioning information set: logarithm of initial income per capita and schooling

In expanded conditioning information, we add the LaPorta et al (1998b) exogenous variables.

Specifically: religious composition (protestant, catholic, muslim), legal origin, ethnic diversity, and distance from the equator.

LIQUID LIABILITIES = liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP, times 100.

COMMERCIAL-CENTRAL BANK = assets of deposit money banks divided by assets of deposit money banks plus central bank assets, times 100.

PRIVATE CREDIT = credit by deposit money banks and other financial institutions to the private sector divided by GDP, times 100.

Note: Each of these financial variables is measured in 1960. Growth is measured from 1960-1995.

Table VI: Financial Intermediation and Growth: Cross-Section Regressions; Alternative Samples of Countries

Dependent variable: Real Per Capita GDP Growth, 1960-95

Original Instrumental variables: Legal Origin Dummy variables

A. Excluding Sub-Saharan African Countries

full conditioning information set

Explanatory Variable	coefficient	standard error	t-statistic	P-value	Number of Observations	J-Statistic	LM-test OIR
PRIVATE CREDIT	2.701	0.878	3.076	0.004	54	0.01	0.62
COMMERCIAL-CENTRAL BANK	9.179	2.356	3.896	0.000	54	0.00	0.00
LIQUID LIABILITIES	1.971	0.847	2.328	0.025	54	0.04	2.34

B. Excluding East Asian Countries

full conditioning information set

Explanatory Variable	coefficient	standard error	t-statistic	P-value	Number of Observations	J-Statistic	LM-test OIR
PRIVATE CREDIT	2.597	1.249	2.080	0.043	58	0.02	1.02
COMMERCIAL-CENTRAL BANK	9.412	3.819	2.464	0.017	58	0.00	0.28
LIQUID LIABILITIES	1.889	0.845	2.235	0.030	58	0.02	1.44

C. Excluding Latin American Countries

full conditioning information set

Explanatory Variable	coefficient	standard error	t-statistic	P-value	Number of Observations	J-Statistic	LM-test OIR
PRIVATE CREDIT	2.852	1.107	2.577	0.015	42	0.06	2.44
COMMERCIAL-CENTRAL BANK	16.260	5.652	2.877	0.007	42	0.02	0.85
LIQUID LIABILITIES	3.389	0.812	4.175	0.000	42	0.03	1.08

Critical values for Hansen-Test Over Identifying Restrictions (2 d.f.): 10% 4.61; 5%=5.99

Full conditioning information set: policy set, plus indicators of revolutions and coups, political assassinations, and ethnic diversity.

LIQUID LIABILITIES = liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP, times 100.

COMMERCIAL-CENTRAL BANK = assets of deposit money banks divided by assets of deposit money banks plus central bank assets, times 100.

PRIVATE CREDIT = credit by deposit money banks and other financial institutions to the private sector divided by GDP, times 100.

**Table VII: Financial Intermediation and Growth: Dynamic Panel Regressions,
Alternative Indicators of Financial Development**

Estimator	conditioning information set	BANK ASSETS	BANK CREDIT	observations
System estimator	simple	3.517 (0.001) [0.108]	2.742 (0.001) [0.151]	359
	policy	1.708 (0.001) [0.559]	1.332 (0.001) [0.538]	359
First Differences	simple	1.812 (0.003) [0.379]	2.036 (0.001) [0.316]	285
	policy	0.736 (0.001) [0.453]	0.486 (0.016) [0.458]	285
Levels	simple	2.15 (0.001) [0.169]	2.189 (0.001) [0.165]	359
	policy	1.884 (0.001) [0.180]	1.666 (0.001) [0.159]	359

Numbers in parentheses are p-values for the coefficient and numbers in brackets are p-values for the Sargan-test

* first-stage results

simple conditioning information set: logarithm of initial income per capita, average years of secondary schooling
policy conditioning information set: simple set plus government size, openness to trade,
inflation, black market premium

BANK ASSETS: assets of deposit money banks divided by GDP

BANK CREDIT: credit by deposit money banks to the private sector divided by GDP

Table VIII: Financial Intermediation and Growth: Dynamic Panel Regressions, Alternative Conditioning Information and Instrumental Variable Sets

Estimator	conditioning information set	LIQUID LIABILITIES	COMMERCIAL - CENTRAL BANK	PRIVATE CREDIT	BANK ASSETS	BANK CREDIT	observations
System estimator	extended	2.697* (0.001)	3.394* (0.002)	1.388* (0.003)	1.609* (0.001)	1.299* (0.004)	359
	simple (legal)	2.296 (0.001)	6.461 (0.001)	2.422 (0.001)	2.59 (0.001)	2.332 (0.001)	356
	policy (legal)	[0.257] 1.988* (0.001)	[0.143] 3.372* (0.002)	[0.329] 1.299* (0.008)	[0.161] 1.255* (0.007)	[0.253] 1.082* (0.018)	356
First Differences	extended	0.328 (0.360) [0.210]	1.016 (0.001) [0.230]	1.091 (0.001) [0.319]	0.721 (0.001) [0.265]	0.635 (0.002) [0.288]	285
Levels	extended	2.759 (0.001) [0.310]	2.87 (0.001) [0.093]	1.771 (0.001) [0.254]	1.563 (0.001) [0.153]	1.412 (0.001) [0.151]	359
	simple (legal)	1.974 (0.001) [0.236]	5.057 (0.001) [0.398]	2.263 (0.001) [0.243]	1.898 (0.001) [0.198]	1.889 (0.001) [0.215]	356
	policy (legal)	2.017 (0.001) [0.404]	2.731 (0.001) [0.512]	1.787 (0.001) ~[0.601]	1.27 (0.001) [0.397]	1.399 (0.001) [0.554]	356

Numbers in parentheses are p-values for the coefficient and numbers in brackets are p-values for the Sargan-test

* first-stage results

simple conditioning information set: logarithm of initial income per capita, average years of secondary schooling

policy conditioning information set: simple set plus government size, openness to trade,

inflation, black market premium

extended conditioning information set: policy set plus growth rate of terms of trade and population growth rate

(legal): includes the legal origin dummies in the instrumental variable set

LIQUID LIABILITIES: liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP

COMMERCIAL - CENTRAL BANK: assets of deposit money banks divided by assets of deposit money banks plus central bank assets

PRIVATE CREDIT: credit by deposit money banks and other financial institutions to the private sector divided by GDP

BANK ASSETS: assets of deposit money banks divided by GDP

BANK CREDIT: credit by deposit money banks to the private sector divided by GDP

Table IX: Legal Environment and Financial Intermediary Development (1960-95)

	Liquid Liabilities				Commercial-Central Bank				Private Credit			
	OLS	OLS	OLS	IV	OLS	OLS	OLS	IV	OLS	OLS	OLS	IV
C	3.497 (0.000)	2.450 (0.000)	4.208 (0.000)	3.879 (0.000)	4.112 (0.000)	3.943 (0.000)	4.434 (0.001)	4.446 (0.000)	2.694 (0.002)	1.557 (0.000)	3.917 (0.001)	3.930 (0.001)
CREDITOR	0.060 (0.328)	0.101 (0.034)			-0.008 (0.759)	-0.001 (0.947)			-0.034 (0.591)	0.011 (0.852)		
ENFORCE	0.217 (0.000)	0.167 (0.000)			0.041 (0.022)	0.033 (0.014)			0.236 (0.000)	0.181 (0.000)		
ACCOUNT	0.003 (0.536)	0.003 (0.658)			0.004 (0.108)	0.004 (0.136)			0.014 (0.009)	0.014 (0.021)		
INCOME	-0.181 (0.096)		-0.046 (0.512)	-0.005 (0.948)	-0.029 (0.454)		0.000 (0.995)	-0.003 (0.934)	-0.197 (0.103)		-0.014 (0.897)	-0.015 (0.910)
LEGAL			0.385 (0.000)	0.327 (0.004)			0.100 (0.009)	0.105 (0.018)			0.488 (0.001)	0.491 (0.001)
Obs.	35	35	35	35	35	35	35	35	35	35	35	35
Prob(F-test)	(0.000)	(0.000)	(0.000)	(0.001)	(0.005)	(0.002)	(0.000)	(0.006)	(0.000)	(0.000)	(0.000)	(0.000)
R-square	0.63	0.59	0.51	0.50	0.38	0.37	0.36	0.36	0.63	0.61	0.58	0.58

LIQUID LIABILITIES = liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP, times 100.

COMMERCIAL-CENTRAL BANK = assets of deposit money banks divided by assets of deposit money banks plus central bank assets, times 100.

PRIVATE CREDIT = credit by deposit money banks and other financial institutions to the private sector divided by GDP, times 100.

CREDITOR = index of secured creditor rights.

ENFORCE = index of law and contract enforcement.

ACCOUNT = index of the comprehensiveness and quality of company reports

LEGAL = index of legal environment. Specifically, LEGAL is the first standardized principal component of CREDITOR, ENFORCE, and ACCOUNT