The influence of fiscal solvency on financial development: evidence for 140 countries, 1990–2020[1]

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Abstract

If financial development facilitates economic development at the international level, as is the consensus view, then it follows that each government's task is to implement policies that effectively boost national financial development. This study tests the new hypothesis that a more fiscally solvent policy approach positively influences financial development. The results, based on a yearly comparison, show that fiscal solvency, approximated by the credit rating on sovereign debt denominated in local currency, affects three dimensions of financial development: (i) the depth of credit leveraging of economic activity; (ii) the efficiency of the bank lending-deposit spread; and (iii) retail access through bank branches and automatic teller machines (ATMs). The test confirms that there is one tool upon whose importance not all macroeconomic policymakers have agreed in their strategic planning for enhanced general public welfare: fiscal solvency.

Keywords

Finance, fiscal policy, public finance, financial policy, public debt, risk, capital markets, creditworthiness, economic development

JEL classification

F65, G00, O16

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I. Introduction

Of the 218 in existence, the number of independent countries and territories (referred to as "countries" for the purpose of this analysis) with a sovereign credit rating in 1970 was 8. That number grew to 14 by 1980, 37 by 1990 and 168 by 2020, making it possible to study the influence of fiscal solvency on financial development in a set of countries that accounted for an average 83% of the world's population and 75% of its available surface area in the period 1990–2020.

Although the relationship between finance and economics is well established (see, for example, Schumpeter, 1911/1934, and Keynes, 1936), the study of the determinants of financial development is more recent and has tended to focus almost exclusively on cross-cutting factors, such as legal tradition (La Porta and others, 1998), religion as a determinant of cultural habits and institutional rules (Stulz and Williamson, 2003), political economy as a determinant of regulatory frameworks (Pagano and Volpin, 2001) and geography as a determinant of institutional frameworks (Acemoglu, Johnson and Robinson, 2001). Other studies have focused on the legal origins of firms' access to financial markets (Beck, Demirgüç-Kunt and Levine, 2005), laws affecting the development of securities markets (La Porta, López de Silanes and Shleifer, 2006) and the macroeconomic policies associated with financial repression in the context of liberalization (Bencivenga and Smith, 1992).

However, Rajan and Zingales (2003), using longer-term data sets, showed that changes in financial development have not always been monotonic over time, and therefore proposed that a policy of simultaneous openness to trade and financial markets accelerated financial development. Chin and Ito (2006) later proposed that trade liberalization was a precondition of financial liberalization. Baltagi, Demetriades and Law (2009) extended this approach to show that the mechanisms of trade and financial openness could be considered substitutes.

Against this backdrop, the present study tests the hypothesis that there is another factor —fiscal solvency— that engenders non-monotonic changes in the development of national financial systems and that can therefore be used as a policy instrument. For this test, sovereign credit ratings were used to build an annual index to approximate fiscal solvency. This factor is separate from institutional change (Acemoglu, Johnson and Robinson, 2005).

The central question that this study seeks to answer is, can greater fiscal solvency facilitate greater development of the national financial system? The study uses a non-experimental quantitative approach and an explanatory unbalanced panel design with samples of up to 140 countries and data spanning nearly three decades. Considering the matter's multidimensional nature, the influence of fiscal solvency was analysed through a yearly comparison of indicators approximating the four dimensions of financial development identified by the World Bank (2019).

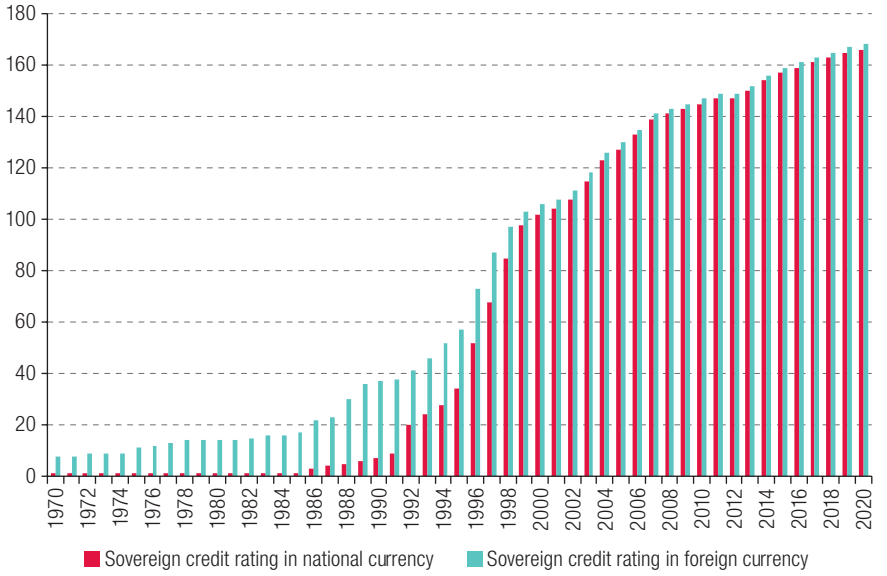
The results show that the null hypothesis accepted in the literature is rejected with representative indicators in three of the four dimensions: (i) the credit leveraging of economic activity, a typical indicator of financial development; (ii) the bank lending-deposit spread, a direct measure of the efficiency with which the financial sector provides its services to the rest of the economy; and (iii) the banking access index based on the relative number of branches and ATMs (IMF, 2023). The results call for a re-evaluation of the residual role that macroeconomic policy has conventionally assigned to public debt management.

The article is divided into five sections, including this introduction. The second section provides an explanation of the growing influence of fiscal solvency on financial development as a result of the more extensive use of credit ratings. The third presents the available data and the selection criteria for the methodology used in this study. Results are presented and analysed in the fourth section. The fifth section presents concluding remarks.

II. The growing role of fiscal solvency in financial development

Progressive global integration since the 1970s might lead one to think that the effects of countries' traditional points of divergence have diminished over time, especially as States have accelerated their convergence by adopting common policies. However, some effects may have intensified as a result of this convergence, including the financial policies that, beginning in the 1980s and 1990s, progressively emphasized the widespread use of credit ratings as a solvency indicator (see figure 1).

Figure 1
Countries with a sovereign credit rating, 1970–2020
(Number of countries)



Source: Prepared by the author, on the basis of data from Expansión, "Rating: calificación de la deuda de los países", Datosmacro.com, 2024 [online] https://datosmacro.expansion.com/ratings and World Government Bonds (WGB), "World credit ratings", 2024 [online] http://www.worldgovernmentbonds.com/world-credit-ratings/.

As is known, the greatest driver of financial convergence has been the series of principles and standards issued by the Basel Committee on Banking Supervision since 1975. The Basel Committee was established in response to the financial crisis triggered by the 1974 failure of Bankhaus Herstatt in Germany and the subsequent refusal of Chase Manhattan Bank to fulfil payment and cheque orders in its capacity as Herstatt's correspondent bank in the United States (Walker, 2001, pp. 26 and 27). The Committee, tasked with developing appropriate principles and rules to guide regulatory and supervisory practices in global banking with a view to preventing future crises, introduced the first credit risk-based capital measurement system in 1998 (BIS, 1998). The system's scope extended beyond Group of 10 countries, applying to all countries with internationally active banks. In 1996, the Committee published an amended capital measurement framework, which went into effect in 1997, to incorporate a capital requirement for market risks (BIS, 1996), and this process has marched on ever since (see, for example, BIS 2001 and 2017).

The growing emphasis on the intensive use of credit ratings to calculate capital requirements in all credit institutions led to an increasingly standardized approach to risk management in other types of financial institutions, which in turn caused global demand for credit ratings to soar —first for public debt and then for private. Since then, sovereign credit ratings have become a key benchmark, establishing a de facto ceiling for the credit ratings of all firms in a given country. This has made them increasingly useful in determining the financing terms —currency, rate, maturity and amount— that lenders extend to borrowers (Borensztein, Cowan and Valenzuela, 2013; OECD, 2009).

One of the least studied ways in which public finances affect financial development is the level of fiscal solvency with which elected politicians (or their advisors) prefer to implement macroeconomic policy in each country. As the latest global financial crisis showed once again, sovereign debt crises are ultimately triggered by the imminent insolvency of a given country's public finances. In the long run, the insolvency of any State is the product of one of the following conditions: (i) an excessive accumulation of unproductive debt; (ii) insufficient structural revenue; (iii) the expectation that some combination of the above will endure or worsen over time (see, for example, Daniel and others, 2006); or (iv) the expectation that, in the event of an overall deterioration of the global outlook, other States will not fare much better in attempting to navigate some combination of these adverse circumstances, as was the case in the last global crisis and the more recent epidemiological crisis, when would-be capital flight had nowhere to land.

In the past, there has been discussion of adopting a golden rule to prevent public financial crises brought on by excessive unproductive debt or insufficient structural revenue. Under this golden rule, States would be prohibited from borrowing to finance any unproductive expenditure on current services provision, which should instead be covered by structural revenue. Such a policy would mean that public debt could only be taken on to finance investment net of depreciation (Khan and Mayes, 2009). Nevertheless, many countries end up doing the exact opposite when, faced with mounting pressure to adopt a more activist fiscal stance (and a diminishing political appetite for tax reform), their governments begin to: (i) take on debt with terms of maturity that far exceed the useful life of the assets that the debt originally financed; (ii) take on debt to cover expenditures that do not generate the needed revenue increases; (iii) issue new debt to partially finance existing debt (including interest); or (iv) directly refinance existing debt.

In recent decades, assessing and rating a given country's capacity to meet its sovereign debt obligations has become the most widely used valuation method for determining fiscal solvency. In general, the worse the valuation of the borrower, the greater the return that lenders will require to offset the increased risk assumed; and similarly, the better the valuation, the lower the return required. By the same token, the higher the explicit or implicit interest payments on a given loan, the lower the borrower's debt-carrying capacity, and vice versa.

Thus, a country's fiscal solvency and the level of development of its financial system are very closely linked: the lower the systemic fiscal solvency, the harder it is for the financial system to perform effectively, owing to the increased financing costs and the diminished capacities that can result in terms of leveraging, efficiency, access and stability; and vice versa.

III. Available data and applied methodology

The 218 countries in existence from 1990 to 2020 comprise the study's overall population. The countries selected for inclusion in the sample were those that had the most units with available data to simultaneously construct the different indicators for the variables involved. The maximum sample size was 140 countries, as shown in table 1.

Table 1
Countries included in the study

Albania	Czechia[b]	Kuwait	Republic of Korea[b]
Angola	Denmark[b]	Kyrgyzstan	Republic of Moldova
Argentina	Dominican Republic	Latvia[b]	Romania
Armenia	Ecuador	Lebanon[a]	Russian Federation
Aruba[a]	Egypt	Lesotho	Rwanda
Australia[b]	El Salvador	Libya	Saudi Arabia
Austria[b]	Estonia[b]	Lithuania[b]	Senegal
Azerbaijan	Eswatini	Luxembourg[a b]	Serbia
Bahamas[a]	Ethiopia	Macao, China[a]	Seychelles[a]
Bahrain[a]	Fiji	Madagascar	Singapore[a b]
Bangladesh	Finland[b]	Malaysia[a]	Slovakia[b]
Barbados[a]	France[b]	Mali	Slovenia[b]
Belarus	Gabon	Malta	South Africa
Belgium[b]	Gambia	Mauritius[a]	Spain[b]
Belize[a]	Georgia	Mexico	Sri Lanka
Benin	Germany[b]	Mongolia	Suriname
Bolivia (Plurinational State of)	Ghana	Montenegro	Sweden[b]
Bosnia and Herzegovina	Greece[b]	Morocco[a]	Switzerland[a b]
Botswana	Guatemala	Namibia	Taiwan[b]
Brazil	Honduras	Netherlands (Kingdom of the)[a b]	Tajikistan
Bulgaria	Hong Kong, China[a b]	New Zealand[b]	Thailand[a]
Burkina Faso	Hungary	Nicaragua	Togo
Cabo Verde	Iceland[b]	Niger	Tunisia
Cambodia	India	North Macedonia	Türkiye
Cameroon	Indonesia	Norway[b]	Uganda
Canada[b]	Irán (Islamic Republic of)	Oman	Ukraine
Chile	Iraq	Pakistan	United Arab Emirates
China	Ireland[a b]	Panama[a]	United Kingdom[a b]
Colombia	Israel[a b]	Papua New Guinea	United Republic of Tanzania
Congo	Italy[b]	Paraguay	United States[a b]
Congo (Democratic Republic of the)	Jamaica	Peru	Uruguay[a]
Costa Rica[a]	Japan[a b]	Philippines[a]	Uzbekistan
Côte d'Ivoire	Jordan	Poland	Venezuela (Bolivarian Republic of)
Croatia	Kazakhstan	Portugal[b]	Viet Nam
Cyprus[a b]	Kenya	Qatar	Zambia

Source: Prepared by the author, on the basis of World Bank, "Indicators", 2024 [online] https://data.worldbank.org/indicator, International Monetary Fund (IMF), "Offshore financial centers: IMF background paper", 23 June 2000 [online] https://www.imf.org/external/np/mae/oshore/2000/eng/back.htm and Moody's Investors Service, *Moody's Country Credit Statistical Handbook*, New York, 2012–2019.

[a] Tax haven.

[b] Industrialized country.

Regarding the construction of indicators, for each country, the dependent variable data correspond to the financial system; the independent variable data correspond to the central government component of the public sector; and the controlled variable data correspond to the specific aggregate activity (see table 2).

Table 2
Selected indicators

Variable	Indicator	Formula	Symbol	Databases
Financial development	Financial leveraging of economic activity	(Private credit from depository institutions and others) / GDP * 100	*Ycréd*	World Bank (2023a)
		Index of depth of financial institutions	*Yipro*	IMF (2023)
	Bank access through branches and ATMs	Index of access to financial institutions	*Yiacc*	
	Efficiency of bank lending-deposit spread (for real and nominal interest rates)	1 / (1 + active real interest rate – passive real interest rate) * 100, average	*Ytir_i*	World Bank (2023a)
		1 / (1 + active nominal interest rate – passive nominal interest rate) * 100, average	*Ytin_i*	
	Stability, by financial de-dollarization	1 – (percentage dollarization of bank deposits) * 100, average	*Yddol*	Moody's Investors Service (2012-2019) and central banks
Fiscal solvency	Sovereign risk index in national currency	Daily weighted average of Moody's,S&P and Fitch sovereign credit ratings	*Xrsmn*	Expansión (2024) and WGB (2024)
Sovereign curve	Domestic public debt market	(Domestic public debt securities / total public debt securities) * 100, average	*Zmidp*	World Bank (2023a)
Economic development	Adjusted net national income per capita	(Net domestic product + net foreign income, 2022 euros purchasing power parity) / total population	*Zinpc*	World Inequality Lab (2024)
	Net income equality of wealthiest 10% of population	National income before taxes and after pensions of wealthiest 10% / national income before taxes and after pensions of 100%	*Zequi*	
Openness of trade system	International trade	(Exports + imports) / GDP	*Zac*	World Bank (2024)
Stability	Price level	Consumer price index	*Zipc*	
Institutional development	Public governance	Simple average of public governance indicators	*Zgob*	World Bank (2023b)
Openness of financial system	External balance	(External assets + external liabilities) / GDP	*Zafbe*	Milesi-Ferretti (2025)
	Capital account openness	Index of financial openness	*Zafcc*	Chin and Ito (2021)
More developed countries	Industrialized countries	1, or 0 if other	*Bind*	Moody's Investors Service (2012)
Crisis	Banking crisis	1, or 0 if other	*Bcri*	World Bank (2023a)
Tax havens	Offshore financial centres	1, or 0 if other	*Bpf*	IMF (2000)

Source: Prepared by the author, on the basis of World Bank, "Global Financial Development", 2023a [online] https://databank.worldbank.org/source/global-financial-development; "Worldwide Governance Indicators", 2023b [online] https://databank.worldbank.org/source/worldwide-governance-indicators, and "World Development Indicators", 2024 [online] https://databank.worldbank.org/source/world-development-indicators; International Monetary Fund (IMF), Financial Development Index Database, 2023 [online] https://data.imf.org/?sk=f8032e80-b36c-43b1-ac26-493c5b1cd33b and "Offshore financial centers: IMF background paper", 23 June 2000 [online] https://www.imf.org/external/np/mae/oshore/2000/eng/back.htm; Moody's Investors Service, *Moody's Country Credit Statistical Handbook*, New York, 2012-2019; Expansión, "Rating: calificación de la deuda de los países", Datosmacro.com, 2024 [online] https://datosmacro.expansion.com/ratings; World Government Bonds (WGB), "World credit ratings", 2024 [online] http://www.worldgovernmentbonds.com/world-credit-ratings/; World Inequality Lab, World Inequality Database, 2024 [online] https://wid.world; G. M. Milesi-Ferretti, "The external wealth of nations database", 13 January 2025 [online] https://www.brookings.edu/articles/the-external-wealth-of-nations-database; M. D. Chin and H. Ito, "The Chinn-Ito index: a de jure measure of financial openness", Portland State University, 2021 [online] https://web.pdx.edu/~ito/Chinn-Ito_website.htm.

Note: The indicator *Xrsmn* was constructed to take into account risk subcategories (+/-) and outlooks (+/-), using values 1.00, 0.90, 0.75, 0.60, 0.45, 0.30, 0.15, 0.00 to represent credit ratings AAA, AA, A, BBB, BB, B, CCC, C and C (or lower).

In addition to the openness and institutional development indicators analysed by Rajan and Zingales (2003), Chin and Ito (2006) and Baltagi, Demetriades and Law (2009), income equality and monetary stability were included as possible determinants of financial development that change over time, following the approach of Clarke, Xu and Zou (2006) and Almarzoqi, Naceur and Kotak (2015). The role of the sovereign curve provided by the domestic public debt market was also considered, following the approach of Jiménez-Sotelo (2023). Determinants that do not change over time were considered in the aggregate as part of the heterogeneity of each country.

These data cover the top 98.4% and 97.5% of the respective data ranges observed for the 187 countries and 162 countries of the world with information available for indicators *Ycréd* (4.93% of GDP or higher) and *Xrsmn* (stable CC or higher). Table 3 provides selected statistics for the indicators.

Table 3
Statistical summary

Indicator	Mean	Median	Standard deviation	Minimum	Maximum	Observations	Period
Ycréd	63.69	52.51	43.91	4.93	304.57	2 990	1990–2020
Yipro	0.34	0.24	0.27	0.02	1.00	3 040	1990–2020
Yiacc	0.42	0.38	0.28	0.00	1.00	3 040	1990–2020
Ytir	6.22	4.86	6.45	-11.86	53.00	1 863	1990–2020
Ytin	6.68	5.11	7.11	-13.09	56.39	1 869	1990–2020
Yddol	74.47	82.06	26.44	0.00	100.00	2 238	1990–2020
Xrsmn	0.62	0.61	0.26	0.02	1.00	3 065	1990–2020
Zmidp	82.41	88.66	18.15	0.09	100.00	1 196	1990–2020
Zinpc	23 785	17 613	19 038	1 535	151 272	3 065	1990–2020
Zequi	0.44	0.44	0.10	0.23	0.71	2 999	1990–2020
Zac	89.74	76.88	58.11	15.16	442.62	3 065	1990–2020
Zipc	98.41	97.27	49.32	0.00	951.62	3 065	1990–2020
Zgob	59.39	58.48	24.56	3.35	99.65	3 065	1990–2020
Zgob#	57.25	54.74	24.28	3.27	99.76	2 559	1996–2020
Zafbe	6.27	1.62	24.94	0.07	405.40	3 065	1990–2020
Zafcc	0.63	0.70	0.36	0.00	1.00	2 936	1990–2020

Source: Prepared by the author, on the basis of World Bank, "Global Financial Development", 2023a [online] https://databank.worldbank.org/source/global-financial-development; "Worldwide Governance Indicators", 2023b [online] https://databank.worldbank.org/source/worldwide-governance-indicators, and "World Development Indicators", 2024 [online] https://databank.worldbank.org/source/world-development-indicators; International Monetary Fund (IMF), Financial Development Index Database, 2023 [online] https://data.imf.org/?sk=f8032e80-b36c-43b1-ac26-493c5b1cd33b and "Offshore financial centers: IMF background paper", 23 June 2000 [online] https://www.imf.org/external/np/mae/oshore/2000/eng/back.htm; Moody's Investors Service, *Moody's Country Credit Statistical Handbook*, New York, 2012-2019; Expansión, "Rating: calificación de la deuda de los países", Datosmacro.com, 2024 [online] https://datosmacro.expansion.com/ratings; World Government Bonds (WGB), "World credit ratings", 2024 [online] http://www.worldgovernmentbonds.com/world-credit-ratings/; World Inequality Lab, World Inequality Database, 2024 [online] https://wid.world; G. M. Milesi-Ferretti, "The external wealth of nations database", 13 January 2025 [online] https://www.brookings.edu/articles/the-external-wealth-of-nations-database; M. D. Chin and H. Ito, "The Chinn-Ito index: a de jure measure of financial openness", Portland State University, 2021 [online] https://web.pdx.edu/~ito/Chinn-Ito_website.htm.

Note: *Zgob#* represents the indicator that excludes all data from the 1990–1995 period, which were stochastically imputed in the *Zgob* indicator.

Some indicators had time series that were not as short, and macroeconomic series were included in certain cases; this meant, for some, the probable presence of trend or persistence over time following any change or shock. In the case of the dependent variable, in all of the tests (*p, Z L** and *Pm*), level indicators *Ytir_i*, *Ytin_i* and *Yddol* and logarithmic indicators *Ycréd*, *Yipro* and *Yiacc* (abbreviated as *lnYcréd*, *lnYinpc* and *lnYiacc*) rejected the null hypothesis that all panels contained a unit root, at a statistical significance of less than 5%, whether the tests were performed with a time trend or only with drift, and with or without eliminating cross-sectional means in an effort to control for potential contemporaneous correlation among countries.

In the case of the fiscal solvency indicator *Xrsmn*, no transformation was necessary to reject at a level of statistical significance of less than 5% the null hypothesis that all panels contained a single root with a time trend or only with drift, eliminating cross-sectional means. When de-meaning was not performed, the null hypothesis could not be rejected, but this was not particularly concerning: owing to the very nature of the indicator (publicly available), the methodology used in its construction (pairwise comparison) and the behaviour of its target audience (investors who can only invest in one alternative by divesting from all others), there will always be contemporaneous correlation.

In the case of the controlled variables, the unit root test results were as theorized, and the relevant transformations were applied or not applied as appropriate. Indicators *Zinpc*, *Zequi*, *Zipc* and *Zapbe*, were stationary with logarithmic differencing (abbreviated as *dlnZinpc*, *dlnZequi*, *dlnZipc* and *dlnZapbe*), while no transformation was necessary for indicators *Zac*, *Zgob* and *Zafcc* or for the sovereign curve indicator (*Zmidp*).

Table 4 shows the indicator correlations, with transformations applied or not applied as appropriate.

Table 4
Correlation matrix

	lnYcred	*lnYipro*	*lnYiacc*	*Ytir_i*	*Ytin_i*	*Yddol*	*Xrsmn*	*Zmidp*
lnYcred	1.0000							
lnYipro	0.8601***	1.0000						
lnYiacc	0.7787***	0.7334***	1.0000					
Ytir_i	0.2646***	0.2190***	0.1884***	1.0000				
Ytin_i	0.2912***	0.2171***	0.2072***	0.9171***	1.0000			
Yddol	0.2652***	0.3531***	0.2465***	0.3276***	0.3047***	1.0000		
Xrsmn	0.6678***	0.7359***	0.5361***	0.3000***	0.3185***	0.4443***	1.0000	
Zmidp	0.4022***	0.3577***	0.1696***	0.2963***	0.3116***	0.4972***	0.3481***	1.0000
	dlnZinpc	*dlnZequi*	*Zac*	*dlnZipc*	*Zgob*	*Zgob#*	*dlnZafbe*	*Zafcc*
dlnZinpc	1.0000							
dlnZequi	-0.0339**	1.0000						
Zac	0.0356**	-0.0272*	1.0000					
dlnZipc	-0.1620***	0.0407***	-0.0688***	1.0000				
Zgob	0.0277**	0.0563***	0.3218***	-0.1842***	1.0000			
Zgob#	-0.0187	0.0351**	0.3391***	-0.2087***	0.9988***	1.0000		
dlnZafbe	-0.1507***	0.0341**	0.0186	0.0691***	0.0690***	0.0992***	1.0000	
dlnZafcc	0.0155	0.0268*	0.2420***	-0.1796***	0.5098***	0.5338***	0.0207	1.0000

Source: Prepared by the author, on the basis of the results of his research.
Note: Statistical significance < 1%(***), 5%(**), 10%(*).

Therefore, following the approach used in previous studies of the determinants of financial development, the theory, updated with the proposed hypothesis, was expressed as follows:

Theory: $y = F(x, z1, z2, z3, z4, z5, z6, z7, z8, z9...) = F(X', Z')$

Hypothesis: $\frac{\partial y}{\partial x} = \gamma > 0$

To disprove the proposed hypothesis, the previously accepted hypothesis in the literature was designated the null hypothesis, and the opposite was designated the alternative hypothesis:

H0: A greater capacity to meet sovereign debt obligations hinders or does not facilitate financial development ($\gamma \leq 0$).

H1: A greater capacity to meet sovereign debt obligations facilitates financial development ($\gamma > 0$).

To address the model uncertainty problem in the explanation of financial development (Huang, 2011), the approach of Rajan and Zingales (2003) was applied for the initial estimation, using static panel data models for several time periods and reflecting that, in the hypothesis of causality, the independent variables (causes) should plausibly precede the dependent variable (effect):

$$y_{i,t} = \alpha + x_{i,t-1} * \gamma + Z'_{i,t-1} * \beta + \varepsilon_{i,t} \quad (1)$$

In equation 1, y represents any of the specifications indicated in table 2 to approximate financial development, x represents the specification indicated to approximate fiscal solvency, and γ represents its parameter (interest); Z represents a vector with the specifications indicated to approximate control

variables, and β represents a vector with their respective parameters; α represents a scalar, and ε represents the error term which, in addition to the idiosyncratic component, includes temporal and individual effects. In addition, i represents the individual dimension of N countries, and t represents the temporal dimension of T years.

To obtain robust results with these statistical models, a panel data model with fixed individual and temporal effects was used, considering the effects induced by the heterogeneity of each country and by financialization (Palley, 2009). For this purpose, the following specification tests were conducted: the Wald test (1940) to verify the joint nullity of the fixed coefficients; the Lagrange multiplier test (Breusch and Pagan, 1980) to verify whether the variance of the random effects estimator and the variance of the grouped data were different; the Hausman test (1978) to determine the viability of a random effects specification in lieu of a fixed effects specification; the modified Wald test (Greene, 2002) to verify whether the individual fixed effects presented heteroscedasticity; and the Woolridge test (2002) to determine whether there was first-order error correlation. According to the literature, there are several temporal determinants of financial development that explain cross-cutting financial development differences among countries; therefore, the specification theory that this study sought to empirically prove was that of fixed effects.

Likewise, depending on the stationarity of the specification indicator used to approximate financial development, the panel data models evaluated not just the static proposal of Rajan and Zingales (2003) but also a dynamic proposal like that of Baltagi, Demetriades and Law (2009). This entailed the addition of the respective lag $y_{i,t-1}$ with its coefficient δ as an additional regressor, as shown in equation 2:

$$y_{i,t} = \alpha + y_{i,t-1} * \delta + x_{i,t-1} * \gamma + Z'_{i,t-1} * \beta + \varepsilon_{i,t} \quad (2)$$

To obtain robust results from these dynamic models, the Arellano-Bond test was performed in the first-order differences model with a view to determining whether there was first-order autocorrelation, indicating no autocorrelation in the original error term. While it should be possible to reject the null hypothesis of no first-order autocorrelation, it should not be the case for second-order or higher autocorrelation, to enable the respective lags to be used as instruments. Should the null hypothesis of no first-order autocorrelation not be rejected, a static model would be required instead of a dynamic one. In the dynamic model, it would also be necessary to conduct the Sargan test (1958) or the Hansen test (1982) to determine the joint validity of the instruments used in the Generalized Method of Moments (GMM) estimation, where only the second of the two is robust to heteroscedasticity or autocorrelation, albeit with a propensity for weakness due to excessive instruments. Therefore, as a minimally arbitrary general rule, it was determined that the number of instruments should not exceed the number of units involved and that the probability value of the Hansen test should ideally be between 0.10 and 0.25 (Roodman, 2009) or at least between 0.05 and 0.80 (Labra and Torrecillas, 2014).

Lastly, given the nature of the hypothesis, unilateral tests were programmed to run in Stata 16.1 for each specific case.

IV. Presentation and discussion of the results

Although the calculations could not be shown here owing to limited space, all model specifications with grouped data or random individual effects were rejected, consistent with the theory and all previous findings. Likewise, there was not enough space to show all the models used to obtain the results of hypothesis contrasts discussed further on, three sets of models representing three financial development aspects (depth, access and efficiency) are shown below.

(a) Influence on financial development depth

Table 5 provides a representative set of regressions for financial depth *(lnYcréd)*. The findings show, after accounting for the presence of endogeneity over time, that countries with greater fiscal solvency experienced more rapid increases in terms of financial depth. The level of statistical significance was maintained irrespective of the method used and of whether only original governance data for 1996–2020 *(Zgob#)* were used or whether the panel with stochastically imputed data for 1990–1995 *(Zgob)* was also included.

Table 5
Fiscal solvency and financial depth, 1990–2020

Explanatory and statistical variables	Dependent variable: $lnYcréd_{i,t}$					
	Full sample / Regression model			1996–2020 sample / Regression model		
	Fixed effects OLS	Exogenous GMM	Pre-determined GMM	Fixed effects OLS	Exogenous GMM	Pre-determined GMM
$lnYcréd_{i,t-1}$	0.8680613*** (0.0143229)	0.8589265*** (0.0247571)	0.885147*** (0.0273638)	0.8455328*** (0.0194745)	0.8207319*** (0.0373274)	0.8786502*** (0.0319782)
$Xrsmn_{i,t-1}$	0.3325568*** (0.0524699)	0.3397579*** (0.0561122)	0.692402*** (0.1613847)	0.32354*** (0.0514716)	0.3492504*** (0.0607408)	0.6824334*** (0.1624322)
$dlnZinpc_{i,t-1}$	0.2383714*** (0.061217)	0.2347911*** (0.0590409)	0.3114254*** (0.0653215)	0.1973124*** (0.0717308)	0.1830918** (0.0727845)	0.2778341*** (0.0767843)
$Zac_{i,t-1}$	-0.0004701* (0.0002401)	-0.0004765** (0.0002344)	-0.0004644** (0.0002294)	-0.0005965* (0.00031)	-0.0006074** (0.0003086)	-0.0005532* (0.0002891)
$dlnZipc_{i,t-1}$	-0.0509099 (0.06017)	-0.0511841 (0.0607316)	-0.017643 (0.0467503)	-0.6296721*** (0.2307837)	-0.6454909*** (0.2282339)	-0.5285593** (0.2269714)
$Zgob_{i,t-1}$	-0.000848 (0.0007991)	-0.0008239 (0.0007796)	-0.0033954*** (0.0012808)			
$Zgob\#_{i,t-1}$				-0.0005893 (0.000809)	-0.0009093 (0.000831)	-0.003794** (0.0015129)
$dlnZafbe_{i,t-1}$	0.0019696 (0.0257789)	0.0034206 (0.0268439)	-0.0112844 (0.0274954)	0.0121906 (0.0200891)	0.0179426 (0.0203351)	-0.0143273 (0.0231375)
$Bcri_{i,t}$	-0,037363** (0.0148846)	-0.0347609** (0.0176862)	-0.0359697** (0.0146322)	-0.0142034 (0.0187689)	-0.0077857 (0.0224503)	-0.0221267 (0.018523)
Instruments		117	94		87	85
P-value (AR(1))		0.000	0.000		0.000	0.000
P-value (AR(2))		0.587	0.508		0.284	0.415
P-value (Hansen)		0.136	0.129		0.040	0.141
Observations	2 866	2 726	2 726	2 368	2 228	2 228
Countries	140	138	138	140	138	138
T maximum	30	29	29	21	20	20
T average	20.5			16.9		
Balancing	68.2%	68.1%	68.1%	80.5%	80.7%	80.7%
Robust	Yes	Yes	Yes	Yes	Yes	Yes

Source: Prepared by the author, on the basis of the results of his research.
Note: GMM, Generalized Method of Moments; OLS, ordinary least squares method. Standard errors in parentheses. Statistical significance < 1%(***), 5%(**), 10%(*). The models used fixed effects estimator *xreg, fe vce (cluster)* and a robust orthogonalized GMM differences estimator with collapsed instruments (*xtabond2*). The constant and fixed effects are not shown.

In this set of models, the estimated coefficients practically double when financial development, economic growth and fiscal solvency are taken into account as pre-determined variables (0.692 or 0.682) rather than exogenous only (0.339 or 0.349).

This means that for any yearly improvement in a given country's sovereign credit rating at the subcategory level (e.g. from BB+ to BBB- or from A- to A) occurring in the period 1990–2020, there is

a corresponding increase in the following year of $\Delta lnYda_{pred} = \gamma_{pred}{}^{*}\Delta X = 0.6924{*}0.05 = 0.0346 \approx 3.46\%$, instead of $\Delta lnYda_{exóg} = \gamma_{exóg}{}^{*}\Delta X = 0.3398{*}0.05 = 0.0170 \approx 1.70\%$, in the country's degree of financial leveraging (indicated by its credit-to-GDP ratio), at a statistical significance of less than 1%.

For regressions only covering the period 1996–2020, there is little change in the difference. The effects on the credit-to-GDP ratio can therefore be calculated at 3.41% and 1.75%, respectively, with no change in statistical significance.

It is worth noting that, while not shown, the coefficients also vary little when substituting financial openness indicators *dlnZafbe* and *Zafcc* in all six models. Thus, if all other effects had been held constant, the alternative effects on the ratio would have been 3.58% and 1.60%, respectively, in the period 1990–2020.

It is also worth noting that, while Baltagi, Demetriades and Law (2009) obtained surprising negative and statistically significant coefficients for the per capita GDP logarithm as an indicator of economic activity in all the specifications performed for the period 1980–2003, the present study's results are compatible with the theory, with positive and statistically significant coefficients of growth obtained using the per capita GNI logarithm indicator instead.

In comparing coefficients for openness to trade, financial openness and institutional development, statistical significance declines or disappears, but at the same time, the coefficients for the sovereign risk, inflation and banking crisis indicators not previously considered become highly significant.

(b) Influence on financial development access

Table 6 presents a representative set of regressions for financial access (*lnYiacc*). The findings show, after accounting for the presence of endogeneity over time, that countries with greater fiscal solvency experienced more rapid increases in terms of financial access in the period 1990–2020. Results remained robust irrespective of the method used and of whether only original governance data for 1996–2020 (*Zgob#*) were used or whether the panel with stochastically imputed data for 1990–1995 (*Zgob*) was also included.

Table 6
Fiscal solvency and financial access, 1990–2020

Explanatory and statistical variables	Dependent variable: $lnYiacc_{i,t}$					
	Full sample / Regression model			1996–2020 sample / Regression model		
	Fixed effects OLS	Exogenous GMM	Pre-determined GMM	Fixed effects OLS	Exogenous GMM	Pre-determined GMM
$lnYiacc_{i,t-1}$	0.9417711*** (0.0154656)	0.9795722*** (0.0137645)	0.9466446*** (0.0210961)	0.9182313*** (0.0177097)	0.9591043*** (0.0150924)	0.9133366*** (0.0240353)
$Xrsmn_{i,t-1}$	0.0960823*** (0.0324232)	0.0743886** (0.0299508)	0.5477657*** (0.1463966)	0.0977262*** (0.0342875)	0.0892555*** (0.03424)	0.6038011*** (0.1391253)
$dlnZinpc_{i,t-1}$	0.1476567*** (0.0501417)	0.1344388*** (0.0494193)	0.1800687*** (0.0587039)	0.1380398*** (0.0501918)	0.125517** (0.0499179)	0.1641078*** (0.0625293)
$Zac_{i,t-1}$	-0.0002576* (0.0001326)	-0.0001797 (0.0001241)	-0.0002383 (0.0001502)	-0.0004058** (0.0001558)	-0.0003127** (0.000145)	-0.0003513* (0.0001809)
$dlnZipc_{i,t-1}$	0.0212351 (0.0240985)	0.0263145 (0.0202883)	0.0625114*** (0.0150415)	-0.0192667 (0.0722245)	-0.0015206 (0.0594104)	0.085399 (0.0754055)
$Zgob_{i,t-1}$	-0.0015135** (0.0006899)	-0.0017563*** (0.0006313)	-0.0046347*** (0.0012208)			
$Zgob\#_{i,t-1}$				-0.0010286 (0.0006891)	-0.0019763*** (0.0007301)	-0.0051143*** (0.0012746)
$dlnZafbe_{i,t-1}$	-0.0041355 (0.0123553)	-0.010834 (0.0127637)	-0.0200816 (0.0157915)	-0.0016155 (0.0126394)	-0.0131965 (0.0135404)	-0.0284125* (0.0159119)
$Bcri_{i,t}$	-0.0266851*** (0.0057134)	-0.0281912*** (0.0054096)	-0.0172087* (0.0088784)	-0.0214399*** (0.0061949)	-0.0245644*** (0.0059303)	-0.0170789 (0.0104303)

Explanatory and statistical variables	Dependent variable: $InYiacc_{i,t}$					
	Full sample / Regression model			1996–2020 sample / Regression model		
	Fixed effects OLS	Exogenous GMM	Pre-determined GMM	Fixed effects OLS	Exogenous GMM	Pre-determined GMM
Instruments		117	94		87	85
P-value (AR(1))		0.000	0.000		0.000	0.000
P-value (AR(2))		0.297	0.277		0.567	0.673
P-value (Hansen)		0.185	0.115		0.038	0.116
Observations	2 899	2 762	2 762	2 394	2 257	2 257
Countries	137	135	135	137	135	135
T maximum	30	29	29	21	20	20
T average	21.2			17.5		
Balancing	70.5%	70.5%	70.5%	83.2%	83.6%	83.6%
Robust errors	Yes	Yes	Yes	Yes	Yes	Yes

Source: Prepared by the author, on the basis of the results of his research.
Note: GMM, Generalized Method of Moments; OLS, ordinary least squares method. Standard errors in parentheses. Statistical significance < 1%(***), 5%(**), 10%(*). The models used fixed effects estimator *xreg, fe vce (cluster)* and a robust orthogonalized GMM differences estimator with collapsed instruments (*xtabond2*). The constant and fixed effects are not shown.

Here, the estimated coefficients increased practically sevenfold when financial development, economic growth and fiscal solvency were taken into account as pre-determined variables (0.548 or 0.604) rather than exogenous only (0.074 or 0.089).

This means that for any yearly improvement in a given country's sovereign credit rating at the subcategory level in the period 1990–2020, there is a corresponding increase in the following year of $\Delta lnYabb_{pred} = \gamma_{pred}{}^{*}\Delta X = 0.5478{*}0.05 = 0.0273 \approx 2.73\%$, instead of $\Delta lnYabb_{exóg} = \gamma_{exóg}{}^{*}\Delta X = 0.0744{*}0.05 = 0.0037 \approx 0.37\%$, in the country's index of access to financial institutions through bank branches and ATMs, at a statistical significance of less than 1%.

These statistically significant results increase slightly (to 3.02% and 0.45%, respectively) if only the period 1996–2020 is taken into account.

The effects are somewhat diminished when substituting financial openness indicators *dlnZafbe* and *Zafcc* in all six models. Thus, the estimated effects with all others held constant would be 2.34% and 0.31% for the period 1990–2020 (regressions not shown).

No previous studies were identified that use this access indicator to approximate financial development.

(c) Influence on financial development efficiency

Table 7 provides a representative set of regressions for financial efficiency *(lnYiacc)*. In this case, no endogeneity over time was observed. The findings show that countries with greater fiscal solvency experienced higher levels of efficiency, in the form of lower bank lending-deposit spreads for both real interest rates *(Ytir)* and nominal interest rates *(Ytin)* for the period 1990–2020.

Table 7
Fiscal solvency and financial efficiency, 1990–2020

Explanatory and statistical variables	Dependent variable: $Ytir\_i_{i,t}$			Dependent variable: $Ytin\_i_{i,t}$		
	Regression model: fixed effects OLS / Scope of sample					
	Full	1996–2020	0%<Ytir<100%	Full	1996–2020	0%<Ytin<100%
$Xrsmn_{i,t-1}$	6.456193** (2.622335)	6.868385** (2.70008)	6.384225** (2.664578)	7.329493** (2.862969)	7.812687*** (2.894909)	7.164609** (2.893272)
$dlnZinpc_{i,t-1}$	0.5215604 (0.9746675)	-0.0944986 (0.8434796)	0.4291664 (10.001451)	0.5194831 (10.060543)	-0.0135964 (0.920152)	0.4173384 (10.09093)
$Zac_{i,t-1}$	-0.0027528 (0.0068997)	-0.0035413 (0.0061181)	-0.0027841 (0.0065574)	-0.0036243 (0.0075429)	-0.0046071 (0.0068558)	-0.0039797 (0.0069097)
$dlnZipc_{i,t-1}$	-1.386343 (2.290088)	1.361551 (2.882638)	-3.085917 (2.228415)	-6.647282** (3.055656)	-2.744423 (3.689871)	-9.242402*** (2.810671)
$Zgob_{i,t-1}$	0.0221825 (0.0439581)		0.0292876 (0.046101)	0.018229 (0.0470724)		0.0278745 (0.048874)
$Zgob\#_{i,t-1}$		0.0372028 (0.0459639)			0.0323915 (0.0485553)	
$dlnZafbe_{i,t-1}$	-0.2261722 (0.4826925)	-0.298986 (0.5300002)	-0.4925804 (0.5521385)	-0.075461 (0.56228)	-0.204548 (0.5991724)	-0.4229844 (0.6269885)
$Bcri_{i,t}$	-0.4113341 (0.436571)	-0.1082244 (0.3936348)	-0.523995 (0.4113773)	-0.4706933 (0.4874545)	-0.1310938 (0.4463179)	-0.6153025 (0.4409232)
$X_{i,t-1}*Bpf_{i,t-1}$	-7.80329* (4.257134)	-6.739712* (3.926943)	-7.853164* (4.287502)	-8.590284* (4.516614)	-7.412859* (4.11631)	-8.617401* (4.543104)
F	1.87	1.84	3.31	2.92	2.19	5.47
Prob. > F	0.007	0.015	0.000	0.000	0.002	0.000
Observations	1 804	1 557	1 721	1 822	1 575	1 739
Countries	101	101	98	102	102	99
T maximum	31	21	31	31	21	31
T average	17.9	15.4	17.6	17.9	15.4	17.6
Balancing	57.6%	73.4%	56.6%	57.6%	73.5%	56.7%
Robust errors	Yes	Yes	Yes	Yes	Yes	Yes

Source: Prepared by the author, on the basis of the results of his research.
Note: Standard errors in parentheses. Statistical significance < 1%(***), 5%(**), 10%(*). The models used fixed effects estimator *xreg, fe vce (cluster)* and a robust orthogonalized GMM differences estimator with collapsed instruments (*xtabond2*). The constant and fixed effects are not shown.

Maintaining differentiation of countries with tax havens, findings remained robust irrespective of whether only original governance data for 1996–2020 (*Zgob#*) were used or whether the stochastically completed panel for 1990–1995 (*Zgob*) was also included. Results were similar when data were eliminated if the bank lending-deposit spread was negative or above 10,000 basis points.

Thus, for countries without tax havens, for any subcategory improvement in the sovereign credit rating, there is a corresponding financial efficiency estimate (as measured by the bank lending-deposit spread) of $\Delta y_{Completa} = \gamma_{Completa} * \Delta x = 6.46 * 0.05 = 0.32$ when considering the full sample, $\Delta y_{1996\text{-}2020} = \gamma_{1996\text{-}2020} * \Delta x = 6.87 * 0.05 = 0.34$ when considering the 1996–2020 sample and $\Delta y_{0\%<Yba<100\%} = \gamma_{0\%<Yba<100\%} * \Delta x = 6.38 * 0.05 = 0.32$ when considering the sample that excludes extreme values. The statistical significance of the results is less than 5%, even though these samples are, on average, 30%–40% smaller than those used in the two previous cases.

To illustrate, the median bank lending-deposit spread of 4.86% can be used as a point of reference. The initial efficiency of the spread ($Ytir\_i_{t=0} = \frac{100}{1+Ybb/100} = \frac{100}{1+4.86\%} = 95.73$) would become $Ytir\_i_{t=1} = 95.73 + 0.32 = 95.69 = \frac{100}{1+4.51\%}$ after one year, for every 100 monetary units of assets and liabilities processed.

Thus, the real bank lending-deposit spread would decrease by 35 basis points, from 4.86% to 4.51%, for any sovereign credit rating improvement at the subcategory level (e.g. from BBB+ to A-), when considering the full sample coefficient. Similar results are obtained when considering the sample that excludes extreme values.

The magnitude and sign of the estimated interaction coefficients suggest that there would be almost no effect on countries with tax havens.

Here again, no previous studies were identified that use this efficiency indicator to approximate financial development.

(d) Results of hypothesis contrasts

Lastly, table 8 shows the results of the different hypothesis contrasts with the six indicators used to approximate the four dimensions of financial development: (i) *lnYcréd* and *lnYipro* and for depth; (ii) *lnYiacc* for access; (iii) *Ytir_i* and *Ytin_i* for efficiency; and (iv) *Yddol* for stability.

Table 8
Unilateral probability values for disproving null hypothesis (H0: $\gamma \leq 0$)

Model	Regressors added or substituted for those maintained	Dependent variable		
		lnYcréd	*lnYipro*	*lnYiacc*
Dynamic fixed effects OLS	*Zgob; dlnZafbe; dlnZipc*	0.0000***	0.0025***	0.0018***
	Zgob;Zafcc;dlnZipc	0.0000***	0.0001***	0.0036***
	Zgob#;dlnZafbe;dlnZipc	0.0000***	0.0001***	0.0025***
	Zgob#;Zafcc;dlnZipc	0.0000***	0.0002***	0.0043***
Dynamic GMM differences (exogenous)	*Zgob;dlnZafbe;dlnZipc*	0.0000***	0.0092***	0.0065***
	Zgob;Zafcc;dlnZipc	0.0000***	0.0002***	0.0155**
	Zgob#;dlnZafbe;dlnZipc	0.0000***	0.0003***	0.0046***
	Zgob#;Zafcc;dlnZipc	0.0000***	0.0005***	0.0102**
Dynamic GMM differences (pre-determined)	*Zgob;dlnZafbe;dlnZipc*	0.0000***	0.4257	0.0001***
	Zgob;Zafcc;dlnZipc	0.0000***	0.3034	0.0001***
	Zgob#;dlnZafbe;dlnZipc	0.0000***	0.1288	0.0000***
	Zgob#;Zafcc;dlnZipc	0.0000***	0.0642*	0.0000***
		Ytir_i	*Ytin_i*	*Yddol*
Static fixed effects OLS	*Zgob,dlnZafbe*	0.0567*	0.0334**	0.2504
	Zgob; dlnZafbe; dlnZipc	0.0691*	0.0606*	0.2063
	Zgob; dlnZafbe; dlnZipc,0%<Yti<100%	0.0786*	0.0710*	
	Zgob#; dlnZafbe	0.0262**	0.0137**	0.1558
	Zgob#; dlnZafbe;dlnZipc	0.0215**	0.0152**	0.2707
	Zgob#;dlnZafbe;dlnZipc;0%<Yti<100%	0.0227**	0.0161**	
Static fixed effects OLS (adding interaction between *Xrsmn* and *Bpf*)	*Zgob,dlnZafbe*	0.0038***	0.0018***	0.3355
	Zgob; dlnZafbe; dlnZipc	0.0078***	0.0060***	0.2707
	Zgob; dlnZafbe; dlnZipc,0%<Yti<100%	0.0092***	0.0075***	
	Zgob#; dlnZafbe	0.0061***	0.0026***	0.1983
	Zgob#; dlnZafbe;dlnZipc	0.0062***	0.0041***	0.1939
	Zgob#;dlnZafbe;dlnZipc;0%<Yti<100%	0.0059***	0.0039***	

Source: Prepared by the author, on the basis of the results of his research.
Note: GMM, Generalized Method of Moments; OLS, ordinary least squares method. Statistical significance < 1%(***), 5%(**), 10%(*). Regressors *Xrsmn*; *Zinpc*; *Zac* and *Bcri* are maintained for all models.

Differing from the approach suggested by Clarke, Xu and Zou (2006) and by Beck, Demirgüç-Kunt and Levine (2007), the control for inequality (*Zequi*) was disregarded, as it did not ultimately prove significant in any of the models.

The results show that, using the logarithm indicator for the leveraging of economic activity (column *lnYcréd*), the null hypothesis was rejected at a statistical significance of less than 1% in all 12 models, irrespective of the financial openness indicator used (*dlnZafbe* or *Zafcc*), the coverage of the governance indicator used as a control variable (*Zgob* or *Zgob#*), the consideration of variables *Xrsmn* and *dlnZippa* as exogenous or pre-determined, or the application of a fixed effects OLS only.

The samples shrank in five countries when *Zafcc* was used as a regressor in lieu of *dlnZafbe*.

When the financial depth logarithm indicator (column *lnYipro*) was used instead of the leveraging logarithm indicator, the statistical significance of the null hypothesis rejection was maintained at less than 1%, except in dynamic pre-determined models, which did not prove significant.

When the financial access logarithm was used to approximate the degree of financial development of each country (column *lnYiacc*), the null hypothesis was rejected at a statistical significance of less than 1% in 10 of the 12 models and less than 5% in the other 2 models.

Using the bank lending-deposit spread to measure the efficiency of financial development, in both nominal and real terms (columns *Ytir_i* and *Ytin_i*), the null hypothesis was rejected at a statistical significance of less than 5% only for the original series of governance index data (*Zgob#)*. However, the statistical significance of the null hypothesis rejection was less than 1% when an interaction was included to separate the influence of countries with tax havens (*Bpf*), and the choice of model appeared to have very little effect.

Separating out industrialized countries (*Bind*) produced no significant differences.

The null hypothesis could not be rejected in any of the models when using the de-dollarization indicator (column *Yddol*) to approximate financial stability.

(e) Discussion of three particularities observed in the results

Three specific aspects of the results bear further discussion: (i) the partial difference of the contrast results with the financial depth indicators; (ii) the statistical insignificance of the contrast with the financial stability indicator; and (iii) the possibility of omitted-variable bias.

First, the partial rejection of the null hypothesis with indicator *lnYipro* relative to the total for *lnYcréd* in table 8 is attributable to the fact that indicator *Yipro*, constructed by the International Monetary Fund, is not adequately defined for less developed countries, which comprise the majority of the available sample.

As shown in table 9, that depth index subsumes not only indicator *Ycréd* but three others referring to the total assets of non-credit institutions. In less developed countries, this creates a coverage problem, as only the first indicator has exclusively domestic coverage, while for the other three, investments— which represent a large chunk of less developed countries' assets— are carried out both domestically and abroad. It is certain that deteriorating fiscal solvency would have an effect on total credit (domestic), whereas this is not necessarily so for total investments (domestic and international), as declining local investments could be offset by rising international investments.

Table 9
Links between financial development indicators

Aggregated indicators		Indicators by dimension	Individual indicators
Financial development index	Financial institution index	Depth index *(Yipro)*	Private sector credit / GDP (*Ycréd)*
			Pension fund assets / GDP
			Mutual fund assets / GDP
			Life insurance and non-life insurance premiums / GDP
		Access index *(Yiacc)*	Bank branches per capita * 100 000
			ATMs per capita * 100 000
		Efficiency index	Net interest margin
			Bank lending-deposit spread *(Ytin)*
			Non-interest income / total income
			Overhead costs / total assets
			Earnings / total assets
			Earnings / equity
	Financial markets index	Depth index	Stock market capitalization / GDP
			Stocks traded / GDP
			International public debt securities / GDP
			Domestic and international debt securities of non-financial corporations / GDP
			Domestic and international debt securities of financial corporations / GDP
		Access index	Stock market capitalization of 10 largest corporations / GDP
			Total number of issuers of debt (domestic and international, non-financial and financial corporations) / 100 000
		Efficiency index	Stocks traded / stock market capitalization
Indicators not included in any index		Stability indicators	Non-dollarized deposits / total deposits *(Yddol)*
			Non-dollarized credit / total credit
			Non-dollarized debt securities / total debt securities
			1 - International holders of debt securities / total holders of debt securities
			Domestic deposits and debt securities / domestic credit and investment

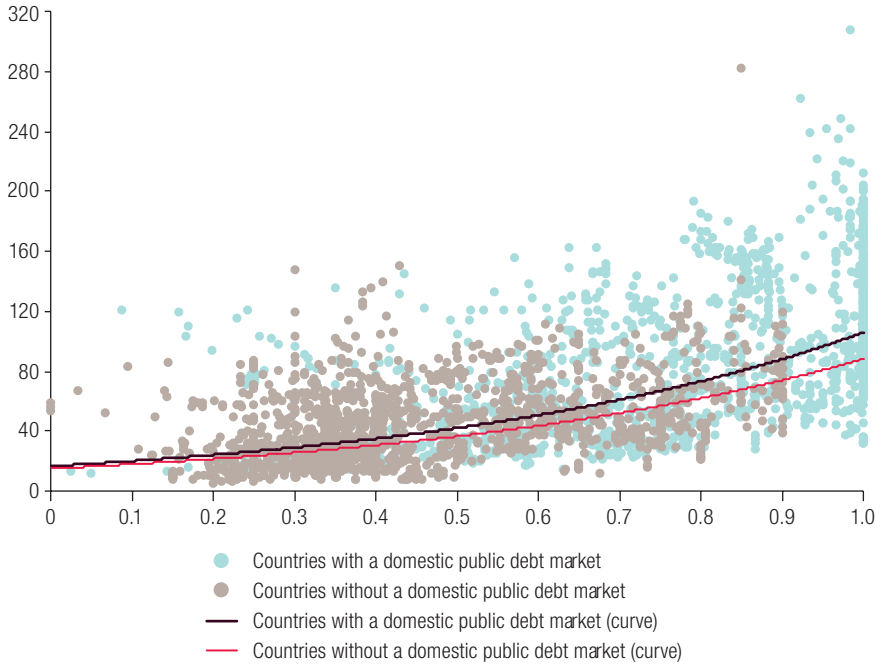
Source: Prepared by the author, on the basis of R. Sahay and others, "Rethinking financial deepening: stability and growth in emerging markets", *IMF Staff Discussion Note*, SDN/15/08, International Monetary Fund (IMF), 2015, and K. Svirydzenka, "Introducing a new broad-based index of financial development", *IMF Working Paper*, No. WP/16/5, IMF, 2016.

The second aspect of the results bearing further examination is the inclusion and non-rejection of the null hypothesis using indicator *Yddol*. The IMF indices do not include any financial stability indicator (see table 9), and yet, for less developed countries, the dollarization of financial systems is one of the largest sources of vulnerability. Its consideration in the analysis was therefore deemed essential. However, because the average maturity of bank deposits tends to fluctuate and be shorter than one year, one plausible hypothesis for the non-rejection is that this indicator's response is much more rapid and unstable.

The case of Peru, a particularly dollarized economy, offers an illustrative example of the volatility associated with financial system dollarization. According to official statistics, 53% of the country's bank deposits were held in checking and savings accounts in 2015 and 58% in 2019, while in the same two years, fixed deposits with terms of maturity longer than one year accounted for just 9% and 14% of total deposits, respectively. This translates into a sizeable volume of funds subject to rapid changes in currency composition, even in the span of a few days. Moreover, in 2015, the average volume of debits and credits was 9.5 times the year's average beginning and ending balances, compared to 4.5 in 2019. In parallel to these considerable fluctuations in the annual rotation of deposits through financial institutions, the national currency depreciated by 14.2% against the dollar over the course of 2015, while the exchange rate held relatively steady throughout 2019, appreciating by 0.3%. In the final analysis, less fiscal solvency means a less stable currency in the face of similar exogenous shocks.

The third point for discussion is the possible role of the sovereign curve provided by a domestic public debt market (*Zmidp*). This indicator was not considered in any of the previous regressions because it would exclude nearly 60% of the sample data from the estimations, and not just any data: the exclusion would tend to affect less developed countries in particular, as shown in figure 2. This bias is consistent with Levine's observation (2002) that stock market development follows banking sector development.

Figure 2
Financial leveraging and fiscal solvency, 1990–2020
(Percentages and index)



Source: Prepared by the author, on the basis of World Bank, "Indicators", 2024 [online] https://data.worldbank.org/indicator, Expansión, "Rating: calificación de la deuda de los países", Datosmacro.com, 2024 [online] https://datosmacro.expansion.com/ratings and World Government Bonds (WGB), "World credit ratings", 2024 [online] http://www.worldgovernmentbonds.com/world-credit-ratings/.
Note: The vertical axis shows credit-to-GDP ratios, expressed in percentages, and the horizontal axis shows the sovereign risk index, with 0.00 representing default and 1.00 representing the greatest possible solvency.

Is there an omitted-variable bias, then, in the previous findings? The answer depends on the group of countries included and the dimension of financial development under analysis. Assuming that the 87 countries without available data on their domestic public debt markets do not have a national stock market, the influence of fiscal solvency on financial depth would be nearly the same, with a minimal decrease in the coefficients calculated and a null hypothesis rejection with the same levels of statistical significance.

However, for the 52 countries that do have data on their domestic public debt markets, the degree of influence of the same level of fiscal solvency could be greater than estimated, but the net impact would depend on its interaction with the relative size of each domestic market, as shown in table 10. The results, while not shown, vary little when substituting financial openness indicators *dlnZafbe* and *Zafcc* in all six models.

Table 10
Fiscal solvency, domestic markets and financial development, 1990–2020

Explanatory and statistical variables	Dependent variable: $InYcred_{i,t}$					
	Full sample / Regression model			1996–2020 sample / Regression model		
	Fixed effects OLS	Exogenous GMM	Pre-determined GMM	Fixed effects OLS	Exogenous GMM	Pre-determined GMM
$lnYcréd_{i,t-1}$	0.9018847*** (0.0188208)	0.912141*** (0.0597999)	0.7787768*** (0.0988094)	0.8797891*** (0.0338686)	0.8542352*** (0.08725)	0.8167138*** (0.1114332)
$Xrsmn_{i,t-1}$	0.4986862*** (0.0991847)	0.4933744*** (0.1015507)	0.1277722 (0.4951229)	0.5084313*** (0.1216543)	0.5266576*** (0.1239486)	0.2073178 (0.4455961)
$Zmidp_{i,t-1}$	0.0024215*** (0.0008898)	0.0024476*** (0.0008627)	-0.0039023 (0.0048187)	0.0025436*** (0.0008397)	0.0024728*** (0.0008556)	0.0009217 (0.0042402)
$Zmidp_{i,t-1}$ *$Xrsmn_{i,t-1}$	-0.0024938** (0.0010481)	-0.0025568** (0.0010293)	0.0079079 (0.0072288)	-0.0024145** (0.0009928)	-0.0022767** (0.0011026)	-0.0003188 (0.0071479)
$dlnZinpc_{i,t-1}$	0.139525 (0.1008437)	0.1495904 (0.0956277)	0.1252281 (0.1329272)	0.0746166 (0.0950835)	0.0428219 (0.1274551)	-0.0425988 (0.1574405)
$Zac_{i,t-1}$	-0.0004628 (0.0003437)	-0.0004752 (0.0003381)	-0.0000699 (0.0004255)	-0.0005779 (0.0004075)	-0.0005721 (0.0004105)	-0.0006855 (0.0005945)
$dlnZipc_{i,t-1}$	-0.1449321*** (0.0223457)	-0.1468792*** (0.0221391)	-0.1100583** (0.0428834)	-0.3922298* (0.2041858)	-0.4188299** (0.2011735)	-0.5188131** (0.2395299)
$Zgob_{i,t-1}$	-0.0004022 (0.0010842)	-0.000385 (0.0010424)	-0.0024038 (0.0025741)			
$Zgob\#_{i,t-1}$				-0.0000917 (0.0012183)	-0.0004802 (0.0012357)	0.0010916 (0.0021874)
$dlnZafbe_{i,t-1}$	-0.0450893 (0.0533582)	-0.0470584 (0.0517322)	-0.0204444 (0.066394)	-0.0230906 (0.0576375)	-0.0135565 (0.0598457)	0.0118997 (0.0597777)
$Bcri_{i,t}$	-0.042974*** (0.0111317)	-0.045607*** (0.0176901)	0.0034681 (0.0341812)	-0.0284296** (0.0119378)	-0.0234595 (0.0196965)	-0.0175872 (0.0326709)
Instruments		67	49		49	40
P-value (AR(1))		0.010	0.016		0.001	0.000
P-value (AR(2))		0.891	0.987		0.156	0.323
P-value (Hansen)		0.978	0.475		0.178	0.220
Observations	1 114	1 062	1 062	812	760	760
Countries	52	51	51	52	51	51
T maximum	30	29	29	21	20	20
T average	21.4			15.6		
Balancing	71.4%	71.8%	71.8%	74.4%	74.5%	74.5%
Robust	Yes	Yes	Yes	Yes	Yes	Yes

Source: Prepared by the author, on the basis of the results of his research.
Note: GMM, Generalized Method of Moments; OLS, ordinary least squares method. Standard errors in parentheses. Statistical significance < 1%(***), 5%(**), 10%(*). The models used fixed effects estimator *xreg, fe vce (cluster)* and a robust orthogonalized GMM differences estimator with collapsed instruments (*xtabond2*). The constant and fixed effects are not shown.

In terms of possible influence on the other dimensions of financial development (efficiency, access and stability), the results of the hypothesis contrasts (not shown) indicate no change, estimating the influence of the domestic public debt market on those dimensions to be not significantly different from zero.

V. Final reflections

The financial development of any country is linked to how effectively and efficiently its financial system fulfils its core function —the allocation and deployment of economic resources, both spatially and across time— in an uncertain environment (Merton, 1990). To do this, the financial system needs to not only (i) support the accumulation of physical and human capital; (ii) use the resulting productive assets in the most efficient manner; and (iii) provide access to the entire population by establishing

and expanding institutions, instruments and markets (FitzGerald, 2006); but also (iv) do so without becoming a source of instability. Thus, financial development is not only a matter of quantity but also a matter of quality, as demonstrated by the global financial crisis of 2007–2008 (Sahay and others, 2015).

In that context, the confirmation of the proposed hypothesis is notable on two fronts. First, with one of the same indicators of the quantity of financial development used in earlier studies, the null hypothesis that was previously accepted as truth regarding the completeness of financial development theories was rejected. Second, using the largest sample identified to date, the study found evidence that greater fiscal solvency also affects the quality of financial development —that is, it affects the quality with which the financial system provides its services to the rest of the economy—, reducing costs in the form of the bank lending-deposit spread and expanding its service coverage in the form of bank branches and ATMs.

The confirmation of the hypothesis indicates that the role of public debt management in resisting economic and financial disruptions and avoiding crises is much larger than previously thought (IMF/World Bank, 2001). Indeed, greater fiscal solvency not only avoids problems but generates direct positive externalities for the development of the local financial system and, with its established relationship to economic development, also contributes to the increased well-being of the populations involved.

While governments can aspire to finance their budget deficits with public debt management strategies (IMF/World Bank, 2002), they cannot realistically achieve this aim while maintaining cost and risk targets unchanged, even through futile attempts to sustain a stable debt-to-GDP ratio (IMF/World Bank, 2009 and 2014). Costs and risks would continue to rise as long as debt and debt requirements continued to grow and as long as credible tax reform to service those requirements remained elusive. Ultimately, fiscal solvency perceptions depend not only on the immediate ability to pay but also on whether the current macroeconomic policy can credibly increase that ability over time (OECD, 2009).

Thus, it would be misleading to refer to low-debt or high-debt countries if a benchmark level of fiscal solvency has not been previously specified, nor would it be suitable to refer to countries' relative fiscal space if there has not been an increase in income or a decrease in expenditure beforehand (Heller, 2005), complemented by the necessary reforms (Roy, Heuty and Letouzé, 2006). Public debt sustainability is similar in that regard: a public debt trend of a certain level can be unsustainable at one risk rating (e.g. BBB-) but acceptable at a lower rating (e.g. BB+), without an insolvency crisis hanging in the balance in either scenario.

The question of what level of fiscal solvency is desirable or tolerable for a given country should be answered through the strategic foresight exercises conducted by its public treasury (Jiménez-Sotelo, 2017). However, similar to the question of the merits of policy favouring domestic public debt markets to provide a sovereign curve as a public good (Jiménez-Sotelo, 2023), the answer has more to do with moral philosophy and political science than with actual economic theory (ILO, 2012, pp. 3–11), because it depends on the ethical basis used to determine what is good and what is bad for a given society (Jiménez-Sotelo, 2018) and on the power struggle (Bunge, 1999, pp. 176–180) to decide who gets what, when and how (Lasswell, 1936).

The question of why elites in all countries might not seek to increase the capacity to repay public debt with a view to boosting financial development and, by extension, economic growth, was already examined from a political economic theory perspective by Becerra, Cavallo and Scartascini (2010), with data for 97 countries. They concluded that the relative intensity of opposition to financial development among a country's elites depends on their degree of credit dependency and the capabilities and role of the government in credit markets.

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