# Center for Economic Institutions
# Working Paper Series

**No. 2021-4**

## "The Finance-Growth Nexus in Latin America and the Caribbean: A Meta-Analytic Perspective"

**Ichiro Iwasaki**

**October, 2021**

Center for Economic Institutions

Working Paper Series

Institute of Economic Research
Hitotsubashi University
2-1 Naka, Kunitachi, Tokyo, 186-8603 JAPAN
https://cei.ier.hit-u.ac.jp/English/index.html
Tel:+81-42-580-8405/Fax:+81-42-580-8333

**CEI Working Paper Series No. 2021–4**
**October 2021**

# The Finance-Growth Nexus in Latin America and the Caribbean: A Meta-Analytic Perspective*

## Ichiro Iwasaki †

**Abstract**: This paper performs a meta-analysis of the effect of financial development and liberalization on macroeconomic growth in Latin America and the Caribbean using a total of 233 estimates collected from 21 previous works. Meta-synthesis of the collected estimates demonstrates that it is probable that financial development and liberalization enhance economic growth in the region, and these policy measures have the potential to have a meaningful impact on the real economy. The synthesis results also reveal that the choice of financial variables significantly affects reported estimates in the literature. Meta-regression analysis of literature heterogeneity and test for publication selection bias produce findings that are compatible with the synthesis results. The test results of publication selection bias also confirm that the existing literature contains genuine empirical evidence of the growth-promoting effect of finance in the region.

**JEL classification numbers**: E44, G10, O11, O16, O54

**Keywords**: financial development and liberalization, economic growth, meta-analysis, publication selection bias, Latin America and the Caribbean

---

* This research was supported financially by the Japan Center for Economic Research (JCER) and the Zengin Foundation for Studies on Economics and Finance. I thank Heiko Rachinger for providing a STATA code of the endogenous kinked model (Bom and Rachinger, 2019), Michie Kano and Eriko Yoshida for their research assistance, and Tammy Bicket for her editorial assistance. I also wish to express my deepest respect to the authors of the articles included in the meta-analysis in this paper. The usual disclaimer applies.

† Center for Economic Institutions, Institute of Economic Research, Hitotsubashi University, Naka 2-1, Kunitachi, Tokyo 186-8603, JAPAN; Email: iiwasaki@ier.hit-u.ac.jp

# 1 Introduction

The relationship between finance and the real economy is a research topic with a long history in economics, dating back to such classic works as Rudolf Hilferding's *Finance Capital* (Das Finanzkapital) and Joseph Schumpeter's *The Theory of Economic Development* (Theorie der wirtschaftlichen Entwicklung), which were published in the early 1910s (Hilferding, 1910; Schumpeter, 1911). Since then, from Hicks (1969) to Stiglitz (2000), there have been many controversies over the impacts of financial development and liberalization on macroeconomic growth, involving many scholars and researchers all over the world. In addition, from 2000 onward, econometric analysis has become very intensive, starting with Beck et al. (2000) and Levine et al. (2000), in order to test the applicability of theoretical considerations to reality.

In response to the lively debate among economists, staff at international financial institutions and government officials have started paying greater attention to the development and liberalization of the financial systems as a promising policy measure to promote economic growth. Consequently, international comparisons from this perspective are actively being made today. The *Global Financial Development Report*, published regularly by the World Bank, is a typical example (World Bank, 2019). Furthermore, the bank is working diligently to develop and publish various indicators of the financial systems of 214 countries and regions around the world, and researchers are actively using its Global Financial Development Database for their cross-national comparisons and empirical analyses.

**Table 1** compares the world regions based on their liquid liabilities-to-GDP and private credit-to-GDP ratios over the five-year period from 2013 to 2017 using the above-mentioned database. As shown in the table, the five-year averages of the liquid liabilities to GDP and the private credit to GDP for 167 countries are 66.9% and 54.7%, respectively. East Asian and Western European countries are far above this level, while Sub-Saharan African countries are far below the global average. Countries in Latin America and the Caribbean are roughly on par with countries in Eastern Europe, Oceania, and South and Inner Asia, suggesting that these emerging markets and developing economies still have much more room for progress in their financial systems than do East Asian and Western European states. This is why the governments of Latin America and the Caribbean are greatly interested in the development and liberalization of their financial systems from the perspective of development policy.

Another noteworthy feature of Latin America and Caribbean countries is the pronounced disparity within the region in terms of financial development. **Figure 1** shows a scatter plot of 32 countries from Antigua and Barbuda to Uruguay using the same data set as in **Table 1**. As this figure shows, the variance among these 32 countries is extremely large, both in terms of liquid liabilities to GDP and private credit to GDP. Moreover, while many countries do not reach the average level of the whole region, some countries are quite close to a level equal to that in East Asia and Western Europe. Against this background, interest in researching the finance–growth nexus in Latin America and the Caribbean has gradually increased in recent years.

To verify the conviction that financial development and liberalization have the potential to contribute to economic growth, a large number of empirical analyses have been carried out and are still ongoing all over the world. However, the results of previous empirical research have suggested, at best, pros and cons, and, as the number of publications increases, so does the opacity. The same research situation also applies to studies of the finance–growth nexus in Latin America and the Caribbean. In fact, 21 previous works on this topic provide a total of 233 estimates of the effects of financial development and liberalization on GDP growth; as the forest plot in **Figure 2** shows, these estimates vary significantly between and within studies. In addition, there is no chronological trend here in the years of publication and, as we will report later, the variation in reported empirical results has no clear relationship with target countries and estimation period.

Meta-analysis can serve as an effective tool to provide a clear path in the face of such uncertain research circumstances (Borenstein et al., 2009; Stanley and Doucouliagos, 2012). For instance, Iwasaki (2020a) successfully presents the general conclusions of core research subjects of transition economics through a meta-analysis of the existing literature with chaotic research contents. In this paper, utilizing the advanced techniques and guidelines of meta-analysis proposed by Stanley and Doucouliagos (2012), Havránek et al. (2020), and others, we will synthesize and compare empirical evidence reported in the previous studies of finance and growth in Latin American and Caribbean economies. Several attempts have been made to meta-analyze the finance-growth literature (Bumann et al., 2013; Arestis et al., 2015; Valickova et al., 2015; Bijlsma et al., 2018). Nevertheless, to the best of our knowledge, no meta-analysis focusing on Latin America and the Caribbean has ever been published. By performing the first meta-analysis of the relevant research works, this paper aims to test the following (null) hypothesis:

**Hypothesis 1**: *Financial development and liberalization have no impact on macroeconomic growth in Latin America and the Caribbean*.

The key empirical methodology in finance-growth studies is the selection of financial variables; researchers of the Latin American and Caribbean economies also employ various proxies for the extent of development and liberalization of financial institutions and markets in their econometrical analysis. At the same time, however, they have a strong tendency to extensively use two prototypical financial variables—liquid liabilities to GDP and private credit to GDP—as compared to other available variables. We question how this empirical strategy affects the results reported in their studies by testing the following (null) hypothesis:

**Hypothesis 2**: *A difference in financial variable does not affect reported estimates in the studies of Latin America and the Caribbean*.

In addition to the synthesis of and comparison with empirical results in the literature in question, meta-analysis has another important mission: To assess the degree of publication selection bias and the presence of genuine evidence beyond such artificial manipulation. "Publication selection occurs when researchers, reviewers, and editors are inclined to publish research results that are consistent with the conventional view and/or statistically significant. Consequently, larger and more significant effects will be overrepresented in the research record" (Iwasaki, 2020a, p. 7). In this regard, Stanley and Doucouliagos (2012) pointed out that "[t]he real problem of publication selection is not its existence, but the large biases that it can impact upon any summary of empirical economic knowledge, when uncorrected" (p. 52). In this paper, we will also tackle the issue of whether the published studies provide evidence of the true effect of financial development and liberalization on economic growth in Latin America and the Caribbean by testing the next (null) hypothesis through a meta-analysis:

**Hypothesis 3**: *The existing literature does not contain genuine evidence regarding the effect size of finance on growth in Latin America and the Caribbean*.

The meta-synthesis of 233 estimates extracted from 21 previous works demonstrates that financial development and liberalization are highly likely to promote economic growth in Latin American and Caribbean countries, and these policy measures tend to have a meaningful impact on the real economy. The synthesis results also reveal that the choice of financial variable significantly affects estimates reported in the literature. Meta-regression analysis (MRA) of heterogeneity across studies and testing for publication selection bias produce findings that are largely in line with the synthesis results. The test results of publication selection bias also confirm that the existing literature contains genuine empirical evidence of the growth-enhancing effect of finance in the region.

The remainder of this paper is organized as follows. Section 2 describes the procedure of selecting literature and overviews selected studies for meta-analysis. Section 3 synthesizes estimates collected from the selected studies. Section 4 performs an MRA of literature heterogeneity. Section 5 tests for publication selection bias. Lastly, Section 6 summarizes the major findings and concludes the paper.

## 2 Procedure for Selecting Literature and Overview of Selected Studies for Meta-Analysis

As the first step of testing the hypotheses, this section first describes the procedure for selecting literature and then overviews research works included in the meta-analysis.

To uncover studies that empirically examined the effect of financial development and liberalization on macroeconomic growth in Latin America and the Caribbean, we searched for relevant literature by accessing EconLit, Web of Science, and major academic press websites.[1] In utilizing these electronic databases, we carried out an AND search of paper titles, using "*finance*" or "*financial*" and "*growth*" as keywords. This title search yielded nearly 2,870 hits on EconLit and Web of Science and more than 580 additional hits on academic press websites. After eliminating duplication among the literature found through the mechanical searches, we confirmed that, at a minimum, the literature in this study field consisted of more than 2,500 published works in English. Included are numerous studies intended for purposes other than empirical analysis of the finance–growth nexus in Latin American and Caribbean economies. Therefore, as a second step, we looked closely at the content of each study to determine whether it examined Latin American and Caribbean countries and, if so, whether it included estimates that could be subject to our meta-analysis, narrowing the literature list to a total of 21 English works.

**Table 2** lists 21 articles selected for meta-analysis in order of publication year. This

[1] The following academic press websites were used in this literature search: Emerald Insight, Oxford University Press, Sage Journals, Science Direct, Springer Link, Taylor and Francis Online, and Wiley Online Library. The search of academic press websites was conducted for the most recent studies, published since January 2020, to supplement the results of the EconLit and Web of Science search. The final search of literature was conducted in June 2021.

list is consonant with **Figure 2**. As reported in this table, 16 works are multinational studies, and the remaining five works present single-country studies focusing on either Argentina, Brazil, or Colombia. The results of our literature search indicate that empirical works on the causal relationship between finance and growth in Latin America and the Caribbean began to be published in the early 2000s, after which succeeding studies were published in almost every year. We can also confirm that there was a large surge in studies on this topic in the 2010s. Actually, 13 of 21 selected works have been published from 2010 onward. To grasp the true effect by a meta-analysis, this fact serves as a favorable condition due to recent notable developments in econometric analysis.

The 21 selected works cover the 119-year period from 1896 through 2014 as a whole. A series of financial variables—pioneered in studies such as Beck et al. (2000) and Levine et al. (2000)—that has become the standard empirical methodology in this field today is also utilized proactively in studies of Latin American and Caribbean economies. Actually, the 21 selected studies report estimates of nine types of financial variables, including: (1) liquid liabilities to GDP, (2) private credit to GDP, (3) bank credit to GDP, (4) private credit to domestic credit, (5) market capitalization, (6) stock market activity, (7) comprehensive index of financial development, (8) capital account openness, and (9) stock market liberalization. The first seven variables represent the degree of financial development, while the last two variables are used as a proxy for financial liberalization. As pointed out in the Introduction, however, the extant literature has a strong tendency to employ either liquid liabilities to GDP or private credit to GDP as a key independent variable in empirical analysis. In fact, the variables of liquid liabilities to GDP and private credit to GDP are utilized in 10 selected works each, while the other five financial development variables are adopted in 13 papers, and the financial liberalization variables are employed only in two studies; consequently, the frequency of the individual use of the seven variables other than liquid liabilities to GDP and private credit to GDP to is extremely low.

For the present study, we adopted an eclectic coding rule, in which we do not necessarily limit selection to one estimate per study; instead, multiple estimates are collected from the selected studies if and only if we can recognize notable differences from the viewpoint of empirical methodology in at least one item of the target country, data type, regression equation, estimation period, estimator, composition of independent variables, and so forth. As a result of extracting estimates according to this coding policy, we obtained a total of 233 estimates. The mean and median of the number of estimates per study account for 11.1 and 8, respectively. Among these 233 estimates, 70 and 74 present the results of liquid liabilities to GDP and private credit to GDP, respectively; the remaining 71 estimates use the other five financial development variables, and 18 use the two financial liberalization variables. Under this condition, we will test Hypothesis 2 by classifying the collected estimates into four groups—(1) liquid liabilities to GDP, (2) private credit to GDP, (3) other financial development variables, and (4) financial liberalization variables—and contrasting these four variable types.

To synthesize and compare the estimates collected, we transformed each estimate to a partial correlation coefficient (PCC). The PCC is a unitless measure of the association of a dependent variable and the independent variable in question when other variables are held constant. In this paper, a meta-analysis is performed using PCCs of the collected estimates consistently throughout the following sections.

## 5 Meta-Synthesis

A meta-analysis is ordinarily composed of three steps: (1) meta-synthesis of collected estimates, (2) MRA of literature heterogeneity, and (3) testing for publication selection bias (Stanley and Doucouliagos, 2012; Iwasaki, 2020b).[2] We follow this standard procedure in testing the hypotheses. Accordingly, in this section, as the first step of meta-analysis, we synthesize the PCCs of the 233 estimates introduced in the preceding section.

First, let us look at the distribution of the estimates. **Table 3** shows the descriptive statistics of the collected estimates and the results of the *t* mean comparison test and Shapiro–Wilk normality test for all studies and by financial variable type. **Figure 3** shows the corresponding kernel density estimations. **Table 3** shows that both the mean and median for the category "all studies" are positive, and according to the *t*-test, the null hypothesis that the mean is zero is rejected at the 1% significance level. In addition, Panel (a) of **Figure 3** exhibits a kernel density estimation biased in the positive direction. These results suggest that the empirical results reported in the 21 selected studies as a whole demonstrate that financial development and liberalization do contribute to economic growth in Latin America and the Caribbean. Furthermore, the mean and median of estimates of liquid liabilities to GDP account for 0.251 and 0.165, respectively, greatly exceeding those of private credit to GDP (0.014 and 0.026, respectively), other financial development variables (0.080 and 0.097, respectively), and financial liberalization variables (0.103 and 0.116, respectively). To back up this observation, both the analysis of variance (ANOVA) and the Kruskal-Wallis rank-sum test strongly reject the null

[2] The **Appendix** provides a methodological note regarding the meta-analysis applied in this paper.

hypothesis that there is no difference among these four variable types. Panel (b) of **Figure 3** indicates that these observed differences are closely related to a stronger bias toward the positive side in the estimates of liquid liabilities to GDP than those of the other three financial variable types.

In light of the above considerations, we will turn next to the results of meta-synthesis. Column (a) of **Table 4** reports synthesis results using a meta fixed-effect model and a meta random-effects model, while Column (b) reports the heterogeneity test and measures. As shown in Column (b), the Cochran *Q* test of homogeneity rejects the null hypothesis at the 1% significance level, and the $I^2$ and $H^2$ statistics indicate the presence of heterogeneity among the studies concerned in all cases except for financial liberalization variables. Accordingly, we have adopted the estimates of the random-effects model for all studies, liquid liabilities to GDP, private credit to GDP, and other financial development variables as reference values of the traditional method, while we use the estimate of the fixed-effect model as a reference value for financial liberalization variables.

Column (c) of **Table 4** displays results of the unrestricted weighted least squares averaging (UWA) and the weighted average of the adequately powered (WAAP) approach proposed by Stanley and Doucouliagos (2017) and Stanley et al. (2017) as a new synthesis method. Although in theory the UWA synthesis generated the same point estimate as that of the transitional fixed-effect model, the *t* value of the former notably falls below that of the latter, suggesting that the UWA method is less influenced by excess heterogeneity than the fixed-effect model. In addition, three of five cases successfully synthesized collected estimates using the WAAP method. Hence, we adopt the WAAP estimates of 0.170, 0.203, and 0.271 as the best synthesis values for all studies, liquid liabilities to GDP, and other financial development variables, respectively, while the random-effects estimate of 0.010 and the fixed-effect estimates of 0.105 are used as the reference synthesis values for private credit to GDP and financial liberalization variables, respectively.

According to the standards of Doucouliagos (2011) regarding the evaluation of PCCs in macroeconomics research,[3] the WAAP synthesis value of 0.170 for all studies implies that the growth-enhancing effect of financial development and liberalization in Latin America and the Caribbean reaches an economically meaningful scale; therefore,

[3] As the evaluation criteria of the correlation coefficient, Doucouliagos (2011) proposed 0.104, 0.226, and 0.386 to be the lowest thresholds of small, medium, and large effects, respectively, as general standards in macroeconomic research (ibid., Table 3, p. 11).

Hypothesis 1 is rejected. Furthermore, the WAAP synthesis values of 0.203 for liquid liabilities to GDP and 0.271 for other financial development variables largely exceed the threshold of "small" and "medium" scales, respectively, while the random-effects synthesis value of private credit to GDP is statistically insignificant and the fixed-effect synthesis value of financial liberalization variables is only slightly above the "small" threshold. Thus, these results jointly reject Hypothesis 2.

As discussed above, the meta-synthesis showed results in opposition to both Hypotheses 1 and 2. These findings, however, fail to account for differences in study conditions across selected research works. Therefore, we need to check the robustness of the synthesis results reported in this section by testing whether they are replicable when various aspects of heterogeneity in the literature are controlled for. In the next section, we will address this issue through a multivariate MRA.

## 6 Meta-Regression Analysis

In this section, as the second step of meta-analysis, we examine the effects of literature heterogeneity on the empirical results of selected works by estimating a multivariate meta-regression model. To this end, we take the PCCs of the collected estimates as the dependent variable, while we initially employ a total of 25 variables as meta-independent variables. These 25 variables capture the differences in the number of countries studied, estimation period, data type, estimator, types of economic growth variables, attributes of financial variables, and selection of control variables in addition to the variables of financial variable type that aim to test Hypothesis 2 and standard errors of PCCs.[4]

To tackle the issues of model uncertainty and multicollinearity that may arise from the use of a multitude of moderators, following the example of Polák (2019) and Havranek and Sokolova (2020), we first conducted a Bayesian model averaging (BMA) analysis and OLS frequentist check, taking the private credit to GDP, other financial development variables, and financial liberalization variables as well as standard errors of PCCs as focus regressors and the other meta-independent variables as auxiliary regressors. As a result of this selection process, six variables—time-series data, real GDP, lagged, with intercepted variable, investment, and education—having both a posterior inclusion probability (PIP) of 0.50 or more in the BMA analysis and a *p* value of 0.10 or less in the OLS frequentist check are identified as robust moderators against model uncertainty and

[4] **Appendix Table A1** lists the names, definitions, and descriptive statistics of the 25 meta-independent variables.

multicollinearity.[5]

We then regressed the PCCs of collected estimates on four focus regressors and the six selected moderators using five different models. The estimation results are reported in **Table 5**. As shown in this table, estimates are sensitive to the choice of estimator. Therefore, we assume that meta-independent variables that are statistically significant and have the same sign in at least three of five models constitute robust estimates.

From the above standpoint, we confirm that the variable of private credit to GDP was estimated to be insignificant in all five models, while the coefficients of other financial development variables and financial liberalization variables exhibited significant and negative signs in four and three models, respectively, taking liquid liabilities to GDP as the reference category. These results imply that, on one hand, the estimates of financial variables other than the two major variables fall below those of liquid liabilities to GDP, on average, if other study conditions are held constant. On the other hand, there is no statistical difference between liquid liabilities to GDP and private credit to GDP in terms of the effect size measured by PCC, *ceteris paribus*. Thereby, the MRA results in this section partially reject Hypothesis 2.[6]

The six selected moderators as well as standard errors of PCC show robust estimates in **Table 5**. These results also give some insights for understanding the empirical analysis conducted in the previous literature.

## 7 Test of Publication Selection Bias

As the final step of meta-analysis, we test for publication selection bias using a funnel plot and the goodness-of-fit test of proportional distribution, as well as the MRA test

---

5 The results of the BMA analysis and OLS frequentist check are reported in **Appendix Table A2**. It is argued that BMA is sensitive to the priors used in estimation (Bajzik et al., 2020; Matousek et al., 2021; Zigraiova et al., 2021). Hence, for a robustness check, we also estimated a model using the weighted-average least squares (WALS) estimator introduced by Magnus et al. (2010), which is based on a transparent definition of prior ignorance and fits a classical linear regression model with uncertainty about the choice of explanatory variables. As a result, we found that the WALS model indicated a set of meta-independent variables quite similar to that of the BMA model.

6 Estimation results of a model with all moderators are reported in **Appendix Table A3**. As shown in this table, the combination of statistically significant meta-independent variables is different from that in **Table 5**, implying that the MRA without the selection of moderators is likely to be strongly affected by the problems of model uncertainly and multicollinearity in the case of this study.

procedure combining the funnel-asymmetry test (FAT), the precision-effect test (PET), and the precision-effect estimate with standard error (PEESE).

The funnel plot presented in **Figure 4** shows that the estimates extracted from all 21 studies form a distribution with an inverted funnel shape, suggesting that strong manipulation of the publication selection of empirical evidence is unlikely to exist in the literature. At the same time, we notice that significant differences are observed in the distribution across the four financial variable types. In fact, the estimates of liquid liabilities to GDP show a distribution skewed toward the positive side, while those of private credit to GDP tend to appear in the vicinity of zero. In sum, it is quite difficult to make a clear judgment about publication selection bias from the funnel plot.[7]

Therefore, in **Table 6,** we conducted a goodness-of-fit test to examine whether collected estimates are distributed proportionally around the true effect. According to the table, in the case of all studies, if we assume that the true effect size is zero, as illustrated by the dotted line in **Figure 4**, then the ratio of positive and negative estimates would be 159:74, and the null hypothesis that the ratio of positive to negative estimates is equal is rejected at the 1% significant level ($z$ = 5.569, $p$ = 0.000). Meanwhile, if we assume that the WAAP synthesis value depicted by the solid line in **Figure 4** approximates the true effect, then the collected estimates would be distributed to 156:77 on the left and right sides of the threshold of 0.170, and the null hypothesis is again rejected strongly ($z$ = -5.176, $p$ = 0.000). These results imply that the probability of publication selection bias is quite high in this research domain, irrespective of differences in the assumptions of the true effect size. The same conclusion can be applied to the financial development variables other than liquid liabilities to GDP and private credit to GDP. On the other hand, the judgment of publication selection bias in the estimates of liquid liabilities to GDP and financial liberalization variables is contradictory between the two assumptions of the true effect. With respect to the estimates of private credit to GDP, the likelihood of publication selection can be relatively lower than for the other three financial variable types.

As seen above, the visual examination using a funnel plot in **Figure 4** and the univariate test in **Table 6** demonstrate mutually inconsistent results. Therefore, we will rely on the methodologically stricter FAT-PET-PEESE procedure for a final judgment.

[7] The shape of the funnel plot that seems to peak at or near zero may indicate the presence of a potential measurement error and the resulting attenuation bias in previous studies that could drive the reported results to zero. This observation implies the need to deal with endogeneity between publication selection bias and the standard error in the FAT-PET-PEESE procedure using the IV estimation method.

**Table 7** shows the results for all studies. As reported in Panel (a) of the table, in three of five models, FAT could not reject the null hypothesis that the intercept ($\gamma_0$) is zero, suggesting that publication selection is less likely to have taken place in the extant literature. However, even if publication selection bias is absent, the collected estimates might not contain genuine empirical evidence. Panel (a) shows that the null hypothesis that the coefficient ($\gamma_1$) of the inverse of the standard error ($1/SE$) is zero is rejected in four models, accordingly, proving that the collected estimates do contain empirical evidence. Furthermore, as seen in the results of the PEESE approach, shown in Panel (b), the coefficients ($\gamma_1$) of $1/SE$ are estimated to be statistically significant in four models; therefore, the true value should be in a range of 0.1043 to 0.1586 in terms of PCC. These estimation results lead us to conclude that the effect of financial development and liberalization on economic growth in Latin America and the Caribbean is positive on an economically meaningful scale and, accordingly, to reject Hypothesis 1. In addition, the statistically significant estimates of PET and PEESE also reject Hypothesis 3, which postulates the non-existence of genuine evidence.[8]

Further, we performed the FAT-PET-PEESE procedure separately by financial variable type. **Table 8** summarizes the results together with those for all studies mentioned above. As reported in this table, the FAT identified publication selection bias only in the estimates of the financial development variables other than liquid liabilities to GDP and private credit to GDP. The PET suggested the presence of genuine empirical evidence in the estimates of liquid liabilities to GDP, other financial development variables, and financial liberalization variables, and the PEESE produced a non-zero publication selection–adjusted effect size for all three of these cases. The PEESE-generated values shown in the column farthest right in **Table 8** largely conform to the meta-synthesis results reported in **Table 4**, thereby jointly rejecting Hypothesis 2. At the same time, we note that genuine evidence of the effect size of private credit to GDP is not found in the selected studies, perhaps due to the relatively low statistical significance of their estimates, as the median statistical power of 0.039 in **Table 4** indicates.

[8] The FAT-PET-PEESE procedure assumes a linear relationship between publication selection bias and standard errors, which might not be true in the case of this study. For a robustness check, therefore, we carried out alternative estimations of publication selection bias–corrected effect size using four advanced techniques that address the possible nonlinear relationship between publication selection bias and the standard error. **Appendix Table A4** shows the results. From this table, we confirm that, consistent with the WAAP and PEESE estimates, these alternative models repeatedly verify the presence of a non-zero truth effect of finance on growth.

## 8 Conclusions

In this paper, we carried out the first meta-analysis of the effects of financial development and liberalization on macroeconomic growth in Latin America and the Caribbean. Until now, the extant literature shows mixed evidence, and, consequently, the overall situation was extremely unclear in this region. Using 233 estimates collected from 21 previous works, our meta-analysis successfully gave a definite answer on this point by rejecting the three hypotheses raised in the Introduction.

Concretely, the meta-synthesis results in Section 5 demonstrated that financial development and liberalization are highly likely to enhance economic growth in Latin American and Caribbean countries, and these policy measures have the potential to meaningfully impact real life, as opposed to Hypothesis 1. In fact, according to the WAAP synthesis value reported in **Table 4**, the effect size of finance on growth in the region largely exceeds the threshold of the small effect and is approaching the medium scale, according to the Doucouliagos criteria. The synthesis results also reveal that the choice of financial variable significantly affects reported estimates in the selected papers, which contradicts Hypothesis 2. In this regard, it is noteworthy that the synthesized effect size of the financial development variables, other than liquid liabilities to GDP and private credit to GDP using the WAAP method, reaches a level that is well above the medium threshold. The multivariate MRA of literature heterogeneity in Section 6 and the test for publication selection bias in Section 7 produced findings that are largely compatible with the synthesis results. The publication selection bias test results also confirmed that the existing literature does contain genuine empirical evidence of the growth-promoting effect of finance in the region; consequently, Hypothesis 3 is rejected.

Researchers and policymakers may greatly welcome the above results, which suggest that policy measures designed to build sound financial systems will impact the national economy in Latin American and Caribbean countries in statistically significant and economically favorable ways. At the same time, the finding that the variable of private credit to GDP—the representative measurement of financial intermediation—is estimated with a low statistical power in the previous papers and, consequently, does not capture the notable impact on the real economy raises a big question from an empirical point of view.[9]

---

[9] The MRA result that detects no statistically significant difference between liquid liabilities to GDP and private credit to GDP when various study conditions are simultaneously controlled for

The number of studies on the finance-growth nexus in Latin America and the Caribbean is limited as compared with that in other regions of the world. In fact, as a result of the literature search described in Section 2, we identified 41, 72, and 96 studies that provide empirical evidence of the impact of financial development and liberalization on economic growth in Europe, Asia, and the Middle East/Africa, respectively, while only 21 studies were found to fit the meta-analysis in this paper.[10] Further efforts by researchers are required with the aim of accumulating empirical results to answer the above question and to grasp a more precise picture of the relationship between finance and growth in the region.

## **Appendix.** Methodology of Meta-Analysis: A Brief Guide

In this appendix, we will provide a brief description of the methodology of meta-analysis performed in this paper.

To synthesize and compare estimates derived from the selected studies, we utilize the partial correlation coefficient (PCC). The PCC is a unitless measure of the association of a dependent variable and the independent variable in question when other variables are held constant. When $t_k$ and $df_k$ denote the $t$ value and the degree of freedom of the $k$-th estimate, respectively, the PCC ($r_k$) is calculated with the following equation:

$$r_k = \frac{t_k}{\sqrt{t_k^2 + df_k}}. \quad (1)$$

The standard error ($SE_k$) of $r_k$ is given by $\sqrt{(1 - r_k^2)/df_k}$.

We synthesize PCCs using the meta fixed-effect model and the meta random-effects model; according to the Cochran $Q$ test of homogeneity and $I^2$ and $H^2$ heterogeneity measures, we adopt the synthesized effect size of one of these two models. In addition to this traditional synthesis method, we also utilize the unrestricted weighted least squares average (UWA) approach proposed by Stanley and Doucouliagos (2017) and Stanley et al. (2017) as a new synthesis method. The UWA is less subject to influence from excess heterogeneity than is the fixed-effect model. The UWA method regards as the synthesized effect size a point estimate obtained from the regression that takes the standardized effect

may be a key that solves this issue.

[10] Needless to say, these 21 works are not the only ones that deal with the finance–growth nexus in Latin America and the Caribbean. In fact, a machine search using EconLit yielded more than 80 references on this topic in June 2021, while the relevant literature related to Europe, Asia, and the Middle East/Africa accounted for more than 300, 500, and 650 references, respectively.

size as the dependent variable and the estimation precision as the independent variable. Specifically, we estimate Eq. (2), in which there is no intercept term, and the coefficient, $\alpha$, is utilized as the synthesized value of the PCCs:

$$t_k = \alpha(1/SE_k) + \varepsilon_k, \qquad (2)$$

where $\varepsilon_k$ is a residual term. In theory, $\alpha$ in Eq. (2) is consistent with the estimate of the meta fixed-effect model.

Furthermore, Stanley et al. (2017) proposed conducting a UWA of estimates, the statistical power of which exceeds the threshold of 0.80, and called this estimation method the weighted average of the adequately powered (WAAP). They stated that WAAP synthesis has less publication selection bias than the traditional random-effects one. We adopt the WAAP estimate as the best synthesis value whenever available. Otherwise, the traditional synthesized effect size is used as the second-best reference value.

Following the synthesis of collected estimates, we conduct a meta-regression analysis (MRA) to explore the factors causing heterogeneity between selected studies. More concretely, we estimate a meta-regression model:

$$y_k = \beta_0 + \sum_{n=1}^{N-1} \beta_n x_{kn} + \beta_N se_k + e_k, \qquad (3)$$

where $y_k$ is the PCC (i.e., $r_k$) of the $k$-th estimate, $\beta_0$ is the constant, $x_{kn}$ denotes a meta-independent variable that captures the relevant characteristics of an empirical study and explains its systematic variation from other empirical results in the literature, $se_k$ is the standard error of the PCC, $\beta_n$ denotes the meta-regression coefficient to be estimated, and $e_k$ is the meta-regression disturbance term.

As pointed out in Iwasaki et al. (2020), there is no clear consensus among meta-analysts about the best model for estimating Eq. (3). Hence, to check the statistical robustness of coefficient $\beta_n$, we perform an MRA using the following six estimators: (1) the cluster-robust weighted least squares (WLS), which clusters the collected estimates by study, computes robust standard errors, and is weighed by the inverse of standard error as a measure of estimate precision; (2) the cluster-robust WLS weighed by the degrees of freedom to account for sample-size differences among the studies; (3) the cluster-robust WLS weighed by the inverse of the number of estimates in each study to avoid the domination of the results by studies with large numbers of estimates; (4) the multi-level mixed-effects RLM estimator; (5) the cluster-robust random-effects panel GLS estimator; and (6) the cluster-robust fixed-effects panel LSDV estimator. We report either a random-effects model or a fixed-effects model, according to the Hausman test of model specification.

As Polák (2019) and Havranek and Sokolova (2020) argued, MRA involves the issue of model uncertainty, in the sense that the true model cannot be identified in advance. In addition, there is a high risk that the simultaneous estimation of multiple meta-independent variables could lead to multicollinearity. Accordingly, in line with the approach of Bayesian meta-analysts, we first estimate the posterior inclusion probability (PIP) of each meta-independent variable other than the variables needed for hypothesis testing and standard error of PCCs, using the Bayesian model averaging (BMA) method. Then, we conduct an OLS frequentist check of variables with PIPs of 0.50 or more, adopting a policy of employing variables for which the estimates are statistically significant at a level of 10% or above as selected moderators in Eq. (3).

As the final stage of meta-analysis, we examine publication selection bias using a funnel plot, by conducting a goodness-of-fit test of proportional distribution, and by performing an MRA test procedure consisting of a funnel-asymmetry test (FAT), a precision-effect test (PET), and a precision-effect estimate with standard error (PEESE), which were proposed by Stanley and Doucouliagos (2012) and have been used widely in previous meta-studies.

A funnel plot is a scatter plot with the effect size (in the case of this paper, the PCC) on the horizontal axis and the precision of the estimate (the inverse of the standard error $1/SE$) on the vertical axis. In the absence of publication selection bias, effect sizes reported by independent studies vary randomly and symmetrically around the true effect size. Moreover, according to the statistical theory, the dispersion of effect sizes is negatively correlated with the precision of the estimate. Therefore, the shape of the plot must look like an inverted funnel. In other words, if the funnel plot is not bilaterally symmetrical but is deflected to one side, then an arbitrary manipulation of the study area in question is suspected, in the sense that estimates in favor of a specific conclusion (i.e., estimates with an expected sign) are more frequently published.

The goodness-of-fit test examines the proportional distribution of the reported estimates. The test is performed based on either the assumption that the true effect size is zero or the assumption that the selected meta-synthesis value approximates the true effect. By conducting this univariate test, we inspect whether the estimates in question are distributed evenly around the true effect size.

The FAT-PET-PEESE procedure has been developed to test publication selection bias and the presence of genuine evidence in a more rigid manner: FAT can be performed by regressing the $t$ value of the $k$-th estimate on the inverse of the standard error ($1/SE$) using the next equation (4), thereby testing the null hypothesis that the intercept term $\gamma_0$ is equal to zero:

$$t_k = \gamma_0 + \gamma_1(1/SE_k) + v_k, \qquad (4)$$

where $v_k$ is the error term. When the intercept term $\gamma_0$ is statistically significantly different from zero, we can interpret that the distribution of the effect sizes is asymmetric.

Even if there is publication selection bias, a genuine effect may exist in the available empirical evidence. Stanley and Doucouliagos (2012) proposed examining this possibility by testing the null hypothesis that the coefficient $\gamma_1$ is equal to zero in Eq. (4). The rejection of the null hypothesis implies the presence of genuine empirical evidence. $\gamma_1$ is the coefficient of precision; therefore, it is called a PET.

Moreover, Stanley and Doucouliagos (2012) also stated that an estimate of the publication selection–adjusted effect size can be obtained by estimating the following equation (5), which has no intercept. If the null hypothesis of $\gamma_1 = 0$ is rejected, then the non-zero true effect does actually exist in the literature, and the coefficient $\gamma_1$ can be regarded as its estimate.

$$t_k = \gamma_0 SE_k + \gamma_1(1/SE_k) + v_k \qquad (5)$$

This is the PEESE approach.[11]

To test the robustness of the regression coefficients obtained from the above FAT-PET-PEESE procedure, we estimate Eqs. (4) and (5) using not only the unrestricted WLS estimator, but also the WLS estimator with bootstrapped standard errors, the cluster-robust WLS estimator, and the unbalanced panel estimator for a robustness check. In addition to these four models, we also run an instrumental variable (IV) estimation with the inverse of the square root of the number of observations used as an instrument of the standard error, because "the standard error can be endogenous if some method choices affect both the estimate and the standard error. Moreover, the standard error is estimated, which causes attenuation bias in meta-analysis" (Cazachevici et al., 2020, p. 5).

Furthermore, as pointed out in Bajzik et al. (2020) and Zigraiova et al. (2021), the

[11] We can see that the coefficient $\gamma_1$ in Eq. (5) may become the estimate of the publication bias–adjusted effect size in light of the fact that the following equation is obtained when both sides of Eq. (5) are multiplied by the standard error:

$$\text{Effect size}_k = \gamma_0 SE_k^2 + \gamma_1 + w_k. \quad (5b)$$

When directly estimating Eq. (5b), the WLS method, with $1/SE_k^2$ as the analytical weight, is used.

FAT-PET-PEESE approach implicitly assumes that publication selection bias is linearly proportional to the size of the standard error, which might not be practical in some cases. To deal with the possible nonlinear relationship between the two, some advanced techniques have been developed recently. They include the “Top 10” approach, proposed by Stanley et al. (2010), who discovered that discarding 90% of the published findings greatly reduces publication selection bias and is often more efficient than conventional summary statistics; the selection model, developed by Andrews and Kasy (2019), which tests for publication selection bias using the conditional probability of publication as a function of a study’s results; the endogenous kinked model, innovated by Bom and Rachinger (2019), which presents a piecewise linear meta-regression of estimates of their standard errors, with a kink at the cutoff value of the standard error below which publication selection is unlikely; and the *p*-uniform method, introduced by van Aert and van Assen (2012), which is grounded on the statistical theory that the distribution of *p*-values is uniform conditional on the population effect size. In this paper, we apply these four techniques to provide alternative estimates of the publication selection bias–corrected effect size and compare them with the WAAP and PEESE estimates for a robustness check.

## References

van Aert, R.C. and M. van Assen (2021) Correcting for publication bias in a meta-analysis with the p-uniform method, Working paper, Tilburg University and Utrecht University.

Andrews, I. and M. Kasy (2019) Identification of and correction for publication bias, American Economic Review, 109(8): 2766–2794.

Arestis, P., G. Chortareas and G. Magkonis (2015) The financial development and growth nexus: A meta-analysis, Journal of Economic Surveys, 29(3): 549–565.

Bajzik, J., T. Havranek, Z. Irsova and J. Schwarz (2020) Estimating the Armington elasticity: The importance of study design and publication bias, Journal of International Economics, 127, Article 103383.

Beck, T., L. Ross and L. Norman (2000) Finance and the sources of growth, Journal of Financial Economics, 58 (1-2): 261-300.

Bijlsma, M., C. Kool and M. Non (2018) The effect of financial development on economic growth: A meta-analysis, Applied Economics, 50(57): 6128-6148.

Bittencourt, M. (2012) Financial development and economic growth in Latin America: Is Schumpeter right? Journal of Policy Modeling, 34(3): 341-355.

Blanco, L. (2009) The finance-growth link in Latin America, Southern Economic Journal, 76(1): 224-248.

Blanco, L. (2013) Finance, growth, and institutions in Latin America: What are the links? Latin American Journal of Economics, 50(2): 179-208.

Bom, P. R. D. and H. Rachinger (2019) A kinked meta-regression model for publication bias correction, Research Synthesis Methods, 10(4): 497–514.

Borenstein, M., L. V. Hedges, P. T. Higgins and H. R. Rothstein (2009). Introduction to Meta-Analysis, John Wiley & Sons: Chichester.

Bumann, S., N. Hermes and R. Lensink (2013) Financial liberalization and economic growth: A meta-analysis, Journal of International Money and Finance, 33: 255-281.

Bussière, M. and M. Fratzscher (2008) Financial openness and growth: Short-run gain, long-run pain? Review of International Economics, 16(1): 69–95.

Campos, N. F., M. G. Karanasos and B. Tan (2012) Two to tangle: Financial development, political instability and economic growth in Argentina, Journal of Banking and Finance, 36(1): 290-304.

Campos, N. F., M. G. Karanasos and B. Tan (2016) From riches to rags, and back? Institutional change, financial development and economic growth in Argentina since 1890, Journal of Development Studies, 52(2): 206-223.

Cazachevici, A., T. Havranek and R. Horvath (2020) Remittances and economic growth: A meta-analysis, World Development, 134, Article 105021.

Christopoulos, D. K. and E. G. Tsionas (2004) Financial development and economic growth: Evidence from panel unit root and cointegration tests, Journal of Development Economics, 73(1), 55– 74.

Dawson, P. J. (2010) Financial development and economic growth: A panel approach, Applied Economics Letters, 17(7-9): 741–745.

Doucouliagos, H. (2011) How large is large? Preliminary and relative guidelines for interpreting partial correlations in economics, School Working Paper No. SWP 2011/5, School of Accounting, Economics and Finance, Faculty of Business and Law, Deakin University: Melbourne.

Dufrenot, G., V. Mignon and A. Peguin-Feissolle (2010) Testing the finance-growth link: Is there a difference between developed and developing countries? Economics Bulletin, 30(3): 1794-1807.

Fuchs-Schündeln, Ni. and N. Funke (2003) Stock market liberalization financial and macroeconomic implications, Review of World Economics, 139(4): 730-761.

Hassan, M. K., B. Sanchez and J-S. Yu (2011) Financial development and economic growth: New evidence from panel data, Quarterly Review of Economics and Finance, 51(1): 88-104.

Havranek, T. and A. Sokolova (2020) Do consumers really follow a rule of thumb? Three thousand estimates from 144 studies say "probably not," Review of Economic Dynamics, 35: 97-122.

Havránek, T, T. D. Stanley, H. Doucouliagos, P. Bom, J. Geyer-Klingeberg, I. Iwasaki, W. R. Reed, K. Rost and R. C. M. van Aert (2020) Reporting guidelines for meta-analysis in economics, Journal of Economic Surveys, 34: 469-475.

Hicks, J. R. (1969) A Theory of Economic History, Oxford University Press: Oxford.

Hilferding, R. (1910) Das Finanzkapital: eine Studie über die jüngste Entwicklung des Kapitalismus, Verlag der Wiener Volksbuchhandlung Ignaz Brand & Co.: Wien.

Iwasaki, I. (ed.) (2020a) The Economics of Transition: Developing and Reforming Emerging Economies, Routledge: Abingdon and New York.

Iwasaki, I. (2020b) Meta-Analysis of Emerging Markets and Economies: An Introductory Note for the Special Issue," Emerging Markets Finance & Trade, 56(1): 1-9.

Iwasaki, I., X. Ma and S. Mizobata (2020) Corporate ownership and managerial turnover in China and Eastern Europe: A comparative meta-analysis, Journal of Economics and Business, 111, Article 105928.

Lee, C-C. and C-P. Chang (2009) FDI, Financial development, and economic growth: International evidence, Journal of Applied Economics, 12(2,): 249-271.

Levine, R., N. Loayza and T. Beck (2000) Financial intermediation and growth: Causality and causes, Journal of Monetary Economics, 46(1): 31-77.

Magnus, J. R., O. Powell and P. Prüfer (2010) A comparison of two model averaging techniques with an application to growth empirics, Journal of Econometrics, 154(2): 139-153.

Matousek, J., T. Havranek and Z. Irsova (2021) Individual discount rates: a meta-analysis of experimental evidence, Experimental Economics. (Early View: https://link.springer.com/article/10.1007/s10683-021-09716-9)

Mundaca, B. G. (2009) Remittances, financial market development, and economic growth: The case of Latin America and the Caribbean, Review of Development Economics, 13(2): 288–303.

Narayan, P. K. and S. Narayan (2013) The short-run relationship between the financial system and economic growth: New evidence from regional panels, International Review of Financial Analysis, 29: 70–78.

Pessoa, F. M. C., M. J. Braga and G. A. S. Morais (2019) Economic growth and financial development in Brazil: A flexible regression model approach, CEPAL Review, (128): 91-112.

Polák, P. (2019) The Euro's trade effect: A meta-analysis, Journal of Economic Surveys, 33(1): 101-124.

Ramirez, M. D. (2013) Do financial and institutional variables enhance the impact of remittances on economic growth in Latin America and the Caribbean? A panel cointegration analysis, International Advances in Economic Research, 19(3): 273-288.

Rodriguez, C. M. (2014) Financial development, fiscal policy and volatility: Their effects on growth, Journal of International Trade & Economic Development, 23(2): 223-266.

Schumpeter, J. (1911) Theorie der wirtschaftlichen Entwicklung. Eine Untersuchung über Unternehmergewinn, Kapital, Kredit, Zins und den Konjunkturzyklus, Verlag von Duncker and Humblot: Leipzig.

Stanley, T. D. and H. Doucouliagos (2012) Meta-Regression Analysis in Economics and Business, London and New York: Routledge.

Stanley, T. D. and H. Doucouliagos (2017) Neither fixed nor random: Weighted least squares meta-regression, Research Synthesis Method, 8(1): 19-42.

Stanley, T. D., H. Doucouliagos and J. P. A. Ioannidis (2017) Finding the power to reduce publication bias, Statistics in Medicine, 36(10): 1580-1598.

Stanley, T. D., S. B. Jarrell and H. Doucouliagos (2010) Could it be better to discard 90% of the data? A statistical paradox, The American Statistician, 64: 70–77.

Stefani, P. (2007) Financial development and economic growth in Brazil: 1986-2006, Economics Bulletin, 3(69): 1-13.

Stiglitz, J. E. (2000) Capital market liberalization, economic growth, and instability, World Development, 28(6): 1075-1086.
Valickova, P., T. Havranek and R. Horvath (2015) Financial development and economic growth: A meta-analysis, Journal of Economic Surveys, 29(3): 506–526.
Venegas-Martínez, F. and A. Rodríguez-Nava (2014) Is there a relationship between financial development and economic growth in Latin American countries with higher per capita GDP? IEB International Journal of Finance, 9: 8-21.
Ventura, C. M. (2008) The effects of financial intermediation on Colombian economic growth, Ensayos sobre Política Económica, 26(57): 250-280.
Williams, K. (2018) Has the finance–growth link been broken? Panel data evidence from Latin America and the Caribbean, Economia, 19(3): 404–423.
World Bank (2019) Global Financial Development Report 2019/2020: Bank Regulation and Supervision a Decade after the Global Financial Crisis, International Bank for Reconstruction and Development: Washington, DC.
Zigraiova, D., T. Havranek, Z. Irsova and J. Novak (2021) How puzzling is the forward premium puzzle? A meta-analysis, European Economic Review, 134, Article 103714.

**Table 1**. Financial development in the world and regionally, 2013–2017

| Region | Nunber of economies | Liquid liabilities to GDP [a] | Private credit to GDP [b] |
|---|---|---|---|
| World | 167 | 66.9 | 54.7 |
| East Asia | 5 | 200.8 | 144.8 |
| Eastern Europe | 20 | 55.8 | 47.5 |
| Latin America and the Caribbean | 32 | 58.7 | 48.2 |
| Middle East and North Africa | 17 | 89.5 | 58.2 |
| Oceania | 10 | 54.3 | 62.7 |
| South and Inner Asia | 24 | 59.6 | 51.0 |
| Sub-Saharan Africa | 39 | 31.5 | 23.9 |
| Western Europe | 20 | 122.6 | 106.9 |

Note: Five-year simple average of panel data

[a] In percent

[b] Private credit by deposit money banks and other financial institutions to GDP, in percent

Source: Author's calculations based on the World Bank Global Financial Development Database (https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database)

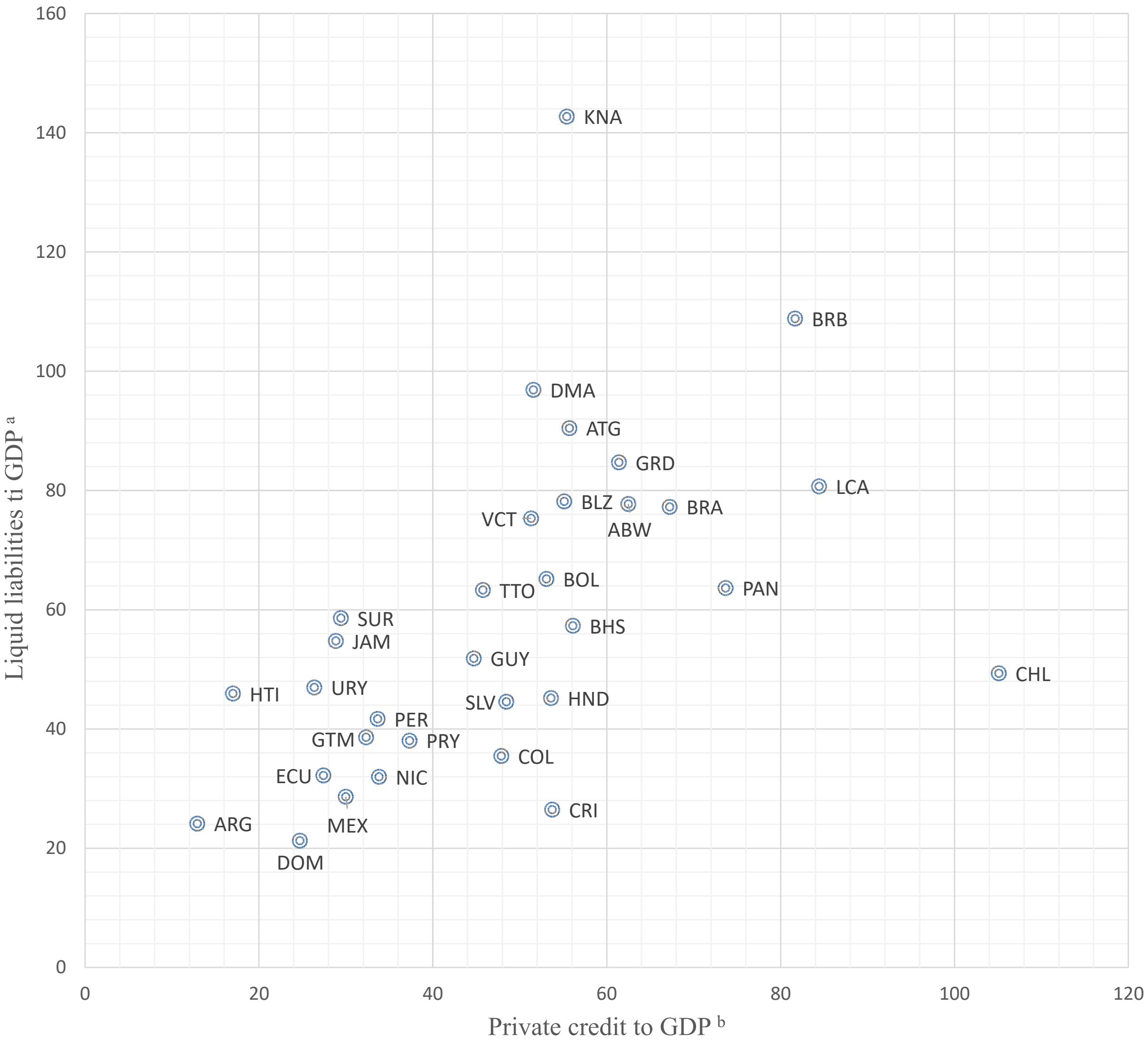


**Figure 1**. Financial development in Latin America and the Caribbean, 2013–2017

Notes: Five-year simple average of panel data, in percent. Country abbreviations: ATG—Antigua and Barbuda; ARG—Argentina; ABW—Aruba; BHS—Bahamas; BRB—Barbados; BLZ—Belize; BOL—Bolivia; BRA—Brazil; CHL—Chile; COL—Colombia; CRI—Costa Rica; DMA—Dominica; DOM—Dominican Republic; ECU—Ecuador; SLV—El Salvador; GRD—Grenada; GTM—Guatemala; GUY—Guyana; HTI—Haiti; HND—Honduras; JAM—Jamaica; MEX—Mexico; NIC—Nicaragua; PAN—Panama; PRY—Paraguay; PER—Peru, KNA—St. Kitts and Nevis; LCA—St. Lucia; VCT—St. Vincent and the Grenadines; SUR—Suriname; TTO—Trinidad and Tobago; URY—Uruguay

[a] In percent

[b] Private credit by deposit money banks and other financial institutions to GDP, in percent

Source: Author's illustration based on the World Bank Global Financial Development Database (https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database)

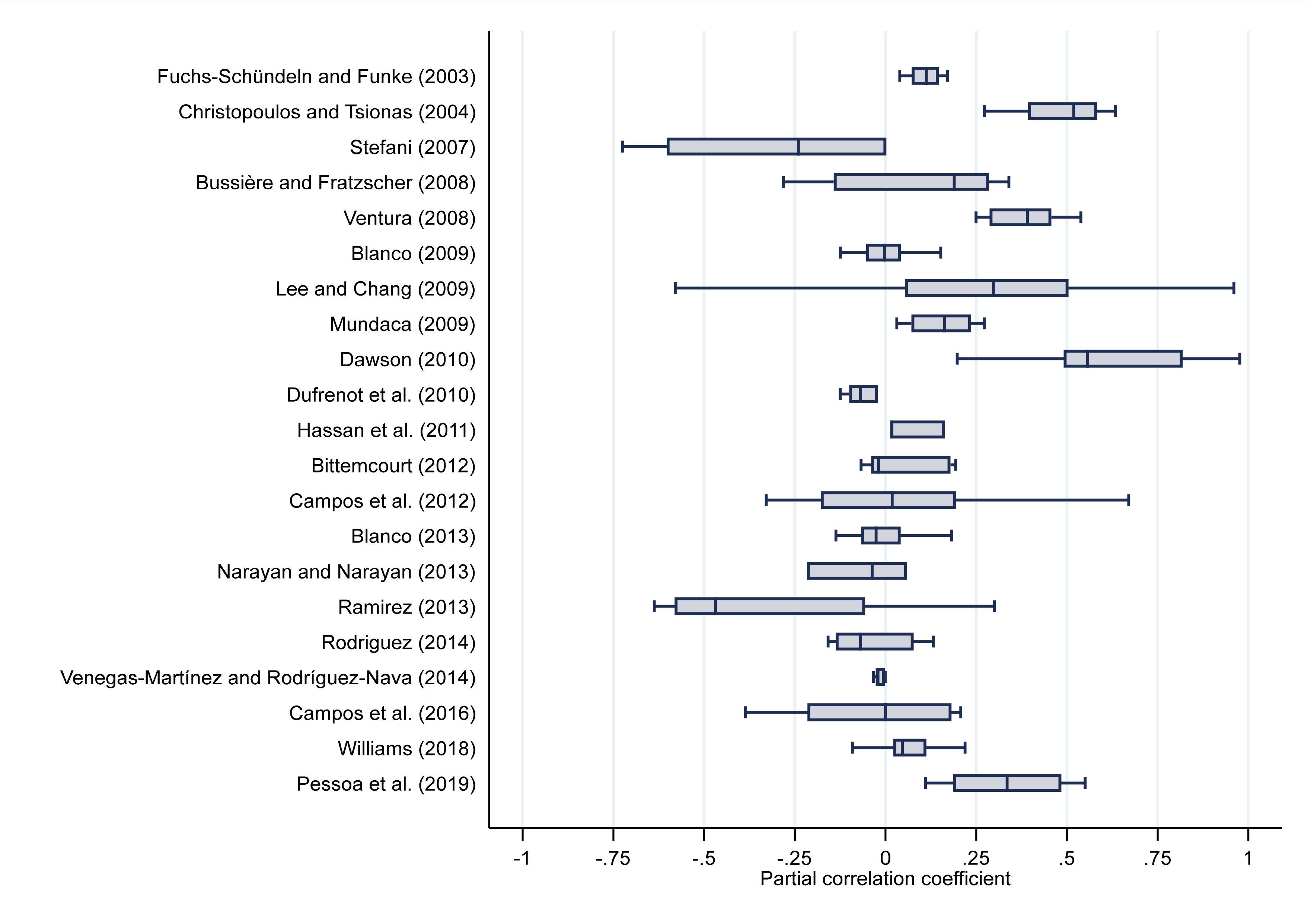


**Figure 2**. Forest plot of 21 studies of the finance-growth nexus in Latin America and the Caribbean

Note: Box plot in this figure comprises the lower adjacent value (the left adjacent line), 25th percentile (the left hinge of the box), median (the line in the box), 75th percentile (the right hinge of the box), and the upper adjacent value (the right adjacent line).

**Table 2**. List of 21 selected studies of the finance-growth nexus in Latin America and the Caribbean for meta-analysis

| Author(s) (Publication year) | Number of target countries | Estimation period [a] | | Financial variable type | | | | Number of collected estimates | Average precision [d] |
|---|---|---|---|---|---|---|---|---|---|
| | | From | To | Liquid liabilities to GDP | Private credit to GDP | Other financial development variables [b] | Financial liberalization variables [c] | | |
| Fuchs-Schündeln and Funke (2003) | 7 | 1975 | 2000 | | | ✓ | ✓ | 14 | 12.14 |
| Christopoulos and Tsionas (2004) | 8 | 1970 | 2000 | ✓ | | | | 8 | 6.17 |
| Stefani (2007) | 1 (Brazil) | 1986 | 2006 | | ✓ | ✓ | | 4 | 5.00 |
| Bussière and Fratzscher (2008) | 8 | 1980 | 2002 | | | | ✓ | 6 | 5.70 |
| Ventura (2008) | 1 (Colombia) | 1960 | 2006 | | | ✓ | | 6 | 7.05 |
| Blanco (2009) | 18 | 1962 | 2005 | ✓ | ✓ | | | 14 | 21.25 |
| Lee and Chang (2009) | 18 | 1970 | 2002 | ✓ | ✓ | | | 18 | 7.80 |
| Mundaca (2009) | 25 | 1970 | 2002 | | | ✓ | | 8 | 16.84 |
| Dawson (2010) | 15 | 1960 | 2002 | ✓ | | | | 15 | 9.26 |
| Dufrenot and Peguin-Feissolle (2010) | 23 | 1980 | 2006 | ✓ | ✓ | ✓ | | 6 | 24.96 |
| Hassan et al. (2011) | 12 | 1980 | 2007 | ✓ | ✓ | ✓ | | 3 | 11.11 |
| Bittemcourt (2012) | 4 | 1980 | 2007 | ✓ | | ✓ | | 12 | 10.30 |
| Campos et al. (2012) | 1 (Argentina) | 1896 | 2000 | ✓ | | ✓ | | 24 | 10.59 |
| Blanco (2013) | 16 | 1961 | 2010 | | ✓ | | | 12 | 22.01 |
| Narayan and Narayan (2013) | 11 | 1995 | 2011 | | | ✓ | | 3 | 13.65 |
| Ramirez (2013) | 13 | 1990 | 2007 | | ✓ | | | 4 | 14.80 |
| Rodriguez (2014) | 20 | 1960 | 2000 | | ✓ | | | 12 | 14.03 |
| Venegas-Martínez and Rodríguez-Nava (2014) | 7 | 1990 | 2011 | | | ✓ | | 6 | 12.15 |
| Campos et al. (2016) | 1 (Argentina) | 1896 | 2000 | | | ✓ | | 8 | 10.47 |
| Williams (2018) | 32 | 1970 | 2014 | ✓ | ✓ | ✓ | | 40 | 9.99 |
| Pessoa et al. (2019) | 1 (Brazil) | 1995 | 2014 | ✓ | ✓ | ✓ | | 10 | 25.00 |

Notes:

[a] Estimation period may differ depending on target countries.

[b] Include bank credit to GDP, private credit to domestic credit, market capitalization, stock market activity, and comprehensive index of financial development

[c] Include capital account openness and stock market liberalization

[d] Average precision denotes the mean of the inverse of standard errors of the partial correlation coefficient of estimates collected from the study.

**Table 3**. Descriptive statistics of the partial correlation coefficients, *t*-test, and Shapiro–Wilk normality test of collected estimates and univariate comparative analysis of four financial variable types

| | *K* | Mean[a] | Median[b] | S.D. | Max. | Min. | Kurtosis | Skewness | *t*- test [c] | Shapiro–Wilk normality test (z) [d] |
|---|---|---|---|---|---|---|---|---|---|---|
| All studies | 233 | 0.112 | 0.065 | 0.280 | 0.976 | -0.830 | 4.506 | 0.364 | 6.120 *** | 4.830 ††† |
| Liquid liabilities to GDP | 70 | 0.251 | 0.165 | 0.339 | 0.976 | -0.580 | 2.506 | 0.356 | 6.212 *** | 2.316 †† |
| Private credit to GDP | 74 | 0.014 | 0.026 | 0.231 | 0.692 | -0.830 | 5.993 | -0.702 | 0.537 | 3.534 ††† |
| Other financial development variables | 71 | 0.080 | 0.097 | 0.238 | 0.670 | -0.724 | 4.177 | -0.318 | 2.828 *** | 0.860 |
| Financial liberalization variables | 18 | 0.103 | 0.116 | 0.141 | 0.340 | -0.281 | 4.753 | -1.092 | 3.107 *** | 1.773 †† |

Notes:

[a] ANOVA: $F = 10.17$, $p = 0.000$; Bartlett's test: $\chi^2 = 23.0542$, $p = 0.000$

[b] Kruskal-Wallis rank-sum test: $\chi^2 = 18.932$, $p = 0.0003$

[c] ***: Null hypothesis that mean is zero is rejected at the 1% level.

[d] †††: Null hypothesis of normal distribution is rejected at the 1% level; ††: at the 5% level.

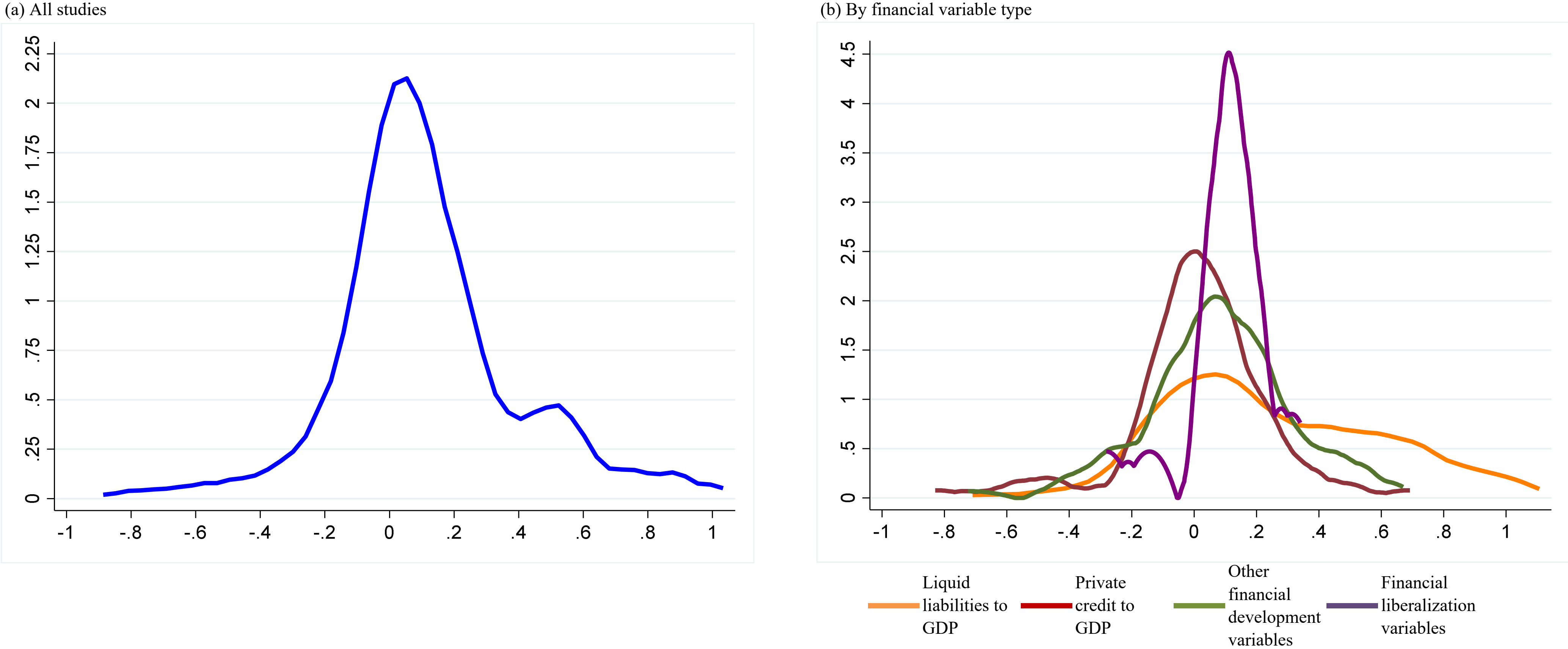


**Figure 3.** Kernel density estimation of collected estimates

Note: The vertical axis is the kernel density. The horizontal axis is the partial correlation coefficient of collected estimates. See Table 2 for the descriptive statistics of collected estimates.

**Table 4**. Synthesis of collected estimates

| | Number of estimates ($K$) | (a) Traditional synthesis: Fixed-effect model ($z$ value)[a] | (a) Traditional synthesis: Random-effects model ($z$ value)[a] | (b) Heterogeneity test and measures: Cochran $Q$ test of homogeneity ($p$ value)[b] | (b) $I^2$ statistic[c] | (b) $H^2$ statistic[d] | (c) Unrestricted weighted least squares average (UWA): UWA of all estimates ($t$ value)[a,e] | (c) Number of the adequately powered estimates [f] | (c) WAAP (weighted average of the adequately powered estimates) ($t$ value)[a] | (c) Median S.E. of estimates | (c) Median statistical power |
|---|---|---|---|---|---|---|---|---|---|---|---|
| All studies | 233 | 0.108 *** (22.93) | 0.109 *** (6.00) | 3136.33 *** (0.00) | 92.77 | 13.84 | 0.108 *** (6.24) | 12 | **0.170 **** **(2.34)** | 0.094 | 0.209 |
| Liquid liabilities to GDP | 70 | 0.207 *** (22.35) | 0.248 *** (6.01) | 1509.31 *** (0.00) | 94.57 | 18.43 | 0.207 *** (4.78) | 12 | **0.203 *** **(1.84)** | 0.098 | 0.562 |
| Private credit to GDP | 74 | 0.016 ** (2.12) | **0.010** **(0.39)** | 660.46 *** (0.00) | 90.81 | 10.88 | 0.016 (0.70) | 0 | - (-) | 0.079 | 0.039 |
| Other financial development variables | 71 | 0.151 *** (17.16) | 0.084 *** (3.07) | 658.23 *** (0.00) | 88.87 | 8.98 | 0.151 *** (5.60) | 9 | **0.271 ***** **(4.09)** | 0.094 | 0.363 |
| Financial liberalization variables | 18 | **0.105 ***** **(4.66)** | 0.105 *** (4.66) | 13.71 (0.69) | 0.00 | 1.00 | 0.105 *** (5.19) | 0 | - (-) | 0.088 | 0.221 |

Notes: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. Selected synthesis values are emphasized in bold.

[a] Null hypothesis: The synthesized effect size is zero.

[b] Null hypothesis: Effect sizes are homogeneous.

[c] Ranged between 0 and 100%, with larger scores indicating heterogeneity

[d] Takes zero in the case of homogeneity

[e] Synthesis method advocated by Stanley and Doucouliagos (2017) and Stanley et al. (2017)

[f] Denotes the number of estimates with statistical power of 0.80 or more, which is computed in reference to the UWA of all collected estimates

**Table 5**. Meta-regression analysis with selected moderators

| Estimator (Analytical weight in brackets)[a] | Cluster-robust WLS [Precision] | Cluster-robust WLS [Sample size] | Cluster-robust WLS [Study size] | Multilevel mixed-effects RML | Cluster-robust random-effects panel GLS |
|---|---|---|---|---|---|
| Meta-independent variable (Default)/Model | [1] | [2] | [3] | [4] | [5][b] |
| Financial variable type (Liquid liabilities to GDP) | | | | | |
| Private credit to GDP | -0.0449 | -0.0174 | -0.0935 | -0.0035 | -0.0054 |
| | (0.048) | (0.018) | (0.064) | (0.035) | (0.036) |
| Other financial development variables | -0.1645 ** | -0.0526 | -0.2166 *** | -0.0644 * | -0.0705 ** |
| | (0.061) | (0.054) | (0.062) | (0.033) | (0.036) |
| Financial liberalization variables | -0.3187 ** | -0.2002 ** | -0.2382 * | -0.0710 | -0.0819 |
| | (0.115) | (0.089) | (0.127) | (0.104) | (0.109) |
| Selected moderators | | | | | |
| Time-series data | 0.5389 *** | 0.3514 *** | 0.4649 *** | 0.5466 *** | 0.5448 *** |
| | (0.129) | (0.120) | (0.089) | (0.116) | (0.117) |
| Real GDP | -0.2898 *** | -0.2060 *** | -0.2995 *** | -0.2639 *** | -0.2666 *** |
| | (0.052) | (0.041) | (0.056) | (0.050) | (0.051) |
| Lagged | -0.2026 *** | -0.1675 *** | -0.2029 *** | -0.2548 *** | -0.2516 *** |
| | (0.062) | (0.057) | (0.063) | (0.084) | (0.085) |
| With intercepted variable | -0.3774 *** | -0.2113 ** | -0.4761 *** | -0.4257 *** | -0.4277 *** |
| | (0.124) | (0.096) | (0.132) | (0.137) | (0.139) |
| Investment | 0.1847 * | 0.0621 | 0.1985 ** | 0.1638 * | 0.1690 * |
| | (0.094) | (0.077) | (0.072) | (0.089) | (0.090) |
| Education | 0.2050 *** | 0.1850 *** | 0.1362 ** | 0.1465 ** | 0.1474 ** |
| | (0.054) | (0.041) | (0.058) | (0.068) | (0.070) |
| *SE* | -2.32754 ** | -1.48449 * | -1.86775 ** | -3.07711 *** | -3.00605 *** |
| | (0.9330) | (0.7297) | (0.7299) | (0.8066) | (0.8158) |
| Intercept | 0.30526 *** | 0.20976 *** | 0.32559 *** | 0.32576 *** | 0.32189 *** |
| | (0.0686) | (0.0385) | (0.0705) | (0.0705) | (0.0713) |
| *K* | 233 | 233 | 233 | 233 | 233 |
| $R^2$ | 0.434 | 0.393 | 0.426 | - | 0.348 |

Notes: Figures in parentheses beneath the regression coefficients are robust standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. SeeAppendix Table A1for the definitions and descriptive statistics of meta-independent variables. Selected moderators denote the meta-independent variableswith a PIP of 0.50 or more in the Bayesian model averaging estimation and $p$ value of 0.10 or less in the frequentist check OLS estimation reported in Appendix Table A2.

[a] Precision: inverse of standard error; Sample size: degree of freedom; Study size: inverse of number of reported estimat

[b] Hausman test: $\chi^2 = 10.22$, $p = 0.1762$

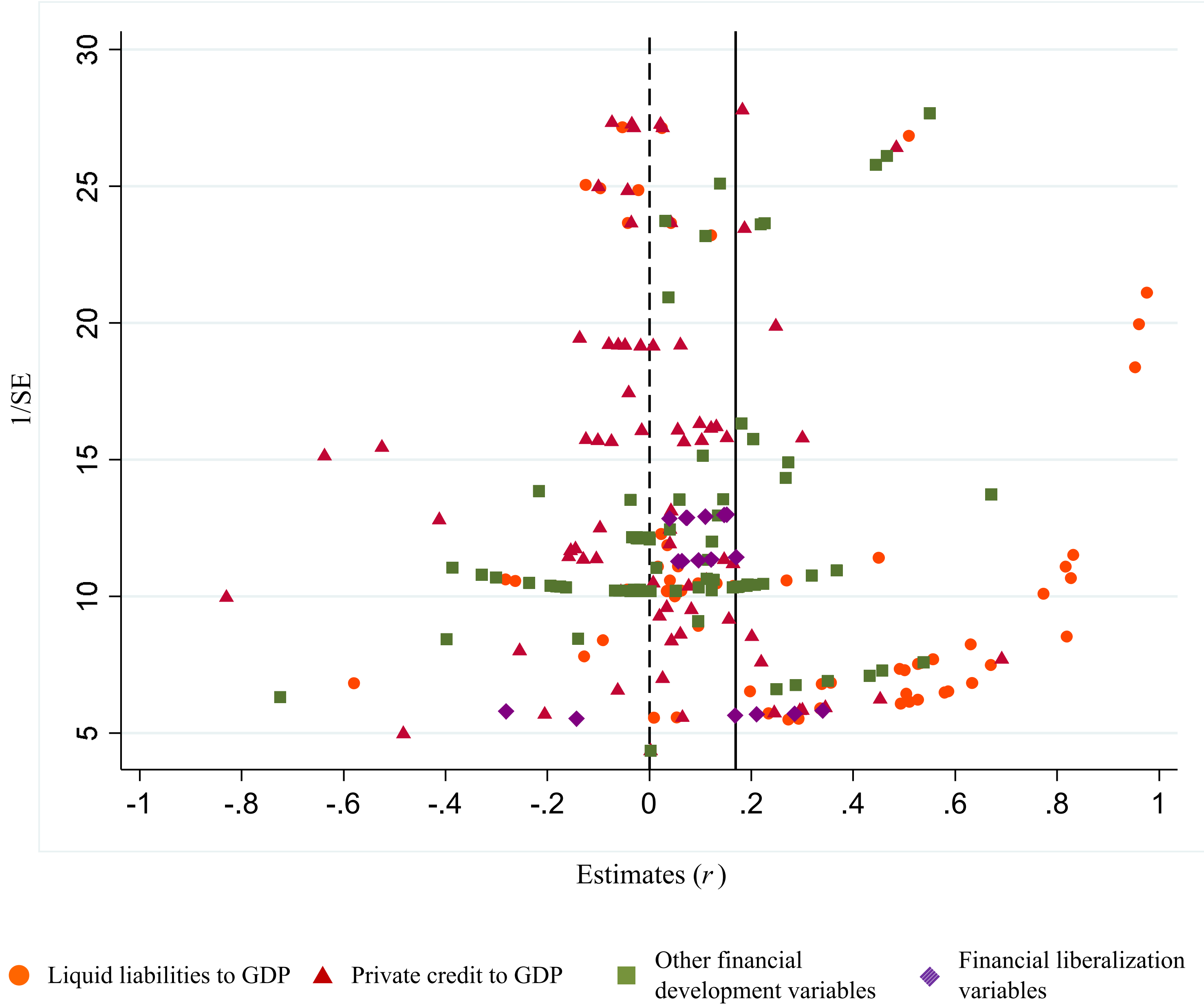


**Figure 4**. Funnel plot of partial correlation coefficients

Note: Solid line indicates the WAAP synthesis value for all studies reported in Table 4

**Table 6**. Univariate test of publication selection bias

| | Number of estimates ($K$) | Under the assumption that the true effect size is zero | | | Under the assumption that the true effect size is the selected synthesis value ($x$) | | |
|---|---|---|---|---|---|---|---|
| | | Number of estimates | | Goodness-of-fit $z$-test ($p$ value)[a] | Number of estimates | | Goodness-of-fit $z$-test ($p$ value)[b] |
| | | $PCC_k$<0 | $PCC_k$>0 | | $PCC_k$<$x$ | $PCC_k$>$x$ | |
| All studies | 233 | 74 | 159 | 5.569 *** (0.000) | 156 | 77 | -5.176 *** (0.000) |
| Liquid liabilities to GDP | 70 | 16 | 54 | 4.542 *** (0.000) | 39 | 31 | -0.956 (0.339) |
| Private credit to GDP | 74 | 31 | 43 | 1.395 (0.163) | 34 | 40 | 0.698 (0.486) |
| Other financial development variables | 71 | 25 | 46 | 2.492 ** (0.013) | 59 | 12 | -5.578 *** (0.000) |
| Financial liberalization variables | 18 | 2 | 16 | 3.300 *** (0.001) | 8 | 10 | 0.471 (0.637) |

Notes: *** and ** denote statistical significance at the 1% and 5% levels, respectively.

[a] Null hypothesis: The ratio of the positive versus negative values is 50:50.

[b] Null hypothesis: The ratio of estimates below $x$ versus those over $x$ is 50:50.

**Table 7**. Meta-regression analysis of publication selection: All studies

(a) FAT-PET test (Equation: $t = \gamma_0 + \gamma_1(1/SE) + v$)

| Estimator | Unrestricted WLS | WLS with bootstrapped standard errors | Cluster-robust WLS | Cluster-robust fixed-effects panel LSDV | IV |
|---|---|---|---|---|---|
| Model | [1] | [2] | [3] | [4] [a] | [5] |
| Intercept (FAT: $H_0$: $\gamma_0 = 0$) | -0.1394 | -0.1394 | -0.1394 | -5.9415 ** | 2.9348 *** |
| | (0.605) | (0.580) | (1.314) | (3.277) | (0.748) |
| $1/SE$ (PET: $H_0$: $\gamma_1 = 0$) | 0.1172 ** | 0.1172 ** | 0.1172 | 0.5791 ** | 0.1275 ** |
| | (0.057) | (0.058) | (0.122) | (0.261) | (0.056) |
| $K$ | 233 | 233 | 233 | 233 | 233 |
| $R^2$ | 0.0346 | 0.0346 | 0.0346 | 0.0346 | - |

(b) PEESE approach (Equation: $t = \gamma_0 SE + \gamma_1(1/SE) + v$)

| Estimator | Unrestricted WLS | WLS with bootstrapped standard errors | Cluster-robust WLS | Random-effects panel ML | IV |
|---|---|---|---|---|---|
| Model | [6] | [7] | [8] | [9] | [10] |
| $SE$ | 0.7362 | 0.7362 | 0.7362 | -31.4800 | 1.8534 * |
| | (2.915) | (2.767) | (6.155) | (7.111) | (1.002) |
| $1/SE$ ($H_0$: $\gamma_1 = 0$) | 0.1043 *** | 0.1043 *** | 0.1043 | 0.1308 *** | 0.1586 * |
| | (0.035) | (0.035) | (0.074) | (0.021) | (0.920) |
| $K$ | 233 | 233 | 233 | 233 | 233 |
| $R^2$ | 0.1437 | 0.1437 | 0.1437 | - | |

Notes: Figures in parentheses beneath the regression coefficients are standard errors. Models [3], [4], and [8] report standard errors clustered by study. Models [5] and [10] use the inverse of the square root of the number of observations used as an instrument of the standard error. *** and ** denote statistical significance at the 1% and 5% levels, respectively.

[a] Hausman test: $\chi^2 = 22.54$, $p = 0.0000$

**Table 8**. Summary of publication selection bias test

| | Number of estimates ($K$) | Test results[a] | | |
|---|---|---|---|---|
| | | Funnel-asymmetry test (FAT) ($H_0$: $\gamma_0 = 0$) | Precision-effect test (PET) ($H_0$: $\gamma_1 = 0$) | Precision-effect estimate with standard error (PEESE) ($H_0$: $\gamma_1 = 0$)[b] |
| All studies | 233 | Not rejected | **Rejected** | **Rejected (0.1043/0.1586)** |
| Liquid liabilities to GDP | 70 | Not rejected | **Rejected** | **Rejected (0.1696)** |
| Private credit to GDP | 74 | Not rejected | Not rejected | Not rejected |
| Other financial development variables | 71 | **Rejected** | **Rejected** | **Rejected (0.2428/0.2451)** |
| Financial liberalization variables | 18 | Not rejected | **Rejected** | **Rejected (0.1079)** |

Notes:
[a] The null hypothesis is rejected when three or more models show a statistically significant estimate. Otherwise not rejected.
[b] Figures in parentheses are PSB-adjusted estimates. If two estimates are reported, the left and right figures denote the minimum and maximu estimates, respectively.

**Appendix Table A1**. Names, definitions, and descriptive statistics of meta-independent variables

| Variable name | Definition | Descriptive statistics | | |
|---|---|---|---|---|
| | | Mean | Median | S.D. |
| Liquid liabilities to GDP | 1 = if financial variable is liquid liabilities to GDP, 0 = otherwise | 0.300 | 0 | 0.459 |
| Private credit to GDP | 1 = if financial variable is private credit to GDP, 0 = otherwise | 0.318 | 0 | 0.467 |
| Other financial development variables | 1 = if financial development variable other than liquid liabilities to GDP and private credit to GDP is used, 0 = otherwise | 0.305 | 0 | 0.461 |
| Financial liberalization variables | 1 = if financial liberalization variable is used, 0 = otherwise | 0.077 | 0 | 0.268 |
| Number of target countries | Total number of target countries | 10.322 | 7 | 10.832 |
| Average year of estimation | Average year of estimation period | 1983.691 | 1986 | 15.845 |
| Length of estimation | Years of estimation period | 42.751 | 33 | 26.640 |
| Panel data | 1 = if panel data is employed for empirical analysis, 0 = otherwise | 0.644 | 1 | 0.480 |
| Time-series data | 1 = if time-series data is employed for empirical analysis, 0 = otherwise | 0.356 | 0 | 0.480 |
| Non-OLS | 0 = if an estimator other than OLS is used for estimation, 0 = otherwise | 0.781 | 1 | 0.414 |
| OLS | 1 = if OLS estimator is used for estimation, 0 = otherwise | 0.219 | 0 | 0.414 |
| GDP car capita | 1 = if the unit of the growth variable is real GDP per capita, 0 = otherwise | 0.579 | 1 | 0.495 |
| Real GDP | 1 = if the unit of the growth variable is real GDP, 0 = otherwise | 0.421 | 0 | 0.495 |
| Log transformation | 1 = if the growth variable is log transformed, 0 = otherwise | 0.339 | 0 | 0.474 |
| Lagged | 1 = if the financial variable is lagged, 0 = otherwise | 0.309 | 0 | 0.463 |
| With intercepted variable | 1 = if the financial variable is estimated with an intercepted variable(s), 0 = otherwise | 0.069 | 0 | 0.253 |
| Macroeconomic stability | 1 = if estimation simultaneously controls for macroeconomic stability, 0 = otherwise | 0.395 | 0 | 0.490 |
| Trade openness | 1 = if estimation simultaneously controls for trade openness, 0 = otherwise | 0.459 | 0 | 0.499 |
| Initial condition | 1 = if estimation simultaneously controls for initial condition, 0 = otherwise | 0.090 | 0 | 0.287 |
| Human capital | 1 = if estimation simultaneously controls for human capital, 0 = otherwise | 0.026 | 0 | 0.159 |
| Investment | 1 = if estimation simultaneously controls for investment including capital formation, 0 = otherwise | 0.386 | 0 | 0.488 |
| Education | 1 = if estimation simultaneously controls for education level, 0 = otherwise | 0.330 | 0 | 0.471 |
| Institutional quality | 1 = if estimation simultaneously controls for institutional quality, 0 = otherwise | 0.129 | 0 | 0.336 |
| Financial crisis | 1 = if estimation simultaneously controls for financial crisis, 0 = otherwise | 0.034 | 0 | 0.182 |
| *SE* | Standard error of partial correlation coefficient | 0.096 | 0.094 | 0.041 |

Note: The variables of financial depth, panel data, non-OLS, and GDP per capita are default categories.

**Appendix Table A2**. Meta-regression analysis of model uncertainty and multicollinearity for selection of moderators

| Estimator | Bayesian model averaging | | | | OLS frequentist check | | | |
|---|---|---|---|---|---|---|---|---|
| Meta-independent variables/Model | [1] | | | | [2] | | | |
| | Coef. | S.E. | *t* | PIP | Coef. | S.E. | *t* | *p* |
| Focus regressors | | | | | | | | |
| Private credit to GDP | -0.0342 | 0.0480 | -0.71 | 1.00 | -0.0381 | 0.0458 | -0.83 | 0.416 |
| Other financial development variables | -0.1254 | 0.0441 | -2.84 | 1.00 | -0.1261 | 0.0476 | -2.65 | 0.015 |
| Financial liberalization variables | -0.2478 | 0.0968 | -2.56 | 1.00 | -0.2089 | 0.1186 | -1.76 | 0.094 |
| *SE* | -2.7066 | 0.7303 | -3.71 | 1.00 | -2.3490 | 1.0092 | -2.33 | 0.031 |
| Auxiliary regressors | | | | | | | | |
| Number of target countries | 0.0006 | 0.0017 | 0.34 | 0.16 | | | | |
| Average year of estimation | -0.0045 | 0.0069 | -0.66 | 0.39 | | | | |
| Length of estimation | -0.0042 | 0.0050 | -0.84 | 0.56 | -0.0016 | 0.0018 | -0.87 | 0.396 |
| Time-series data | 0.5215 | 0.1271 | 4.10 | 1.00 | 0.5259 | 0.1511 | 3.48 | 0.002 |
| OLS | 0.0929 | 0.0942 | 0.99 | 0.57 | 0.1038 | 0.0998 | 1.04 | 0.311 |
| Real GDP | -0.2700 | 0.0630 | -4.28 | 1.00 | -0.2921 | 0.0481 | -6.08 | 0.000 |
| Log transformation | -0.0158 | 0.0411 | -0.38 | 0.19 | | | | |
| Lagged | -0.1609 | 0.0687 | -2.34 | 0.93 | -0.1516 | 0.0633 | -2.39 | 0.027 |
| With intercepted variable | -0.4031 | 0.1039 | -3.88 | 0.99 | -0.3831 | 0.1441 | -2.66 | 0.015 |
| Macroeconomic stability | 0.0169 | 0.0436 | 0.39 | 0.19 | | | | |
| Trade openness | -0.0354 | 0.0647 | -0.55 | 0.30 | | | | |
| Initial condition | 0.0463 | 0.0875 | 0.53 | 0.29 | | | | |
| Human capital | 0.0750 | 0.1376 | 0.54 | 0.30 | | | | |
| Investment | 0.1545 | 0.0757 | 2.04 | 0.88 | 0.1731 | 0.0610 | 2.83 | 0.010 |
| Education | 0.1881 | 0.0634 | 2.97 | 0.98 | 0.1578 | 0.0627 | 2.52 | 0.021 |
| Institutional quality | -0.0122 | 0.0457 | -0.27 | 0.12 | | | | |
| Financial crisis | 0.1066 | 0.1285 | 0.83 | 0.48 | | | | |
| *K* | 233 | | | | 233 | | | |

Notes: See Appendix Table A1 for the definitions and descriptive statistics of meta-independent variables. Estimate of the intercept is omitted. S.E. and PIP denote standard errors and posterior inclusion probability, respectively. In Model [1], the variables of private credit to GDP, other financial development variables, and financial liberalization variables as well as standard errors of partial correlation coefficients (*SE*) are included in the estimation as focus regressors. Therefore, the PIP of these key variables is 1.00.

**Appendix Table A3.** Meta-regression analysis with all moderators

| Estimator (Analytical weight in brackets) [a] | Cluster-robust WLS [Precision] | Cluster-robust WLS [Sample size] | Cluster-robust WLS [Study size] | Multilevel mixed-effects RML | Cluster-robust random-effects panel GLS |
|---|---|---|---|---|---|
| Meta-independent variable (Default)/Model | [1] | [2] | [3] | [4] | [5] [b] |
| Financial variable type (Liquid liabilities to GDP) | | | | | |
| Private credit to GDP | -0.0172 | 0.0100 | -0.0380 | -0.0014 | -0.0076 |
| | (0.043) | (0.015) | (0.052) | (0.038) | (0.045) |
| Other financial development variables | -0.0617 * | -0.0078 | -0.1163 ** | -0.0623 ** | -0.0872 ** |
| | (0.034) | (0.031) | (0.051) | (0.029) | (0.036) |
| Financial liberalization variables | -0.1859 * | -0.1630 * | -0.2343 * | -0.1420 * | -0.2076 ** |
| | (0.095) | (0.083) | (0.134) | (0.075) | (0.105) |
| Composition of target countries | | | | | |
| Number of target countries | -0.0023 | -0.0027 | 0.0039 | -0.0017 | -0.0002 |
| | (0.003) | (0.003) | (0.005) | (0.003) | (0.004) |
| Estimation period | | | | | |
| Average year of estimation | -0.0087 ** | -0.0066 ** | 0.0040 | -0.0119 *** | -0.0097 *** |
| | (0.003) | (0.003) | (0.012) | (0.002) | (0.003) |
| Length of estimation | -0.0099 *** | -0.0092 *** | 0.0018 | -0.0090 *** | -0.0085 *** |
| | (0.002) | (0.002) | (0.010) | (0.003) | (0.003) |
| Data type (Panel data) | | | | | |
| Time-series data | 0.6821 *** | 0.6662 *** | 0.4553 * | 0.5235 *** | 0.5521 *** |
| | (0.141) | (0.190) | (0.234) | (0.167) | (0.160) |
| Estimator (Estimators other than OLS) | | | | | |
| OLS | 0.1276 | 0.0534 | 0.1352 * | 0.1272 | 0.1761 * |
| | (0.098) | (0.072) | (0.078) | (0.080) | (0.102) |
| Characteristics of growth variable | | | | | |
| Real GDP (GDP per capita) | -0.2507 *** | -0.1998 *** | -0.2114 *** | -0.2569 *** | -0.2644 *** |
| | (0.046) | (0.049) | (0.051) | (0.057) | (0.049) |
| Other characteristics of financial variable | | | | | |
| Log transformation (Non-transformed) | -0.1614 | -0.1136 | 0.0303 | -0.0982 | -0.1434 |
| | (0.104) | (0.113) | (0.153) | (0.110) | (0.112) |
| Lagged | 0.1234 | 0.1313 | 0.0110 | 0.0661 | 0.0892 |
| | (0.099) | (0.108) | (0.094) | (0.087) | (0.092) |
| With intercepted variable | -0.1520 * | -0.1204 | -0.1711 * | -0.2222 *** | -0.1860 ** |
| | (0.088) | (0.079) | (0.083) | (0.083) | (0.084) |
| Selection of control variables | | | | | |
| Macroeconomic stability | -0.3963 ** | -0.2746 ** | -0.4908 *** | -0.4694 *** | -0.4909 *** |
| | (0.154) | (0.122) | (0.122) | (0.147) | (0.155) |
| Trade openness | 0.0553 | 0.0563 | 0.0399 | 0.0837 * | 0.0308 |
| | (0.057) | (0.061) | (0.054) | (0.046) | (0.046) |
| Initial condition | -0.1288 ** | -0.0958 ** | -0.1705 * | -0.1047 ** | -0.1207 ** |
| | (0.049) | (0.043) | (0.094) | (0.053) | (0.059) |
| Human capital | 0.1152 | 0.0572 | 0.1081 | 0.0873 | 0.1319 |
| | (0.114) | (0.104) | (0.115) | (0.101) | (0.098) |
| Investment | 0.2284 * | 0.1492 | 0.3083 ** | 0.1140 | 0.2396 * |
| | (0.129) | (0.101) | (0.131) | (0.070) | (0.124) |
| Education | 0.0440 | 0.0251 | 0.2374 * | 0.0870 | 0.0815 |
| | (0.086) | (0.061) | (0.120) | (0.086) | (0.099) |
| Institutional quality | 0.3281 *** | 0.2980 *** | 0.2557 *** | 0.2307 *** | 0.2954 *** |
| | (0.078) | (0.069) | (0.083) | (0.072) | (0.083) |
| Financial crisis | 0.1482 | 0.0990 | 0.1967 ** | 0.1544 ** | 0.1872 * |
| | (0.160) | (0.178) | (0.086) | (0.073) | (0.102) |
| *SE* | -4.5479 *** | -3.7230 *** | -2.5347 | -3.8833 *** | -3.7990 *** |
| | (0.668) | (1.195) | (1.730) | (0.976) | (0.892) |
| Intercept | 18.0835 *** | 13.7841 ** | -7.8428 | 24.3728 *** | 20.0714 *** |
| | (6.232) | (5.918) | (25.166) | (3.193) | (6.568) |
| *K* | 233 | 233 | 233 | 233 | 233 |
| $R^2$ | 0.553 | 0.495 | 0.504 | - | 0.512 |

Notes: Figures in parentheses beneath the regression coefficients are robust standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Appendix Table A1 for the definitions and descriptive statistics of meta-independent variables.

[a] Precision: inverse of standard error; Sample size: degree of freedom; Study size: inverse of number of reported estimates

[b] Hausman test: $\chi^2 = 11.41$, $p = 0.7838$

**Appendix Table A4.** Alternative estimates of publication selection bias–corrected effect size

| Method | Top 10 [a] | Selection model [b] | Endogeneous kinked model [c] | *p* -uniform [d] |
|---|---|---|---|---|
| Model | [1] | [2] | [3] | [4] |
| Publication selection bias–corrected effect size | 0.1019 ** | 0.1510 *** | 0.1172 *** | 0.0713 *** |
| | (0.046) | (0.070) | (0.041) | (0.005) |
| *K* | 23 | 233 | 233 | 233 |

Notes: Figures in parentheses are standard errors. *** denotes that the coefficient is statistically significantly different from zero at the 1% level.

[a] Arithmetic average of the top 10% most precise estimates (Stanley et al., 2010)

[b] Test for publication selection bias using the conditional probability of publication as a function of a study's results (Andrews and Kasy, 2019)

[c] Piecewise linear meta-regression of estimates on their standard errors, with a kink at the cutoff value of the standard error below which publication selection bias is unlikely (Bom and Rachinger, 2019)

[d] Method based on the statistical theory that the distribution of *p* -values is uniform conditional on the population effect size (van Aert and van Assen, 2021)