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Abstract

We analyze diverse and heterogenous literature to grasp the general effect size of financial development on economic growth on a world scale. For that, we perform by far the largest available meta-analysis of the finance–growth nexus using 3561 estimates collected from 177 studies. Our meta-synthesis results show that large heterogeneity in empirical evidence is, in fact, driven by only a limited number of variables (moderators). By using advanced techniques, we also document the existence of the publication selection bias that is propagated in the literature in a nonlinear fashion. We account for uncertainty in moderator selection by employing model-averaging techniques. After adjusting for the publication bias, the results of our meta-regression provide evidence of a small but genuine positive effect of the financial development on growth that very mildly declines over time. Finance channeled via capital markets seems to be more beneficial for economic growth than that provided in the form of private credit. Our evidence goes against arguments about the damaging role of financial development and is in line with century-old theoretical foundations that favor the positive role of finance on economic growth.

JEL-Codes: C120, D220, G210, G330.

Keywords: financial development, economic growth, meta-analysis, publication selection bias.

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1. Introduction and Motivation

The nexus between financial development and economic growth has been the subject of extensive research for quite a long time but without a straightforward answer. Classic works of Schumpeter (1911), Gurley and Shaw (1955), Goldsmith (1969), and Hicks (1969) laid foundations in favor of the idea that the financial system promotes economic growth. This idea was later advocated by King and Levine (1993) and Miller (2012). On the other hand, McKinnon (1973) and Shaw (1973) claimed the opposite due to the inefficient allocation of resources, Robinson (1952) argued for the opposite direction in the nexus, and Lucas (1988) rejected the nexus as "over-stressed." Meanwhile, Stiglitz (2000) linked the issue to damaging financial crises, and Beck et al. (2014) linked it to a country's economic income. Controversies intensified when the nexus was analyzed with econometric techniques, starting with Beck et al. (2000) and Levine et al. (2000). The lack of consensus in theory and increasing opacity in the growing empirical evidence does not provide the desired answers. In simple words, a century-long debate, which has involved many great economists, remains unresolved. Even now in the 21st century, we still do not know the general effect size of financial development on macroeconomic growth. In this paper, we aim to provide some conclusive evidence of the finance–growth nexus empirics with the largest-ever meta-analysis, covering the global research over several decades.

Meta-analysis has been shown to be an effective tool for providing a clear quantitative assessment across empirical research on a specific subject (Borenstein et al., 2009; Stanley and Doucouliagos, 2012). For that, we employ the advanced techniques developed by Stanley and Doucouliagos (2010, 2012) and Stanley et al. (2017), as well as the meta-analysis guidelines proposed by Stanley and Doucouliagos (2012) and Havránek et al. (2020), to assess, compare, synthesize, and analyze the empirical evidence reported in previous primary studies of the finance–growth nexus literature. The goal of our meta-analysis is to grasp the general effect size of financial development on economic growth—evidence that is missing in the existing literature.

What does the literature offer so far? Earlier attempts to meta-analyze the finance–growth nexus include the works of Bumann et al. (2013), Arestis et al. (2015), Valickova et al. (2015), and Bijlsma et al. (2018). These earlier analyses represent valuable contributions, but they have some limitations. Since the bulk of empirical analyses of the finance–growth nexus began appearing in the literature more than two decades ago, the above meta-analyses understandably work with older primary studies covering earlier data, and they work with smaller numbers of estimates. In fact, they cover studies published only through

2012; in this respect, they omit a critical decade of burgeoning empirical research. In addition, the earlier analyses often do not employ the most recent technical advancements and use a limited number of financial development indicators. Recent meta-analyses of the finance–growth literature by Iwasaki (2022), Anwar and Iwasaki (2023a, b), and Ono and Iwasaki (2022) to some extent overcome the former limitations. However, they work with smaller numbers of primary studies (and estimates) because they cover only specific regions/continents; as such, they do not provide a global perspective.

What is the value added by our meta-analysis? What can be learned that is not learned in the region-oriented papers, and how does it connect to them? In recent continent-oriented meta-analyses, the authors strongly suggest that region/country-specific studies of the finance–growth nexus, and especially those of developing economies, vary significantly in their reported estimates in terms of the effect size. We share this critical observation and provide supportive evidence in **Appendix Figure A1**, where we present by study type the distribution of the partial correlation coefficients (PCCs) of reported estimates in the finance–growth literature. Based on the evidence in Panel (a), we show that the distributions of reported estimates indeed vary greatly among different study types. In addition, worldwide studies show the most ideal shape with a narrower range of PCCs (within -0.8 and 0.8). However, other study types exhibit somewhat distorted distributions and tend to report a very large effect size of finance on growth, reaching absolute values of more than 0.9–1.0. A similar observation can be derived to some extent from Panel (b), especially where results based on African and Asian studies exhibit distributional distortions as compared to worldwide studies.

Based on the summary evidence, continent-specific meta-analyses are inconclusive overall about the effect size of finance on growth. We argue that the lack of control for region/country-level fixed effects and small sample sizes leads to overestimating the impact of finance on growth in continent-specific studies.[1] Worldwide studies, which employ large panel data and utilize advanced panel data econometric techniques, are free from these issues. For that, we meta-analyze the worldwide evidence to estimate the general effect size. Our results—presented in Section 5—actually reveal that as compared with the synthesized effect sizes of region/country-specific studies, the worldwide literature indicates a smaller impact of finance on growth. The finding suggests that blindly synthesizing estimation results reported in previous studies is not necessarily a correct approach to ascertaining the general effect size of a particular economic phenomenon.

[1] Irsova et al (2023) provide a link between sample size and precision, and suggest using the sample size as an instrument.

Our meta-analysis leverages a comprehensive dataset that spans multi-country studies, capturing empirical evidence from diverse regions, continents, and economic contexts. This approach allows us to synthesize a broader spectrum of empirical findings, providing a more encompassing perspective on the relationship between finance and growth. By including studies that cover a wider range of country characteristics, our analysis accounts for trends and relationships that may be missed when focusing solely on smaller regional samples. Further, analyzing the global dataset enables us to account for commonalities and divergences that might not be apparent when studying each continent in isolation.

In sum, the available meta-analyses demonstrate that the estimated impacts of financial development vary greatly across studies that employ data from specific regions or continents along with varying sets of financial development indicators. We argue that one major reason for the variation in estimated effects is the lack of control for fixed effects across different regions or continents. Therefore, we believe that an instrumental solution to this issue is to synthesize only worldwide evidence in order to obtain the truly general effect size of financial development. Worldwide evidence is gathered by meta-analyzing reported estimates from multi-country studies that were performed using panel data from countries all over the world.

How serious is the variation in estimated effects? Disturbingly so. In **Figure 1**, we present a forest plot showing the transformed estimates of the finance–growth nexus from all studies subject to our meta-analysis. A simple message taken from the figure is that the link between finance and growth varies substantially. Further, since the studies in the plot are ordered chronologically, it is evident that the variation does not cluster during specific periods but meanders consistently over time. Hence, even newer techniques applied to newer data sets do not seem to produce more consistent results. If nothing else, the inconsistency in empirical research that produces such variation in this long-debated topic must be remedied. Therefore, in the quest to find the general effect size of finance on growth, we propose testing the following (null) hypothesis:

Hypothesis 1: *Financial development has no impact on world macroeconomic growth.*

As mentioned above, the choice of financial development indicators varies across primary studies. The researchers have a strong affinity for using private credit to GDP as a key financial indicator as compared to other available variables; this feature is present also in the studies we analyze. Such an indicator is largely available in data sources but captures more the banking side of the financial structure. Individual indicators related to stock market development are used less despite the fact that they account for the capital side of the finance structure. Then, there are a number of subtler nuances among the indicators. We ask whether the differences among financial indicators are relevant, whether some types are more conducive to growth, and how they affect the results reported in primary studies. To answer those questions, we propose testing the following (null) hypothesis:

Hypothesis 2: *Differences in indicators of financial development do not affect reported estimates.*

Empirical analyses of the finance–growth nexus based on solid quantitative assessment started to appear in the literature more than two decades ago. Since then, financial development has progressed worldwide, albeit at different paces with respect to local conditions. The increasing numbers of empirical studies reflect both newly available data as well as financial developments. Newly published studies might have captured phenomena different than those of the older analyses when it comes to reported effects. In order to assess this aspect of financial development, we aim to test the following (null) hypothesis:

Hypothesis 3: *Reported effect sizes of financial development are time invariant throughout the different publication periods.*

Heterogeneity in the results of the primary studies might stem chiefly from differences in financial development indicators and publication periods. Heterogeneity might also materialize due to the research set-up involving the length of the data, estimation techniques, country coverage, or the implementation of controls for economic development and market environment. Results can also be plagued by the phenomenon known as publication selection bias, which occurs when researchers, reviewers, and editors are inclined to publish research results that are statistically significant and/or in line with *a priori* conventional views. As a result, larger and more significant impacts might emerge in the empirical assessments that bias the summarized results if not corrected in an appropriate way. In order to assess the above issue, we aim to test the following (null) hypothesis:

Hypothesis 4: *Reported effect sizes of financial development are not affected by the publication selection bias.*

In our meta-analysis, we explicitly deal with publication selection bias and various sources of heterogeneity existing in the primary studies (Stanley and Doucouliagos, 2012). With respect to publication selection bias, we employ the now standard approaches of Egger et al. (1997) and Stanley and Doucouliagos (2010, 2012). In addition, we account for the existence of publication bias in its nonlinear form and adopt the technique of Stanley et al. (2010) plus the most recent advancements introduced by Andrews and Kasy (2019), Bom and Rachinger (2019), and van Aert and van Assen (2021). Further, we effectively deal with sources of heterogeneity and model specification uncertainty by employing two different model-averaging methods to select the most influential variables affecting the heterogeneity of results in primary studies. Specifically, we apply Bayesian model-averaging (BMA) and weighted-average least squares (WALS) approaches on all independent meta-variables to identify the key moderators important in explaining the heterogeneity of results.

In sum, we contribute to the literature on the finance–growth nexus by presenting evidence from the largest-yet finance–growth meta-analysis based on 3561 estimates derived from 177 primary studies that cover empirical research over several decades up to 2022. Our key findings show that the heterogeneity in results on a world scale is driven by a very limited number of variables (moderators). Further, we document the existence of publication selection bias in the extant literature that propagates in a nonlinear fashion. After adjusting for the publication bias, the genuine effect of the financial development on growth exists in the primary literature but varies among different financial variables. As such, finance through the capital markets seems to feed economic growth more than other forms of financial development. However, the impact of financial development on growth is fairly small in economic terms but seems to be rather stable as it declines very slowly over time.

The rest of the paper is structured as follows. In Section 2, we provide details regarding the selection of the literature that constitutes the source of our data pool. The meta-synthesis is presented in Section 3. Publication selection bias is covered in Section 4. The meta-regression analysis and its results are presented in Section 5. Section 6 provides conclusions.

2. Literature Selection and Relevant Facts about the Data

In this section, we describe our procedure for selecting literature and review the studies selected for meta-analysis.

We searched for relevant studies that empirically examine the effect of financial development on macroeconomic growth worldwide. We began our search by accessing EconLit, Web of Science, and major academic press websites following the guidelines of meta-analysis described in Havránek et al. (2020). Specifically, we searched the literature across the following academic press websites: 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 2022—to supplement the results of the EconLit and Web of Science search. The final search of the literature was conducted in October 2022.

In utilizing these electronic databases, we carried out an AND search of paper titles, using "*finance*" or "*financial*" and "*growth*" as keywords in order to obtain the widest possible set of literature initially. In this first step, the title search yielded nearly 3,150 hits on EconLit and Web of Science and more than 620 additional hits on academic press websites. After eliminating duplications among the literature found through the mechanical searches, we discovered that, at minimum, the literature in this study field consists of more than 2,700 works published in English. The set includes numerous studies intended for purposes other than empirical analysis of the relationship between financial development and economic growth.

Therefore, as a second step, we looked closely at the content of each study to determine whether it satisfied three conditions: (i) the study examined the impact of financial development on macroeconomic growth, (ii) it used panel data covering multiple countries all over the world, and (iii) it included estimates with standard errors or a suitable measure of their statistical significance that could be subject to our meta-analysis. This step resulted in narrowing the literature list to a total of 177 works published in English. These primary studies enabled us to collect a total of 3561 estimates. In terms of the data obtained from the primary studies, we were able to conduct a meta-analysis that surpassed any similar attempts conducted earlier.

We provide the list of primary studies in **Appendix Table A1**, along with essential characteristics of their scope. Further, we present descriptive statistics related to the estimates in **Table 1**. The earliest primary studies that we analyzed were published in 2000, but they cover years from as early as the 1960s (Beck et al., 2000; Benhabib and Spiegel, 2000; Levine et al., 2000). The analyzed data originate even earlier, in the 1950s (Graf and Karman, 2006). In two exceptional cases, the data date back to 1850 (Rousseau, 2003) and 1880 (Bordo and Rousseau, 2012). The very recent studies were published in 2022, and they employ data from as early as the 1970s (Karadam and Öcal, 2022; Cheng and Hou, 2022; Boikos et al., 2022) and as recent as 2019 (Selvasundaram et al., 2022) and 2020 (Ahmed et al., 2022; Nguyen et al., 2022).[2] Since only two studies cover data from 2020, we are unable to effectively analyze the effect of the COVID-19 pandemic.

Analyzed primary studies are, by default, works that cover multiple countries across

[2] A single study published in 2023 (Kassi et al., 2023) covers the data from 1990 to 2017.

the globe. They cover as few as three countries and as many as an impressive 193 countries (Khan et al., 2019). However, these are exceptions, since our primary studies cover an average of 54 countries (with the median being 48; see **Appendix Table A2**). In terms of length, the primary studies use 29 years as an estimation period, with 1992 being the average of the estimation periods (means and medians are almost identical). A combination of the country coverage and the number of years ensures that primary studies are typically based on hundreds of observations and are not subject to a small-sample bias. Based on the above quantitative characteristics (see **Appendix Table A2**), we can be quite confident that our dataset originating in primary studies provides a global, long-term, and truly representative sample for the purpose of our meta-analysis. The adequacy of our dataset is further supported by the representative use of financial development indicators (see **Table 1**). From 177 selected primary studies, we obtain estimates based on nine indicators of financial development (FD): (i) financial depth, (ii) private credit to GDP, (iii) bank credit to GDP, (iv) private credit to domestic credit, (v) market capitalization, (vi) stock market volume, (vii) stock market turnover ratio, (viii) comprehensive FD index, and (ix) other FD indices.

In the next sections, we proceed with a quantitative assessment of the collected estimates following the conventional stages of meta-analysis, consisting of (a) meta-synthesis, (b) test for publication selection bias, and (c) meta-regression analysis (MRA) of literature heterogeneity. In our approach, we follow the contemporary methods for meta-analysis as outlined by Geyer-Klingeberg et al. (2020), and we strive to comply with the reporting guidelines for meta-analysis in economics as recently summarized by Havránek et al. (2020).

3. Meta-Synthesis

In the initial stage of our meta-analysis, we synthesized the collected estimates by employing a partial correlation coefficient (PCC) that measures the association of a dependent variable (macroeconomic growth) and the independent variable (financial development) when other variables are held constant. We use a PCC-based assessment because PCC is a unitless measure suitable for the aggregation of multiple studies that use an array of different models to assess macroeconomic growth when the units and/or definitions of independent variables vary among the selected papers (Stanley and Doucouliagos, 2012). The PCC is defined as:

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

where t_k and df_k denote the t value and the degree of freedom of the k-th estimate, respectively; $k = 1, 2, \ldots, K$. The number of degrees of freedom (df_k)—the number of observations minus the number of estimated coefficients—is available from each study.

The values of the PCC range within an interval (–1, 1).[3] By using the PCC to quantify the association between financial development and macroeconomic growth, we accentuate the linkage in terms of direction and statistical significance. By using a unitless measure, we are also able to assess the economic effect.[4] In **Figure 2**, we present the individual kernel densities of the PCCs for macroeconomic growth and financial development. The aggregate distribution of the PCCs for all measures of financial development shows that PCC values range within an interval (-0.7, +0.8), with their mean slightly above zero (**Figure 2**, Panel a). We further divide the PCC estimates according to nine different indicators of financial development that were used in the primary studies. Such a division indicates that the impact of individual variables on macroeconomic growth does not differ significantly either by type (**Figure 2**, Panel b) or publication period (**Figure 2**, Panel c). Hence, a simple eyeballing of the literature suggests that the link between the indicators of financial development and macroeconomic growth is uniformly distributed and, on average, small in economic terms. However, there are two exceptions. First, two financial development indicators (comprehensive financial development index, and other financial development indices) are skewed to the left and exhibit no visible impact. Second, the publication period of 2020 or later is characterized by the uniform distribution of PCCs centered at about zero.[5]

In **Table 1**, we report the descriptive statistics and statistical normality test results for each PCC for all studies, and then for studies divided by the financial development type and

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[3] Irrespective of whether the association between variables is positive or negative, Cohen (1988) defined the threshold between medium and large effects as a coefficient of 0.5 and the threshold between small and medium effects as a coefficient of 0.3. A correlation of 0.1 is the lowest threshold of an economically meaningful effect; if the correlation is less than 0.1, the effect is negligible.

[4] The unitless property of the PCC allows for the direct comparison of a wide variety of variables with different definitions and units. This property is quite beneficial for the present study. However, the unitless feature also has a disadvantage that it makes it difficult to identify the elasticity of a variable, which is crucial in some cases. Hence, the adoption of the PCC should be determined by balancing these advantages and disadvantages, taking into account the aim of the research.

[5] The observations from the graphical presentation are consistent with the meta-synthesis results presented later, in **Table 2**.

publication period. This initial evidence shows that individual PCCs exhibit substantial kurtosis, and many are skewed. Their non-normality is also confirmed by a formal test. PCC values also hint at a lack of economic significance. Stock market volume and stock market turnover ratio seem to be two variables with some economic impact, which differentiates them from the rest of the indicators. In a similar vein, only the publication period 2000 to 2004 exhibits some influence.

In order to obtain additional insights regarding the impact of financial development, 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 **Table 2**, we report the results of the traditional meta-synthesis of PCCs given above. The presence of heterogeneity among selected studies is clearly documented since the null of homogeneity is rejected at the 1% significance level by the Cochran Q test of homogeneity (column 4) and by the I^2 and H^2 statistics (columns 5 and 6, respectively). Hence, based on the statistical evidence, we adopt the synthesized effect size of the estimates obtained from the random-effects model (**Table 2**, column 3) as a reference synthesis value using the traditional method. The synthesized effects from the fixed-effect model are reported for the sake of completeness. When we inspect the synthesized random-effects model estimates (**Table 2**, column 3), the key observation is that the synthesized effects exhibit values that are the same as or very similar to the mean PCC values reported in **Table 1** (column 2).

In addition to the traditional synthesis method used above, we also utilized 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 the influence of excess heterogeneity than the fixed-effect model is. The UWA approach is also subject to less influence from potential publication selection bias than are random-effects model estimates. The synthesized effect size of the UWA is a point estimate obtained from the regression that takes the standardized effect size (t_k) as the dependent variable and the estimation precision ($1/SE_k$) as the independent variable. Specifically, we estimate Eq. (2), in which there is no intercept term, and the coefficient, α, is utilized as the synthesized value of the PCCs:

$$t_k = \alpha(1/SE_k) + \varepsilon_k, \tag{2}$$

where ε_k is a residual term. In theory, α in Eq. (2) is consistent with the estimate of the meta fixed-effect model, and the UWA accounts for heterogeneity.

Further, Stanley et al. (2017) proposed computing the UWA only from those estimates whose statistical power exceeded a threshold of 0.8; they called this estimation method the weighted average of the adequately powered estimates (WAAP). Stanley et al. (2017) argued that the WAAP estimate is more robust against publication selection bias and superior to other weighted averages, including fixed-effects, random-effects, and the UWA itself. Following these arguments, whenever a WAAP estimate is available, we adopt it as the best synthesis value. Otherwise, the traditional synthesized effect size is used as the second-best reference value.

The results of UWA and WAAP syntheses are presented in the rightmost five columns of **Table 2**. In theory, the UWA models produce the same point estimate as the fixed-effect model. However, because the UWA method is more robust against publication selection bias than the fixed-effect model, the reported *t* values of the UWA tend to be much smaller than those of the fixed-effect model, as argued by Stanley and Doucouliagos (2017). This is not true in our case because the UWA coefficient values (**Table 2**, section c, column 7) closely resemble those of the fixed-effect model (**Table 2**, section a, column 2), along with similar statistical significance. The WAAP approach could generate a synthesized effect size for three variables (financial depth, stock market volume, stock market turnover ratio) plus all studies together. Therefore, we adopt the WAAP estimates as the selected synthesis values for the above variables (**Table 2**, column 9, in bold), while the random-effects estimates are used as the selected synthesis values for the remaining 11 variables (**Table 2**, column 3, in bold).

Figure 3 illustrates the above-selected synthesis values in a graphical form to make their comparison easier. The synthesis results support the existence of impact between financial development and macroeconomic growth in general. However, where the link exists at a statistically significant level, the effects are mostly small, in an economic sense. In fact, the WAAP synthesis value for all studies accounts for an effect of 0.118 with statistical significance at the 1% level and exceeds the lowest threshold of an economically meaningful effect according to the criteria of Cohen (0.1) and Doucouliagos (0.104).[6] In addition, most synthesis values by financial variable type and by publication period do not

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[6] Cohen's criterion is set with a zero-order correlation, which is the correlation coefficient with no control variables. This is somewhat strict in economics research, in which large numbers of control variables are usually employed in empirical studies. Thus, as the evaluation criteria of the partial correlation coefficient and general standards in macroeconomic research, Doucouliagos (2011; **Table 3**; p. 11) proposed PCC values of 0.104, 0.226, and 0.386 to be the lowest thresholds of small, medium, and large effects, respectively. By both criteria, the synthesized effect size for all studies is regarded as small, though.

reach this minimum threshold. In sum, in terms of the type of financial development, four variables seem to play some role (private to domestic credit, market capitalization, stock market volume, stock market turnover ratio).

Two publication periods (2000 to 2004 and 2005 to 2009) also exhibit very small effects. This is consistent with the information presented in **Figure 4**, where we plot the estimates linking financial development with economic growth ordered chronologically. The captivating pattern in the figure is a very mildly declining line representing a linear approximation of the relationship between financial development and economic growth. In our primary studies, there is a substantial correlation between the publication year and the timespan of the analyzed data—in plain language, more recent studies employ more recent data and vice versa. The pattern in **Figure 4**, then, suggests that the impact of financial development on economic growth is likely to be small and rather stable over time, despite its very mild decline. Under such mildly declining impact of financial development on growth, the earlier (publication) periods might be reasonably expected to show larger impacts than more recent ones. In fact, the simple regression graphically presented in **Figure 4** shows that as the average estimation year comes one year closer to the present moment, the effect size decreases by 0.0039 at 1% significance. Still, the above results might be affected by the existence of heterogeneity and publication selection bias. We analyze those issues in detail in the next steps.

4. Publication Selection Bias

In the second stage of our meta-analysis, we examined the possible influence of publication selection bias on the collected estimates and the presence of genuine empirical evidence in the selected literature.

Publication selection bias is often present in research output; Ioannidis et al. (2017) demonstrated that, in economics alone, this phenomenon can increase the magnitude of estimates twofold. This type of bias might occur because papers that report estimates with the expected signs or conclusions are more likely to be accepted and published. For this reason, an examination of publication selection bias is important for meta-analysis (Stanley and Doucouliagos, 2012).

As a first step, we address this issue by forming funnel plots of the reported PCCs (Egger et al., 1997; Stanley and Doucouliagos, 2010). The funnel plot is a scatter plot with the effect size (measured by PCC in our case) on the horizontal axis and the precision of the estimate (measured by $1/SE$) on the vertical axis. In the absence of publication selection bias, the effect sizes reported by independent studies vary randomly and symmetrically around the true effect. Moreover, according to statistical theory, the dispersion of effect sizes is negatively correlated with the precision of the estimate. Hence, the shape of the plot is symmetric and resembles an inverted funnel. In other words, if the funnel plot is not symmetric but skewed in a specific direction, then one should suspect a publication selection bias. This would hint that estimates in favor of a specific conclusion (i.e., estimates with the expected sign) are more frequently published.

In **Figure 5**, we show the funnel plot of the estimates for all variables. At first sight, the PCC plot exhibits the funnel shape with a symmetric distribution. This evidence suggests that the analyzed literature listed in **Appendix Table A1** might be free from publication selection bias (favoring results with the expected sign). However, a denser cumulation of estimates in the right part of the plot shows that positive values are somewhat over-reported, which suggests that publication selection bias might be in play. As the funnel plot is only a first-order type of assessment, we proceed with a more precise quantitative assessment.

In the next step, we report estimates of meta-regression models, which have been developed to examine in a more rigorous manner publication selection bias and the presence of the true effect. First, we examine publication selection bias based on the fact that, in the presence of publication selection bias, the reported estimates are correlated with the standard errors (Stanley, 2005). Thus, following Stanley and Doucouliagos (2012), we estimate a simple regression:

$$t_k = \gamma_0 + \gamma_1(1/SE_k) + v_k, \qquad (3)$$

where SE_k is a standard error of the k-th estimate, and v_k is the error term.

Coefficient γ_0 represents the strength of publication bias; if it differs statistically from zero, there is evidence of asymmetry in the funnel graph. In Panel (a) of **Table 3**, the funnel–asymmetry test (FAT; H_0: $\gamma_0 = 0$) shows that statistically worse estimates characterized by large standard errors are not linked to larger PCCs, as the H_0 cannot be rejected. As such, the analyzed literature does not seem to contain a risk of publication selection bias. Even in the presence of publication bias, the mean underlying effect beyond publication bias can be captured by intercept γ_1. Stanley and Doucouliagos (2012) proposed assessing its existence by testing the null hypothesis H_0: $\gamma_1 = 0$. The rejection of the null hypothesis implies the presence of genuine empirical evidence. Since γ_1 is the coefficient of precision, the test is called the precision-effect test (PET). In Panel (a) of **Table 3**, the PET shows mostly a statistically significant non-zero effect.

Further, Stanley and Doucouliagos (2012) also suggested that an estimate of the publication selection–adjusted effect size can be obtained by estimating the following equation (5), which has no intercept. [Note: Do you mean equation (4) rather than (5)?] It is a nonlinear version of the FAT–PET specification. 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 γ_1 can be regarded as its estimate.

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

The technique above is known at the precision-effect estimate with a standard error (PEESE) test (Stanley and Doucouliagos, 2012).[7] We present the results in Panel (b) of **Table 3**.

To test the robustness of the regression coefficients obtained from the above FAT–PET–PEESE procedure, we estimated Eqs. (3) and (4) using the unrestricted WLS estimator. For the purpose of robustness, we followed Cazachevici et al. (2020) and Zigraiova et al. (2021) and employ the WLS estimator with bootstrapped standard errors, the cluster-robust WLS estimator, and the unbalanced panel estimator. In addition to these four estimations, we also ran 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). A nonlinear version of FAT–PET specification (4) is less biased than specification (3) if a genuine empirical effect exists. The assessment of H_0: $\gamma_1 = 0$ constitutes a precision-effect estimate with a standard error (PEESE) test (Stanley and Doucouliagos, 2012). In Panel (b) of **Table 3**, we show that the intercept (γ_1) from the PEESE equation is larger (in absolute terms) than that from the FAT–PET equation. Based on the FAT–PET–PEESE procedure, we should conclude that our meta-analyzed studies do not contain publication selection bias and demonstrate some economically meaningful true effects of financial development on growth.

However, as pointed out by Bajzik et al. (2020) and Zigraiova et al. (2021), the 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. For our purpose, we employed the "Top 10" approach, proposed by Stanley et al. (2010), who discovered that discarding 90% of the published

[7] We can see that the coefficient γ_1 in Eq. (4) 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. (4) are multiplied by the standard error: $\text{Effect size}_k = \gamma_0 SE_k^2 + \gamma_1 + w_k$ (4b).
When directly estimating Eq. (4b), the WLS method with $1/SE_k^2$ as the analytical weight is used.

findings greatly reduces publication selection bias and is often more efficient than conventional summary statistics. Further, we used 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. We also adopted the endogenous kinked model of Bom and Rachinger (2019), which represents 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. Finally, we used the *p*-uniform* method, introduced by van Aert and van Assen (2021), which is grounded in the statistical theory that the distribution of *p*-values is uniform conditional on the population effect size. We applied these four techniques to provide alternative estimates of the publication selection bias–corrected effect size and compared them with the WAAP and PEESE estimates for a robustness check. The results, presented in **Table 4**, demonstrate that publication selection bias is present in the primary studies we analyzed and that it is linked to the size of the standard error in a nonlinear fashion. The above results are in contrast to that of the FAT, whose statistical power is not exceedingly high and does not account for nonlinearity. As such, the results highlight the importance of a multifaceted approach to publication selection bias that might otherwise remain hidden.

So far, we have analyzed the bias issue for all variables together. In order to complete the publication selection assessment, we also performed the FAT–PET–PEESE procedure for the individual indicators of financial development as well as for specific publication periods; we summarize the results in **Table 5**. The presence of publication selection bias is evidenced in four indicators of financial development (private to domestic credit, market capitalization, stock market turnover ratio, comprehensive financial development index), since the funnel–asymmetry test (FAT) rejects the null hypothesis of no bias in those cases. The first three indicators coincide with the financial development type, which seems to play some role, as it was presented earlier in **Figure 3**. Further, we detected the presence of publication bias in primary studies published in periods from 2000 to 2004 and 2005 to 2009, which are also periods showing some impact. Then, the results of the PET test indicated the presence of genuine empirical evidence for two financial indicators (financial depth and stock market volume) and three publication periods (2000 to 2004, 2010 to 2014, and 2020 and later).

A summary of our evidence from publication bias tests and preliminary synthesis indicates that publication selection bias exists in the primary studies we analyzed, but its propagation chiefly takes a nonlinear form. Further, we show that after we adjust for the publication bias, the genuine effect of the financial development on growth exists in the primary literature. Finally, the impact of economic growth is small in economic terms and seems to decline over time at a very slow pace, hinting at its rather stable impact.

5. Heterogeneity in the Results: Meta-regression Analysis

During the synthesis of the collected estimates in Section 4, we detected a strong presence of heterogeneity among the studies, which was evidenced by formal testing. Therefore, in the final stage of our meta-analysis, we conducted a meta regression analysis (MRA) to explore the factors behind the heterogeneity in the selected studies.

5.1 Selection of moderators via model-averaging methods

Many potential explanatory variables have been identified in the studies we analyzed. In **Appendix Table A2**, we present a list of 40 independent meta-variables. First, naturally, there are indicators of financial development. Further, we list several publication periods; their inclusion is relevant, as the impact of financial development is shown to be mildly time varying. Then, there are variables that researchers believe lead to systematic differences in the reported empirical evidence; for that reason, they are included as controls among the primary empirical studies. Since there are many approaches to analyzing the nexus of financial development and growth, we also included groups of variables that account for economic development, estimation period, macroeconomic data type, econometric methodology, important economic and societal characteristics, and other relevant nuances that might explain heterogeneity in the meta-analyzed results.

The array of factors potentially affecting heterogeneity among studies is wide, and their inclusion in a regression might be problematic. Most importantly, such an approach would disregard the problem of model uncertainty in the absence of a theoretical model. In our case, the indicators of financial development should certainly be included in the regression, but the rest of the factors are controls that widely differ depending on the specific research study. Further, many independent meta-variables may also cause multicollinearity. Both issues have been raised recently by Havranek and Sokolova (2020) and Zigraiova et al. (2021). We account for these two econometrical issues by implementing two model-averaging techniques. First, we use the Bayesian model-averaging (BMA) approach (Ahtiainen and Vanhatalo, 2012; Havránek and Sokolová, 2020). BMA represents an application of Bayesian inference to provide a coherent and systematic mechanism minimizing uncertainty in model choice. BMA performs regressions on subsets of potential combinations of variables, and the likelihood of each model is given by the posterior model probability (PIP). Specific variables are included in the model based on the value of the PIP calculated across models (Raftery et al., 1997; Eicher et al., 2011). Second, in a similar way, we employ the weighted-average least squares (WALS) estimator to estimate the *t* value of each independent meta-variable other than the variables needed for hypothesis testing and the standard error of PCCs. The WALS approach is an effective alternative to BMA because it performs model selection in a linear rather than an exponential way (Magnus, Powell, and Prüfer, 2010; De Luca and Magnus, 2011). In addition, WALS requires less-complex computations and is based on a transparent definition of prior ignorance. In any event, we employ both techniques to solve the model selection issue.

By using the BMA and WALS approaches, we identify independent meta-variables (moderators) and present them in **Appendix Table A3**. Further, as a robustness check, we also present in **Appendix Table A4** the set of independent meta-variables while controlling for publication year instead of publication period; the results presented in **Appendix Tables A3** and **A4** are in line with no material differences. We select moderators by adopting a policy of employing variables for which the estimates have a PIP of 0.50 or more in the BMA analysis and, at the same time, an absolute *t* value of 1.00 or more in the WALS estimation. By using the above techniques, we follow the approach of recent meta-studies to specify robust moderators in their meta-regression estimation (eg. Havránek and Sokolová, 2020; Anwar and Iwasaki, 2023a; Filomena and Picchio, 2023). The key result from this selection procedure indicates that heterogeneity in the literature is affected by only a small set of relevant variables used in primary studies. The selected moderators are then included in the MRA estimation presented in the next step.

5.2 Estimation

We employed the moderators selected in Section 5.1 and estimated the meta-regression model specified as:

$$PCC_k = \beta_0 + \sum_{n=1}^{N} \beta_n x_{kn} + e_k \, , k = 1, 2, \cdots, K \, , \quad (5)$$

where PCC_k is the partial correlation coefficient of the *k*-th estimate defined earlier in equation (1); β_0 is a constant; x_{kn} represents the *n*-th independent meta-variable that captures relevant characteristics of the *k*-th PCC estimate and explains its systematic variation from other PCCs in the sampled literature; β_n denotes the meta-regression coefficient to be estimated; *N* is the number of independent meta-variables; and e_k is the meta-regression disturbance term (Stanley and Jarrell, 2005). The above model makes it possible to relate various variables to heterogeneity in the results coming from our set of studies.

As pointed out in Iwasaki et al. (2020), there is no clear consensus among meta-analysts as to the best way to estimate specification (5). Hence, to check the statistical significance of coefficient β_n, we performed an MRA using the following five estimators that have been employed as a standard in recent meta-analysis literature: (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; and (5) the cluster-robust random-effects panel GLS estimator. As in de Linde Leonard et al. (2014), we report the results of either a random-effects model or a fixed-effects model, according to the Hausman test of model specification, which is in line with the discussion in Feld and Heckemeyer (2011) and Stanley and Doucouliagos (2012).

5.3 Results

We present the MRA estimation results in **Table 6**. First, we focused on the indicators of financial development; financial depth, measured by liquid liabilities (M3) to GDP in most cases, is taken as a default category. Hence, the coefficients of financial development types in **Table 6** capture their average difference from the effect size of the financial depth. Two variables that consistently exhibit statistically significant coefficients are both indicators characterizing the stock market measure of financial development. The effect size of stock market volume is larger than that of financial depth (default category) by about 0.1 (0.0765 to 0.1124), depending on the estimator type. Similarly, albeit slightly smaller, the effect size of the stock market turnover ratio is also larger than that of financial depth by about 0.8 (0.0726 to 0.0990), depending on the estimator type. This finding is further complemented by the impact of (stock) market capitalization that is larger than that of financial depth by 0.0634, although it is statistically significant in the case of only one estimator (Cluster-robust

WLS [Study size]). The comprehensive financial development index exhibits a marginally larger impact than the default category (0.04) as well. On the other hand, the impact of bank credit to GDP is smaller (by 0.0700 to 0.0359) than that of financial depth. The coefficients of other measures are statistically insignificant, and for that reason, we do not discuss their economic significance.

In sum, the findings show general evidence of a small positive impact of financial development on economic growth. However, the effect is conditioned on the type of financial structure. The effects found for three measures related to the stock market speak in favor of this type of financial development that is conducive to growth; the impact is in line with earlier meta-evidence by Valíčková et al. (2015), who found similar evidence in studies published until 2012. The smaller impact of bank credit (smaller than that of the default category) then correlates with the notion that bank credit often serves as an operating source of financing and, as such, seems to be more important from a short-term perspective. Further, bank credit to households channels financial funds away from firms that could otherwise produce longer-lasting positive impact on growth; the potential process is via the effective interaction of R&D-related patents with finance, as suggested by Chu et al. (2020). On the other hand, as compared with the impact of financial depth, financing obtained via the stock market is perceived as being a fundamental source of long-term financing crucial for corporate development that underlies economic growth from a corporate perspective (Benczúr et al., 2019).

Results regarding the effect of publication period reflect the earlier evidence presented in **Figure 4**. Statistically insignificant negative coefficients of negligible values in earlier publication periods are replaced by statistically significant negative values (about -0.07 and -0.05) in more recent periods. This finding indicates that more recent studies report, on average, smaller effects than older studies; however, these differences are below the economically meaningful threshold of |0.1|. Earlier studies naturally employ older data, and the above result might implicitly mean that the impact of financial development on growth declines over time. On the other hand, as shown in **Appendix Table A1**, several recent studies cover the periods of the 1960s and 1970s, as older studies do. Hence, progress in econometric estimation techniques—which accounts for various issues like simultaneity, omitted variables, or unobserved characteristics—is more likely to be behind the smaller effects reported in more recent studies.[8] Still, if one agrees that financial development expands and improves globally over time, then the smaller estimates reported in recent studies, combined with the pattern reported in **Figure 4**, imply that the marginal returns from expanding financial development actually decline. This result is quite plausible, as it is in line with the standard economic principle of diminishing marginal returns. Further, the diminishing marginal return effect also can be related to the previous findings on the impact

[8] Unfortunately, we only have an OLS-related moderator (based on a sufficiently high PIP); for that reason, we are unable to claim that advances in econometric estimation techniques are controlled for by moderators.

of the financial structure. Arcand et al. (2015; p. 107) showed that "the marginal effect of financial depth on output growth becomes negative when credit to the private sector reaches 80–100% of GDP." This result is consistent with the "vanishing effect" of financial depth found earlier by Rousseau and Wachtel (2011).

Next, we focus on ten key factors selected via the BMA and WALS model-averaging approaches as potentially the most important drivers of heterogeneity in results regarding the nexus between financial development and growth. The original set of potential moderators has shrunk considerably after the BMA–WALS selection procedure was performed, and its use allows us to avoid analyzing and reporting less-than-adequate variables.

At the beginning of our analysis, we accentuated a truly worldwide approach toward our assessment. In terms of country coverage, the proportion of emerging markets with respect to countries covered by a primary study exhibits a large negative effect, both in the BMA and WALS models. The result suggests that the finance–growth nexus in emerging markets is likely to be much smaller than that in developing and developed economies, as reported by Ono and Iwasaki (2022). In addition, in **Appendix Table A2**, we illustrate our adoption of independent meta-variables to capture the proportions of developed, developing, and emerging economies with respect to total observations to control for the possible influence of the difference in country/region sample composition. Based on the results in **Table 6** and **Appendix Table A3**, we find that the proportion does not affect substantially the reported estimates included in our meta-analysis. The most sensible reason for this finding is that primary studies subject to our meta-analysis have effectively controlled for region/country fixed effects.

Further, the proportion of emerging markets covered by primary studies is by an order (of magnitude) smaller than the proportions of developed and developing countries (see **Appendix Table A2**). However, this particular group of countries, placed between their economically more- and less-developed counterparts, seems to be responsible for some reduction in the impact of financial development on growth. A potential source of this result might be rooted in the quality of political institutions, which vary across countries and are shown to be linked with their economic status and growth. Based on their theoretical approaches, Acemoglu et al. (2005) and Davis (2010) argued that political institutions act as mediators for and indirectly impact economic growth. While political institutions of a high level are usually found in developed countries, their quality varies in emerging and developing economies (Acemoglu and Robinson, 2012). Based on a large analysis of emerging and developing economies, Slesman et al. (2019) produced compelling evidence that countries possessing high-quality political institutions benefit from financial development, while countries with low-quality political institutions do not. A non-linear link between economic growth and political institutions found by Slesman et al. (2019) indicates that financial development produces more economic growth, but only in an environment with good-quality political institutions; below a certain threshold, the link is negative. Considering this, we infer that the negative effect associated with the emerging market moderator might be linked to, on average, low institutional quality in emerging markets covered by the primary studies we meta-analyzed.

Assessment over a longer time span in primary studies is captured by the decade dummy and produces a marginal but positive effect in our meta-regression. This result implies that when researchers employ a decade or several-year interval for estimation, they tend to report a somewhat larger effect. This result intuitively reflects the idea that the progress of financial deepening needs time to impact the real economy (Calderón and Liu, 2003). Further, data assessment over longer periods circumvents the issue of cyclical ups and downs (Enders, 2008).

Primary studies that use OLS as an estimation technique do report effects that are marginally larger than those of other studies. The use of estimation techniques is a standard characteristic considered to control for while searching for heterogeneity sources. In the case of our analysis, the estimation technique has some importance, but its economic impact should not be overrated, in any respect. Why is this so? Each analysis performed in a primary study usually employs large sets of aggregated data. As such, valuable tools that finely tune estimation techniques and control for various sources of bias might be unnecessarily (more) sophisticated than the standard OLS. This finding also indirectly infers that, in an aggregate setting, the issue of endogeneity might be overplayed, since this moderator's impact is nonexistent (**Appendix Table A3**). The inference is also consistent with Shin (1987; p. 57) who argues that "aggregate equations are in general subject to less endogeneity" and "this issue has a significant implication for the use of aggregate data."

The coefficient of the real GDP moderator signals an impact larger than those of other studies, although the effect is rather limited in economic terms (**Appendix Table A3**). The finding is intuitively understandable, as controlling for the real GDP makes sense if one wants to analyze the economic growth at the end. The effects associated with similar measures (nominal GDP and log-transformed GDP) do not materialize at all. This result is not surprising, as the use of the nominal GDP usually plagues assessments of economic growth, since even controlling for price level does not necessarily solve the problem of the pace of inflation included in the nominal measure. Further, a logarithmic transformation is known to produce a smaller impact by its construction. For that, the use of the real GDP seems to be a good and intuitive indicator, despite its low impact.

Studies using the GDP growth rate as a control variable report effects somewhat smaller than those of other studies. Since macroeconomic growth is a dependent variable, controlling for GDP growth is important for avoiding implausible results; this approach also helps to circumvent the potential endogeneity problem, as discussed above.

Primary studies that, during estimation, control for macroeconomic stability and investment (including capital formation) tend to report lower effects. These results make sense intuitively, as they go hand in hand; an economically stable environment attracts and provides good opportunities for investment in the economy, and investment itself is directly linked to the financial development via financial flows. It must be noted that the impact of both moderators is quite limited. On the other hand, their effect resonates well with the seminal findings of Bleaney (1996), who showed that good macroeconomic management is associated with faster growth for a given rate of investment.

Studies controlling for the global financial crisis (GFC) tend to report effects lower than those of other studies. During the GFC, economic growth experienced a visible decline across the globe; as such, the impact of the GFC moderator should reflect such a decline. After all, a negative effect of the GFC on the link between financial development and economic growth is shown by Celik Girgin et al. (2017). Still, despite the importance of the GFC on economies and markets, the impact of the GFC moderator is smaller than that of financial development indicators; however, it is on par with the effect of the growth rate variable.

5.4 Robustness checks

Results reported in Section 5.3 show that the time dimension is an important issue in our analysis. Therefore, we further performed the MRA with a selected set of moderators where we control for the publication year instead of the publication period. Financial depth is again taken as a default category.

Results of this alternative approach are reported in **Appendix Table A5** and are consistent with the baseline findings. Stock market volume and the stock market turnover ratio exhibit positive and statistically significant coefficients with similar economic impacts (above the default category) that are strongest among the set of moderators. The comprehensive financial development index exhibits a small positive impact, as was shown before.

When we control for publication year, we again obtain results supportive of the previous findings. The associated statistically significant coefficients are negative, as in the case of publication periods, but their economic significance is much smaller. Still, they provide additional evidence, together with publication period controls, that the impact of financial development mildly declines over time.

The rest of the moderators again exhibit similar impacts as in our baseline finding, in terms of both statistical and economic significance. However, some differences appear. The proportion of emerging markets and investment variables become statistically insignificant, while nominal GDP and political stability become significant. Studies controlling for the nominal GDP and political stability report effects that are smaller and larger, respectively, than those of other studies. The findings are intuitively correct, as the use of nominal GDP often overstates the economic outcome, and political stability is favorable for economic growth. The political stability result is actually in line with the evidence of Slesman et al. (2019), that countries with high-quality political institutions benefit from financial development, while countries struggling with low-quality political institutions do not.

In summary, the key message from the MRA results reported above is that, if other study conditions are equal, capital market–oriented financial development plays a fair role with respect to economic growth as compared to other forms of finance. In this sense, the MRA results are highly consistent with the meta-synthesis results reported in **Table 2** and **Figure 3**. Furthermore, the reported estimates are influenced by a few other study conditions, but their impacts are economically marginal.

6. Conclusions

In this paper, we performed a meta-analysis of 177 primary studies, and from 3561 estimates, we summarized and assessed the impact of financial development on economic growth from the diverse research literature. Several decades of empirical research have produced a surprisingly diverse wealth of evidence that is often contradictory and heterogenous. The strong presence of heterogeneity among the studies was formally detected during the meta-synthesis. Still, our key results point to the fact that great heterogeneity in empirical evidence on a world scale is, in fact, driven by only a limited number of variables (moderators).

We also documented the existence of publication selection bias in the extant literature that was often overlooked or not fully identified in previous meta-studies. The key point is that the publication selection bias is propagated in the literature in a nonlinear fashion that could be detected by the recently advanced methodology we used.

After adjusting for the publication bias, we show that the primary literature does contain a genuine effect of financial development on growth. The key message is that the finance–growth impact is small in economic terms and declines over time. However, its decline is so mild that the effect can be regarded as quite stable.

The effect of financial development also varies somewhat among different financial variables. We present evidence that finance channeled via capital markets seems to be more beneficial for economic growth than finance provided in the form of private credit. The impact of publication periods is rather marginal. Other characteristics we control for produce negligible impact in economic terms. The above results are robust with respect to our checks.

In summary, we grasp a small but positive general effect of financial development on economic growth. The results obtained from the meta-synthesis match those of the meta-regression analysis and correction for publication selection bias. The world-scale positive impact of finance goes against arguments about the damaging role of financial development and is in line with the century-old theoretical foundations favoring a positive role of finance on growth.

References

Acemoglu, D., Robinson, J. A. (2012). Why nations fail: The origins of power, prosperity and poverty. New York: Crown Business.

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.

Ahtiainen, H. and J. Vanhatalo (2012) The value of reducing eutrophication in European marine areas: A Bayesian meta-analysis. Ecological Economics, 83: 1-10.

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

Anwar, A. and I. Iwasaki (2023a) The finance–growth nexus in the Middle East and Africa: A comparative meta-analysis. International Journal of Finance & Economics, 28(4), 4655-4683.

Anwar, A. and I. Iwasaki (2023b) The finance–growth nexus in Asia: A meta-analytic approach. Asian Development Review, 40(1). 13-48.

Arcand, J. L., Berkes, E., Panizza, U. (2015) Too much finance? Journal of Economic Growth, 20(2), 105-148.

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. 87.

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

Beck, T., Degryse, H., Kneer, C. (2014) Is more finance better? Disentangling intermediation and size effects of financial systems, Journal of Financial Stability, 10, 50– 64.

Benhabib, Jess (2000) The role of financial development in growth and investment, Journal of Economic Growth, 5:4, pp. 341–360.

Benczúr, P., Karagiannis, S., & Kvedaras, V. (2019). Finance and economic growth: Financing structure and non-linear impact. Journal of Macroeconomics, 62, 103048.

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.

Bleaney, M. F. (1996). Macroeconomic stability, investment and growth in developing countries. Journal of development economics, 48(2), 461-477.

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

Boikos, Spyridon, Theodore Panagiotidis and Georgios Voucharas (2022) Financial development, reforms and growth, Economic Modelling, 108, Article 105734.

Bordo, Michael D. and Peter L. Rousseau (2012) Historical evidence on the finance-trade-growth nexus, Journal of Banking & Finance, 36:4, pp. 1236-1243.

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

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.

Calderón, C. and L. Liu (2003). The direction of causality between financial development and economic growth. Journal of Development Economics, 72(1): 321-334.

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

Celik Girgin, S., Nguyen, H. O., Karlis, T. (2017). Revisiting the effect of financial development on economic growth after the 2008 Global Financial Crisis. Advances in Economics and Business, 5(8), 456-465.

Cheng, Su-Yin and Han Hou (2022) Innovation, financial development, and growth: Evidences from industrial and emerging countries, Economic Change and Restructuring, 55(3), 1629–1653.

Chu, A. C., Cozzi, G., Fan, H., Pan, S., & Zhang, M. (2020). Do stronger patents stimulate or stifle innovation? The crucial role of financial development. Journal of Money, Credit and Banking, 52(5), 1305-1322.

Davis, L. S. (2010). Institutional flexibility and economic growth. Journal of Comparative Economics, 38, 306–320.

de Linde Leonard, M., Stanley, T. D., & Doucouliagos, H. (2014). Does the UK minimum wage reduce employment? A meta-regression analysis. British Journal of Industrial Relations, 52(3), 499-520.

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.

de Luca, Giuseppe and Jan R. Magnus (2011) Bayesian model averaging and weighted-average least squares: Equivariance, stability, and numerical issues. STATA Journal, 11(4): 518-544.

Egger, M., G. D. Smith, M. Schneider and C. Minder (1997) Bias in meta-analysis detected by a simple, graphical test. British Medical Journal, 315(7109): 629-634.

Eicher, T. S., C. Papageorgiou and A. E. Raftery (2011) Default priors and predictive performance in Bayesian model averaging, with application to growth determinants. Journal of Applied Economics, 26(1): 30–55.

Enders, W. (2008). Applied econometric time series. John Wiley & Sons.

Feld, L. P. and Heckemeyer, J. H. (2011). FDI and taxation: A meta-study. Journal of Economic Surveys, 25: 233–72.

Filomena, M., Picchio, M. (2023). Retirement and health outcomes in a meta‐analytical framework. Journal of Economic Surveys, 37(4), 1120-1155.

Geyer-Klingeberg, J., M. Hang and A. Rathgeber (2020) Meta-analysis in finance research: Opportunities, challenges, and contemporary applications. International Review of Financial Analysis, 71, Article 101524.

Goldsmith, R. W. (1969) Financial Structure and Development. Yale University Press, New Haven

Graff, Michael and Alexander Karmann (2006) What determines the finance-growth nexus? Empirical evidence for threshold models, Journal of Economics, 87:2, pp. 127-157.

Gurley, J. G., Shaw, E. S. (1955) Financial aspects of economic development. American Economic Review. 45(4), 515-538

Havránek, T. and A. Sokolová (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(3): 469-475.

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

Ioannidis, J. P. A., T. D. Stanley and H. Doucouliagos (2017) The power of bias in economics research. Economic Journal, 127: 236-265.

Irsova, Z., Bom, P. R., Havranek, T., & Rachinger, H. (2023). Spurious precision in meta-analysis. Charles University, IES WP 2023/05.

Iwasaki, I. (2022) The finance-growth nexus in Latin America and the Caribbean: A meta-analytic perspective. World Development, 149, Article 105692.

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.

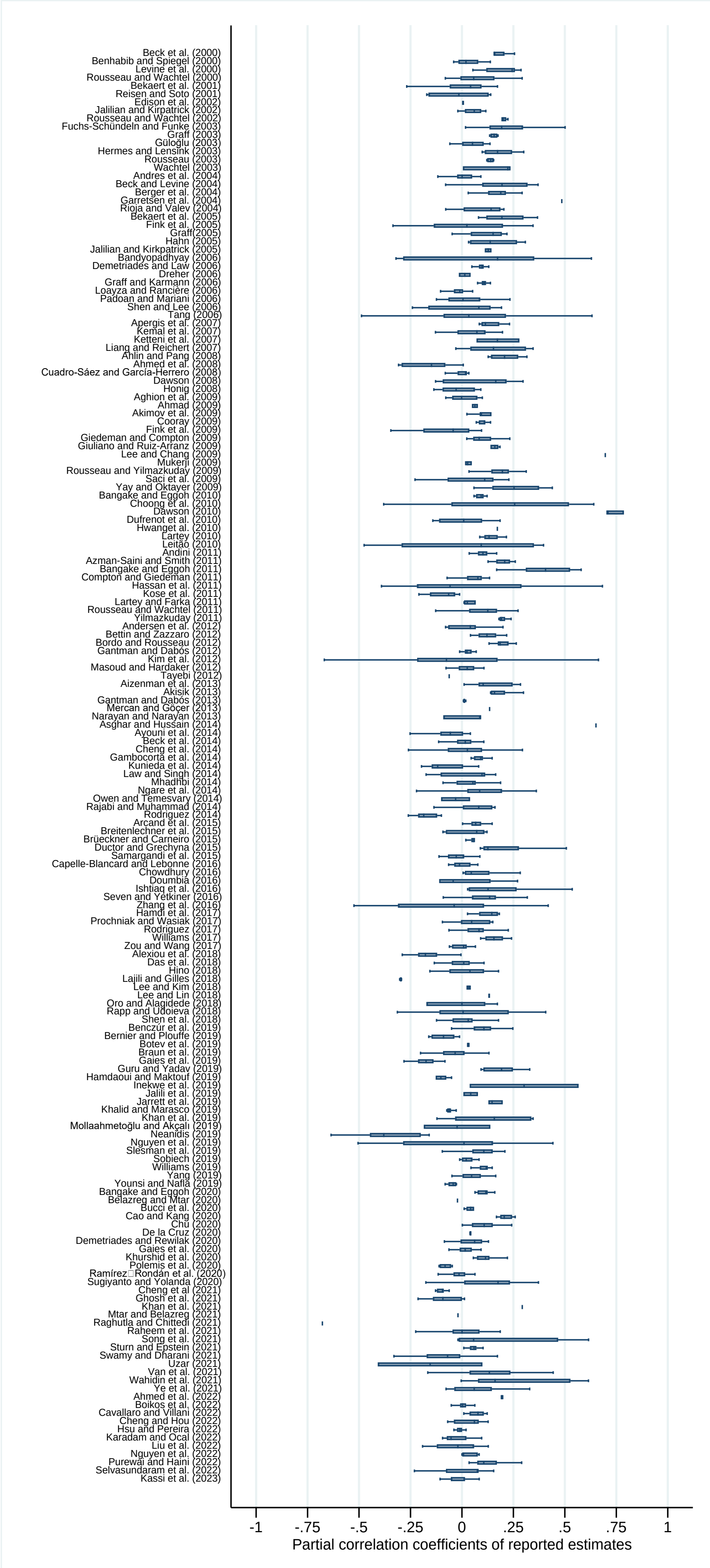
Karadam, Duygu Yolcu and Nadir Öcal (2022) Analysis of distinct asymmetries in financial integration growth nexus for industrial, emerging and developing countries, International Journal of Finance and Economics, 27(2), pp. 2326-2344.

Khan, Sher, Zhuangzhuang Peng and Yongdong Li (2019) Energy consumption, environmental degradation, economic growth and financial development in globe: Dynamic simultaneous equations panel analysis, Energy Reports, 5, 1089-1102.

King, R. G. and R. Levine (1993) Finance and growth: Schumpeter might be right. Quarterly Journal of Economics, 108(3): 717–737.

Levine, R., N. Loayza, and T. Beck. 2000. “Financial Intermediation and Growth: Causality and Causes.” Journal of Monetary Economics 46 (1): 31–77.
Lucas, R. (1988) On the mechanics of economic development. Journal of Monetary Economics, 22(1): 3–42.
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 (2022) Individual discount rates: A meta-analysis of experimental evidence. Experimental Economics, 25: 318-358.
McKinnon, R. I. (1973) Money and Capital in Economic Development. Brookings Institution, Washington DC
Miller, M. H. (2012). Financial markets and economic growth. Journal of Applied Corporate Finance, 24(1), 8-13.
Ono, S. and I. Iwasaki (2022) The finance-growth nexus in Europe: A comparative meta-analysis of emerging markets and advanced economies. Eastern European Economics, 60(1): 1-49.
Robinson, J. (1952) The Rate of Interest and Other Essays. London: Macmillan. 71.
Rousseau, Peter L. (2003) Historical perspectives on financial development and economic growth, Federal Reserve Bank of St. Louis Review, 85:4, pp. 81-105.
Rousseau, P. L. Wachtel, P. (2011) What is happening to the impact of financial deepening of economic growth? Economic Inquiry, 49(1), 276–288.
Raftery, A. E., D. Madigan and J. Hoeting (1997) Bayesian model averaging for linear regression models. Journal of the American Statistical Association. 92(437): 179–191.
Schumpeter, J. (1911) Theorie der wirtschaftlichen Entwicklung. Eine Untersuchung über Unternehmergewinn, Kapital, Kredit, Zins und den Konjunkturzyklus, Verlag von Duncker and Humblot: Leipzig.
Selvasundaram, K., S. Sagathevan and Murtala Abdu (2022) Financial development and economic growth in BRICS revisited: An application of cross-sectional augmented ARDL, International Social Science Journal, 72(245), pp. 799-812.
Shaw, E. S. 1973. Financial Deepening inEconomic Development. New York: Oxford University Press.
Shin, J. S. (1987). Aggregation and the endogeneity problem. International Economic Journal, 1(1), 57-65.
Slesman, L., Baharumshah, A. Z., & Azman-Saini, W. N. W. (2019). Political institutions and finance-growth nexus in emerging markets and developing countries: A tale of one threshold. The Quarterly Review of Economics and Finance, 72, 80-100.
Stanley, T. D. (2005) Beyond publication bias. Journal of Economic Surveys, 19(3): 309-345.
Stanley, T. D. and H. Doucouliagos (2010) Picture this: A simple graph that reveals much ado about research. Journal of Economic Surveys, 24(1): 170-191.
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. and S. B. Jarrell (2005) Meta-regression analysis: A quantitative method of literature surveys. Journal of Economic Surveys, 19(3): 299-308.
Stiglitz, J. E. 2000. “Capital Market Liberalization, Economic Growth, and Instability.” World Development 28:1075–86.
Valickova, P., T. Havranek and R. Horvath (2015) Financial development and economic growth: A meta-analysis. Journal of Economic Surveys, 29(3): 506–526.
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.

Figure 1. Forest plot of 177 worldwide studies of the finance–growth nexus



Note: The box plot in this figure is comprised of the lower adjacent value (the left adjacent line), the 25th percentile (the left hinge of the box), the median (the line in the box), the 75th percentile (the right hinge of the box), and the upper adjacent value (the right adjacent line). Appendix Table A1 lists the 177 studies that appear in this figure.

Table 1. Descriptive statistics of the partial correlation coefficients and *t*-test of collected estimates by financial variable type and publication period

	K	Mean	Median	S.D.	Max.	Min.	Kurtosis	Skewness	*t*-test[a]
All studies	3561	0.045	0.052	0.155	0.787	-0.688	5.775	0.105	17.513 ***
By financial variable type									
Financial depth	594	0.043	0.057	0.151	0.787	-0.391	5.317	0.622	6.995 ***
Private credit to GDP	1203	0.024	0.031	0.140	0.631	-0.636	5.525	-0.161	5.977 ***
Bank credit to GDP	389	0.015	0.053	0.193	0.579	-0.688	4.239	-0.651	1.572 ***
Private credit to domestic credit	125	0.081	0.077	0.147	0.683	-0.475	7.136	0.544	6.161 ***
Market capitalization	317	0.074	0.076	0.131	0.566	-0.380	4.600	0.211	10.096 ***
Stock market volume	229	0.112	0.098	0.181	0.663	-0.669	6.924	-0.030	9.378 ***
Stock market turnover ratio	191	0.138	0.125	0.152	0.769	-0.476	5.269	0.127	12.536 ***
Comprehensive financial development index	265	0.044	0.018	0.140	0.743	-0.250	8.261	1.581	5.116 ***
Other financial development indices	248	0.016	0.000	0.136	0.615	-0.505	6.777	0.952	1.796 *
By publication period									
Publications from 2000 to 2004	421	0.087	0.087	0.123	0.501	-0.268	3.284	0.018	14.523 ***
Publications from 2005 to 2009	624	0.068	0.087	0.165	0.743	-0.688	4.816	-0.041	10.304 ***
Publications from 2010 to 2014	780	0.059	0.063	0.172	0.787	-0.669	6.075	0.440	9.624 ***
Publications from 2015 to 2019	998	0.017	0.038	0.159	0.769	-0.636	4.896	-0.417	3.306 ***
Publications from 2020 and later	738	0.027	0.014	0.126	0.683	-0.678	8.578	0.881	5.821 ***

Note: ***: Null hypothesis that the mean is zero is rejected at the 1% level; *: at the 10% level.

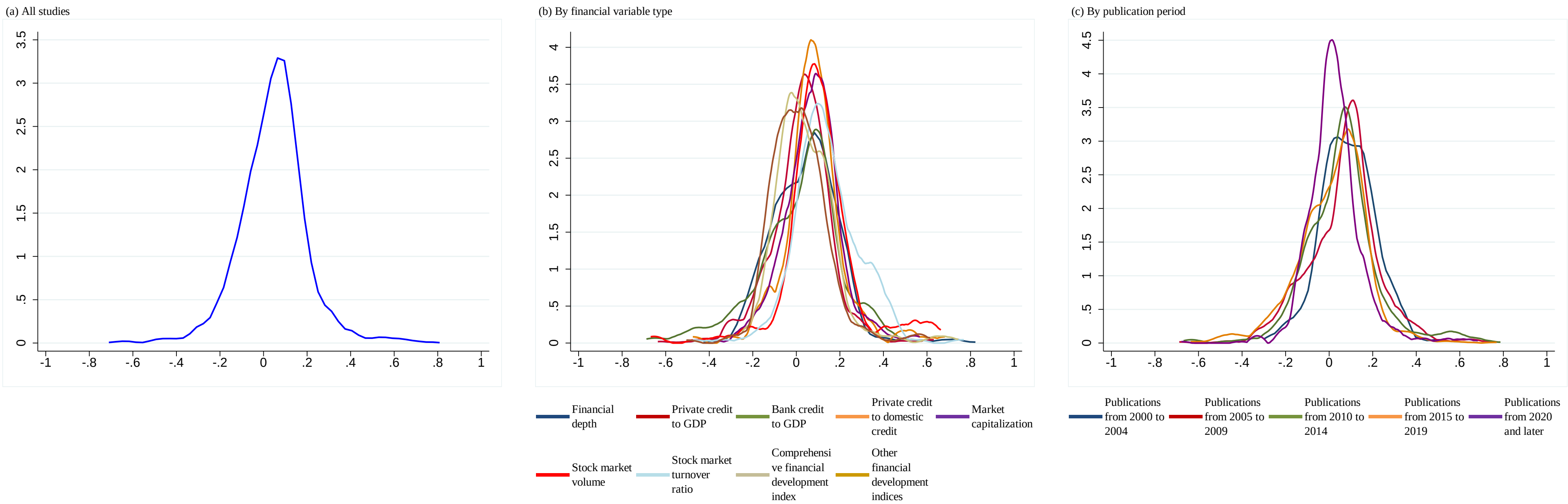


Figure 2. Kernel density estimation of collected estimates

Note: The vertical axis is the kernel density. The horizontal axis is the partial correlation coefficient of the collected estimates. See Table 1 for the descriptive statistics of the collected estimates.

Table 2. Synthesis of collected estimates

	Number of estimates (K)	(a) Traditional synthesis		(b) Heterogeneity test and measures			(c) Unrestricted weighted least squares average (UWA)				
		Fixed-effect model (z value)[a]	Random-effects model (z value)[a]	Cochran Q test of homogeneity (p value)[b]	I^2 statistic[c]	H^2 statistic[d]	UWA of all estimates (t value)[a,e]	Number of the adequately powered estimates[f]	WAAP (weighted average of the adequately powered estimates) (t value)[a]	Median S.E. of estimates	Median statistical power
All studies	3561	0.040 *** (59.98)	0.045 *** (17.84)	44555.10 *** (0.00)	92.26	12.91	0.040 *** (16.96)	12	**0.118** *** **(3.66)**	0.047	0.135
By financial variable type											
Financial depth	594	0.055 *** (32.46)	0.044 *** (7.23)	9804.05 *** (0.00)	91.95	12.41	0.055 *** (7.98)	8	**0.044** **(0.84)**	0.047	0.214
Private credit to GDP	1203	0.023 *** (21.31)	**0.024** *** **(6.34)**	12545.42 *** (0.00)	91.42	11.65	0.023 *** (6.59)	0	- (-)	0.045	0.073
Bank credit to GDP	389	0.027 *** (12.07)	**0.015** **(1.62)**	6495.56 *** (0.00)	94.18	17.19	0.027 *** (2.95)	0	- (-)	0.059	0.065
Private credit to domestic credit	125	0.050 *** (13.19)	**0.077** *** **(5.99)**	1267.87 *** (0.00)	90.64	10.68	0.050 (4.13)	0	- (-)	0.048	0.178
Market capitalization	317	0.063 *** (24.88)	**0.070** *** **(9.63)**	2243.86 *** (0.00)	86.93	7.65	0.063 *** (9.34)	0	- (-)	0.052	0.225
Stock market volume	229	0.113 *** (42.23)	0.112 *** (10.10)	2677.16 *** (0.00)	93.92	16.46	0.113 *** (12.32)	87	**0.106** *** **(8.56)**	0.043	0.743
Stock market turnover ratio	191	0.106 *** (29.83)	0.133 *** (12.47)	1164.30 *** (0.00)	87.34	7.90	0.106 *** (12.05)	42	**0.087** *** **(8.92)**	0.070	0.326
Comprehensive financial development index	265	0.022 *** (10.39)	**0.043** *** **(5.01)**	3956.47 *** (0.00)	93.63	15.70	0.022 *** (2.68)	0	- (-)	0.042	0.073
Other financial development indices	248	0.020 *** (6.88)	**0.015** * **(1.76)**	2723.23 *** (0.00)	88.72	8.86	0.020 ** (2.07)	0	- (-)	0.047	0.061
By publication period											
Publications from 2000 to 2004	421	0.064 *** (27.13)	**0.080** *** **(13.60)**	2418.62 *** (0.00)	83.26	5.98	0.064 *** (11.30)	0	- (-)	0.047	0.273
Publications from 2005 to 2009	624	0.049 *** (28.52)	**0.066** *** **(11.15)**	6675.93 *** (0.00)	90.68	10.73	0.049 *** (8.71)	0	- (-)	0.048	0.172
Publications from 2010 to 2014	780	0.077 *** (48.51)	**0.061** *** **(9.96)**	12554.28 *** (0.00)	92.91	14.10	0.077 *** (12.08)	0	- (-)	0.049	0.351
Publications from 2015 to 2019	998	0.019 *** (15.76)	**0.017** *** **(3.39)**	13309.44 *** (0.00)	93.63	15.71	0.046 *** (4.31)	0	- (-)	0.046	0.169
Publications from 2020 and later	738	0.029 *** (22.39)	**0.028** *** **(6.06)**	8542.52 *** (0.00)	91.35	11.56	0.029 *** (6.58)	0	- (-)	0.042	0.103

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] Ranging 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 a statistical power of 0.80 or more, which is computed in reference to the UWA of all collected estimates

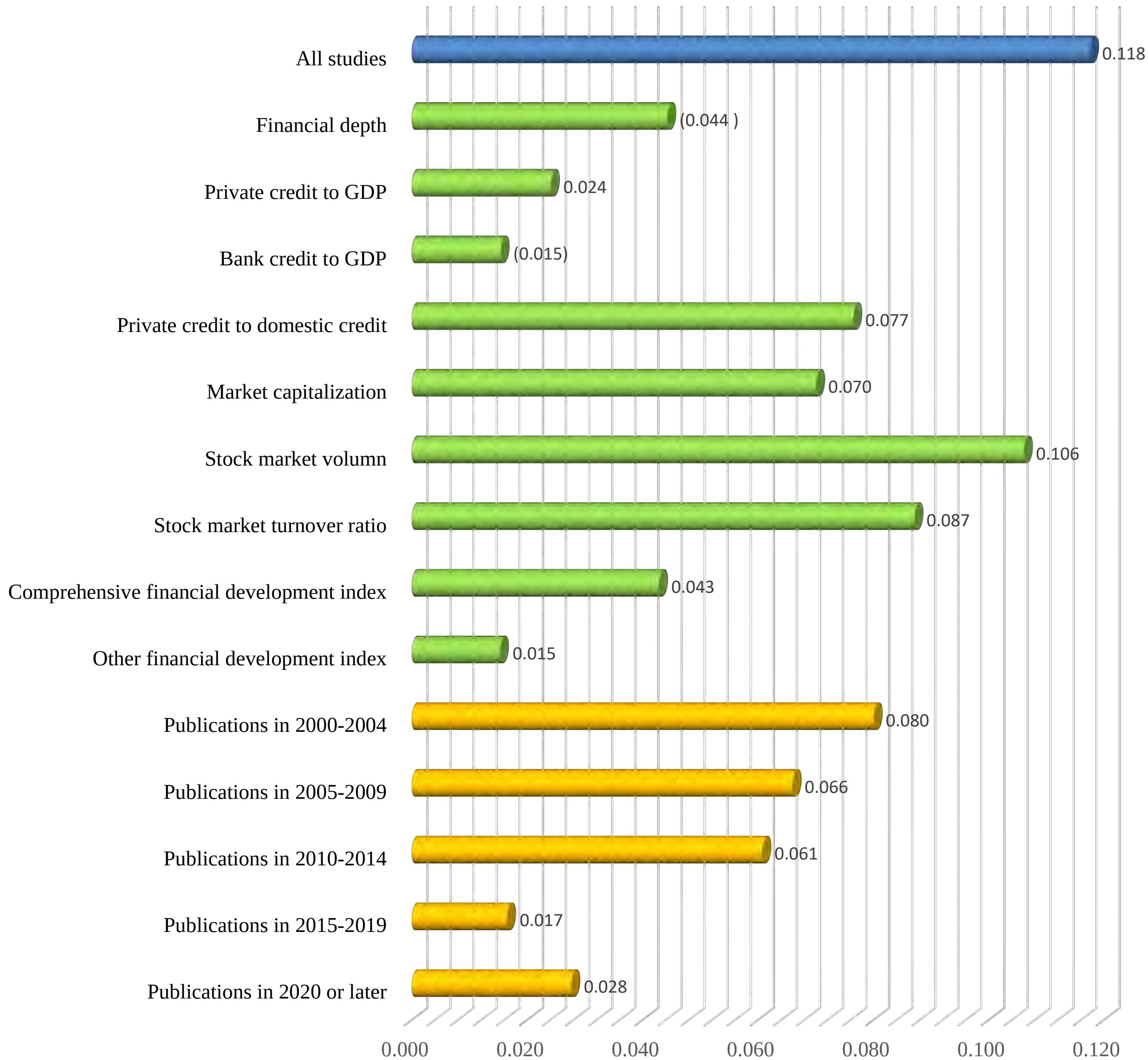
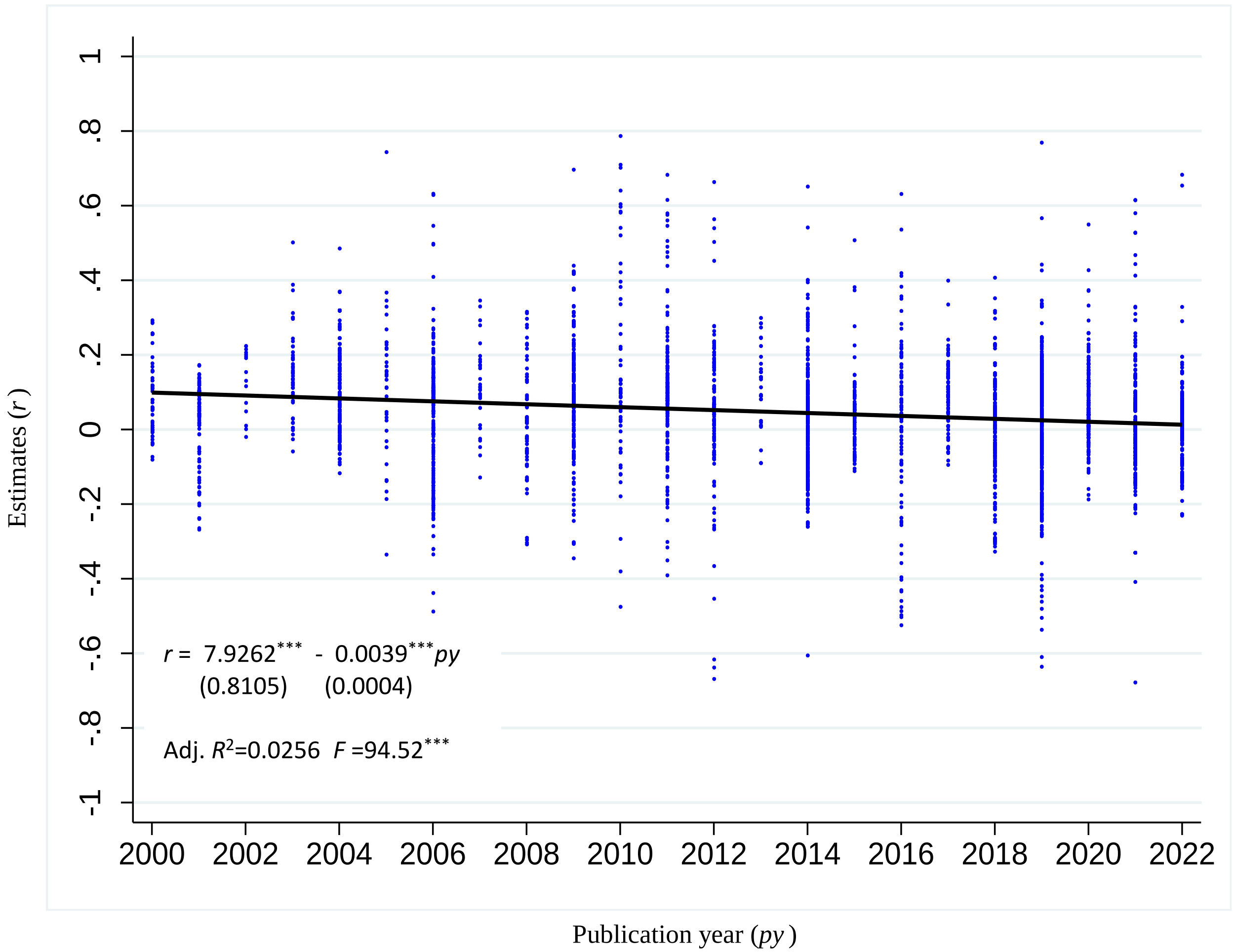


Figure 3. Illustrated comparison of synthesis results

Notes: This figure illustrates the selected synthesized values reported in Table 2. Synthesized values in parentheses are not statistically significantly different from zero.

Figure 4. Chronological order of partial correlation coefficients by publication year



Note: The values in parentheses below the coefficients in the equation are robustness standard errors. *** denotes statistical significance at the 1% level.

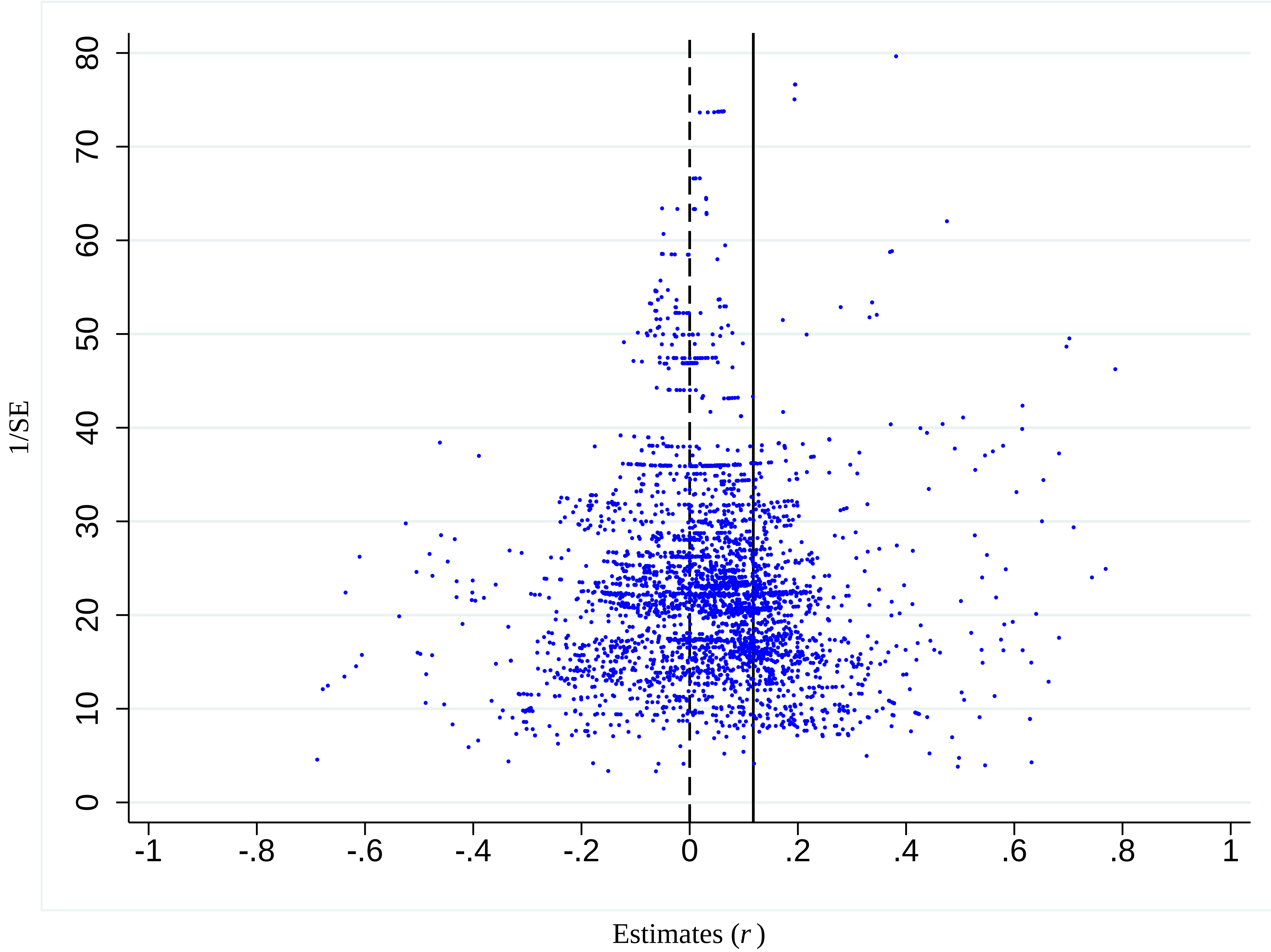


Figure 5. Funnel plot of partial correlation coefficients

Note: The solid line indicates the WAAP synthesis value for all studies reported in Table 2.

Table 3. 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: $\gamma_0 = 0$)	0.2597	0.2597	0.2597	0.2512	0.5353
	(0.197)	(0.218)	(0.480)	(0.562)	(0.170)
$1/SE$ (PET: H_0: $\gamma_1 = 0$)	0.0308 ***	0.0308 ***	0.0308	0.0312	0.0187 ***
	(0.010)	(0.011)	(0.023)	(0.025)	(0.007)
K	3561	3561	3561	3561	3561
R^2	0.0081	0.0081	0.0081	0.0081	0.0070

(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	2.6563 **	2.6563 *	2.6563	3.9819	-19.8926 ***
	(1.356)	(1.463)	(3.653)	(2.938)	(3.670)
$1/SE$ (H_0: $\gamma_1 = 0$)	0.0360 ***	0.0360 ***	0.0360 ***	0.0578 ***	0.1162 ***
	(0.036)	(0.006)	(0.013)	(0.008)	(0.012)
K	3561	3561	3561	3561	3561
R^2	0.0757	0.0757	0.0757	-	-

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: $\chi^2 = 11.21$, $p = 0.0008$

Table 4. 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	0.0409 ***	0.0150 *	0.0308 ***	0.0359 ***
	(0.008)	(0.008)	(0.006)	(0.001)
K	356	3561	3561	3561

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)

Table 5. 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	3561	Not rejected	**Rejected**	**Rejected (0.0360/0.1162)**
By financial variable type				
Financial depth	594	Not rejected	**Rejected**	**Rejected (0.0689/0.1743)**
Private credit to GDP	1203	Not rejected	Not rejected	**Rejected (0.0218/0.1243)**
Bank credit to GDP	389	Not rejected	Not rejected	Not rejected
Private credit to domestic credit	125	**Rejected**	Not rejected	Not rejected
Market capitalization	317	**Rejected**	Not rejected	**Rejected (0.0517/0.1076)**
Stock market volume	229	Not rejected	**Rejected**	**Rejected (0.1133/0.2370)**
Stock market turnover ratio	191	**Rejected**	Not rejected	**Rejected (0.0849/0.2376)**
Comprehensive financial development inde	265	**Rejected**	Not rejected	Not rejected
Other financial development indices	248	Not rejected	Not rejected	Not rejected
By publication period				
Publications from 2000 to 2004	421	**Rejected**	**Rejected**	**Rejected (0.0149/0.2273)**
Publications from 2005 to 2009	624	**Rejected**	Not rejected	**Rejected (0.0398/0.1137)**
Publications from 2010 to 2014	780	Not rejected	**Rejected**	**Rejected (0.0986/0.1107)**
Publications from 2015 to 2019	998	Not rejected	Not rejected	**Rejected (0.0209/0.0263)**
Publications from 2020 and later	738	Not rejected	**Rejected**	**Rejected (0.0309/0.1873)**

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 maximum estimates, respectively.

Table 6. 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 (Financial depth)					
Private credit to GDP	-0.0026	-0.0029	0.0107	-0.0039	-0.0037
	(0.020)	(0.016)	(0.022)	(0.014)	(0.014)
Bank credit to GDP	-0.0058	0.0004	-0.0700 *	-0.0359 *	-0.0357
	(0.027)	(0.023)	(0.041)	(0.022)	(0.022)
Private credit to domestic credit	0.0064	-0.0078	-0.0242	0.0020	0.0020
	(0.026)	(0.026)	(0.042)	(0.024)	(0.024)
Market capitalization	0.0476	0.0436	0.0634 **	0.0349	0.0350
	(0.030)	(0.030)	(0.032)	(0.030)	(0.030)
Stock market volume	0.0997 ***	0.0958 ***	0.0765 **	0.1120 ***	0.1124 ***
	(0.030)	(0.030)	(0.032)	(0.027)	(0.027)
Stock market turnover ratio	0.0990 ***	0.0876 ***	0.0726 **	0.0785 **	0.0786 **
	(0.028)	(0.028)	(0.030)	(0.035)	(0.036)
Comprehensive financial development index	0.0085	-0.0071	0.0493	0.0409 **	0.0416 **
	(0.026)	(0.022)	(0.041)	(0.019)	(0.020)
Other financial development index	-0.0285	-0.0291	0.0060	-0.0193	-0.0193
	(0.031)	(0.034)	(0.033)	(0.022)	(0.022)
Publication period (Publications from 2000 to 2004)					
Publications from 2005 to 2009	0.0064	0.0062	-0.0164	-0.0218	-0.0220
	(0.021)	(0.018)	(0.034)	(0.026)	(0.027)
Publications from 2010 to 2014	0.0102	0.0125	-0.0132	-0.0111	-0.0107
	(0.026)	(0.027)	(0.034)	(0.031)	(0.031)
Publications from 2015 to 2019	-0.0179	-0.0138	-0.0716 **	-0.0678 ***	-0.0685 ***
	(0.022)	(0.020)	(0.034)	(0.025)	(0.026)
Publications from 2020 and later	0.0184	0.0288	-0.0582 *	-0.0470 *	-0.0499 *
	(0.021)	(0.020)	(0.034)	(0.028)	(0.029)
Selected moderators					
Proportion of emerging markets	-0.0931 *	-0.0968 **	-0.0863	-0.0355	-0.0316
	(0.051)	(0.047)	(0.079)	(0.070)	(0.073)
Decade	0.0480 ***	0.0449 ***	0.0147	0.0396 **	0.0425 **
	(0.016)	(0.017)	(0.021)	(0.018)	(0.019)
OLS	0.0377 **	0.0363 *	0.0613 *	0.0207 ***	0.0200 **
	(0.018)	(0.019)	(0.032)	(0.008)	(0.008)
Real GDP	0.0346	0.0243	0.0844 **	0.0387 *	0.0357 *
	(0.034)	(0.034)	(0.038)	(0.022)	(0.021)
Growth rate	-0.0503 ***	-0.0444 ***	-0.0359	-0.0467 **	-0.0481 ***
	(0.017)	(0.016)	(0.024)	(0.019)	(0.019)
Macroeconomic stability	-0.0293	-0.0445 **	-0.0707 **	-0.0186 **	-0.0181 **
	(0.021)	(0.020)	(0.028)	(0.009)	(0.008)
Political stability	0.0374	0.0382	0.0026	0.0229	0.0229
	(0.027)	(0.025)	(0.034)	(0.014)	(0.014)
Trade openness	-0.0095	0.0001	0.0247	-0.0028	-0.0029
	(0.019)	(0.018)	(0.030)	(0.010)	(0.009)
Investment	-0.0281 *	-0.0285	-0.0424 **	-0.0138	-0.0123
	(0.017)	(0.017)	(0.021)	(0.013)	(0.013)
Financial crisis	-0.0427 **	-0.0549 ***	-0.0260	-0.0054	-0.0041
	(0.018)	(0.018)	(0.026)	(0.015)	(0.015)
SE	-0.46856	-0.60368	-0.94633 **	-0.11349	-0.09500
	(0.3677)	(0.4310)	(0.4491)	(0.2521)	(0.2541)
Intercept	0.10174 ***	0.10633 ***	0.18791 ***	0.12456 ***	0.12396 ***
	(0.0298)	(0.0295)	(0.0341)	(0.0262)	(0.0271)
K	3561	3561	3561	3561	3561
R^2	0.141	0.156	0.189	-	0.111

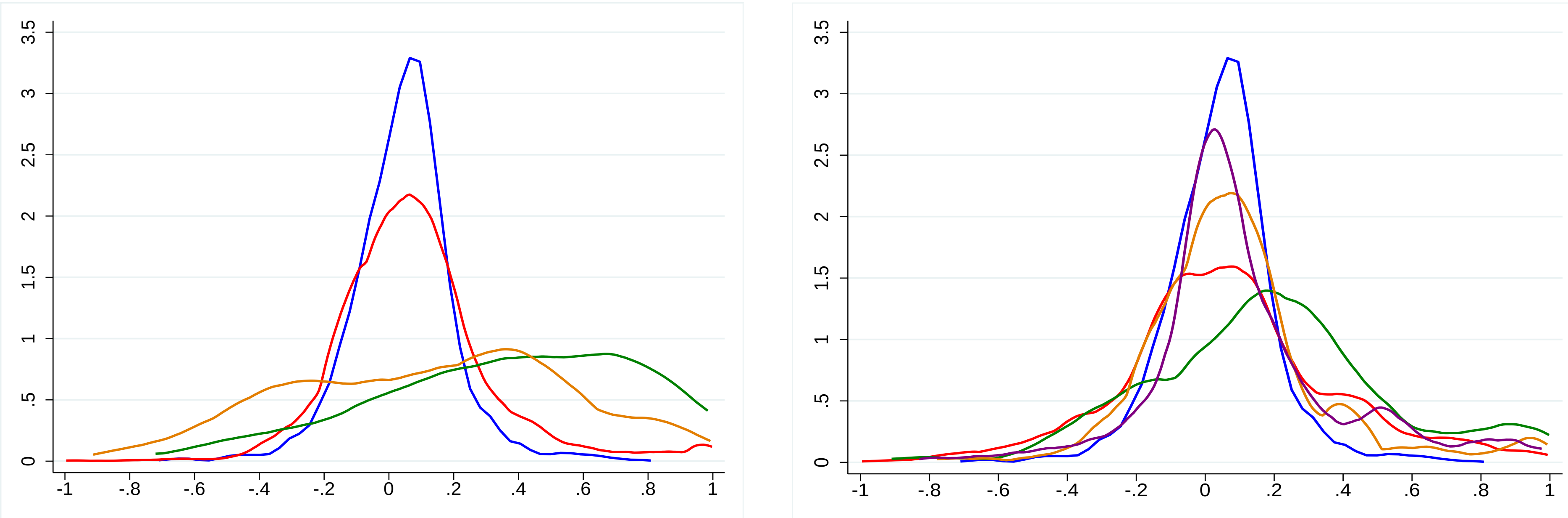
Notes: Figures in parentheses beneath the regression coefficients are robust standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. See Appendix Table A2 for definitions and descriptive statistics of the meta-independent variables. Selected moderators denote meta-independent variables with a PIP of 0.50 or more in the Bayesian model averaging (BMA) estimation and with a t value of 1.00 or more in the weighted-average least squares (WALS) estimation as reported in Appendix Table A3. Estimation results with the publication year instead of the dummy variables of the publication period for robustness check are reported in Appendix Tables A4 and A5.

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

[b] Hausman test: $\chi^2 = 26.47$, $p = 0.1176$

(a) Worldwide studies versus regional/single-country studies

(b) Worldwide studies versus region-specific studies



Appendix Figure A1. Distribution of partial correlation coefficients of reported estimates in the finance-growth literature by study type

Note: The vertical axis is the kernel density. The horizontal axis is the partial correlation coefficient of reported estimates.

Appendix Table A1. List of 177 selected studies of financial development and economic growth for meta-analysis

No.	Author(s) (Publication year)	Number of target countries	Estimation period[a]		Financial variable type									Number of collected estimates
			From	To	Financial depth	Private credit to GDP	Bank credit to GDP	Private credit to domestic credit	Market capitalization	Stock market volume	Stock market turnover ratio	Comprehensive financial development index	Other financial development index	
1	Beck et al. (2000)	77	1960	1995	✓	✓	✓							8
2	Benhabib and Spiegel (2000)	70	1965	1985	✓	✓		✓						20
3	Levine et al. (2000)	74	1961	1995	✓	✓		✓						18
4	Rousseau and Wachtel (2000)	47	1980	1995	✓				✓	✓				19
5	Bekaert et al. (2001)	30	1980	1997		✓			✓	✓				105
6	Reisen and Soto (2001)	44	1986	1997			✓	✓						8
7	Edison et al. (2002)	57	1980	2000					✓					2
8	Jalilian and Kirpatrick (2002)	42	1991	2000			✓						✓	4
9	Rousseau and Wachtel (2002)	84	1960	1995	✓	✓								9
10	Fuchs-Schündeln and Funke (2003)	72	1975	2000						✓				15
11	Graff (2003)	93	1970	1990									✓	4
12	Guloglu (2003)	43	1970	1994	✓	✓		✓					✓	16
13	Hermes and Lensink (2003)	67	1970	1995		✓								6
14	Rousseau (2003)	17	1850	1997	✓									4
15	Wachtel (2003)	80	1960	1995	✓									3
16	Andres et al. (2004)	21	1961	1993	✓	✓		✓	✓				✓	60
17	Beck and Levine (2004)	40	1976	1998			✓				✓			54
18	Berger et al. (2004)	28	1993	2000			✓		✓					20
19	Garretsen et al. (2004)	43	1976	1993		✓								1
20	Rioja and Valev (2004a)	74	1961	1995	✓	✓		✓						19
21	Rioja and Valev (2004b)	74	1961	1995	✓	✓		✓		✓	✓			26
22	Bekaert et al. (2005)	95	1980	1997				✓	✓		✓			8
23	Fink et al. (2005)	11	1990	2001			✓		✓	✓		✓		19
24	Graff (2005)	93	1960	1990								✓		4
25	Hahn (2005)	21	1971	2000		✓				✓	✓			4
26	Jalilian and Kirkpatrick (2005)	42	1990	1999		✓								2
27	Bandyopadhyay (2006)	17	1964	1993	✓	✓	✓	✓						12
28	Demetriades and Law (2006)	24	1978	2000	✓	✓	✓							54
29	Dreher (2006)	76	1970	2000	✓				✓					2
30	Graff and Karmann (2006)	90	1950	2000	✓									10
31	Loayza and Ranciere (2006)	75	1960	2000		✓								24
32	Padoan and Mariani (2006)	42	1960	2001	✓		✓		✓	✓	✓		✓	18

33	Shen and Lee (2006)	48	1976	2001	✓	✓			✓	✓	✓			97
34	Tang (2006)	14	1981	2000	✓		✓	✓	✓	✓	✓			36
35	Apergis et al. (2007)	65	1975	2000	✓	✓	✓							9
36	Kemal et al. (2007)	19	1974	2001	✓	✓			✓	✓			✓	12
37	Ketteni et al. (2007)	74	1961	1995		✓								3
38	Liang and Reichert (2007)	25	1980	2003					✓		✓			8
39	Ahlin and Pang (2008)	71	1960	2000		✓								14
40	Ahmed et al. (2008)	3	1971	2000	✓	✓								12
41	Cuadro-Sáez and García-Herrero (2008)	143	1991	2001		✓								24
42	Dawson (2008)	44	1974	2001	✓									6
43	Honig (2008)	122	1970	2005	✓	✓	✓							18
44	Aghion et al. (2009)	83	1960	2000		✓								29
45	Ahmad (2009)	35	1970	2003		✓		✓						2
46	Akimov et al. (2009)	26	1989	2004	✓	✓		✓						16
47	Cooray (2009)	35	1992	2003	✓	✓	✓					✓	✓	20
48	Fink et al. (2009)	27	1996	2000		✓	✓		✓	✓		✓		36
49	Giedeman and Compton (2009)	75	1960	1995	✓	✓		✓						12
50	Giuliano and Ruiz-Arranz (2009)	73	1975	2000	✓	✓	✓							6
51	Lee and Chang (2009)	37	1970	2002	✓									1
52	Mukerji (2009)	60	1960	1999		✓								3
53	Rousseau and Yilmazkuday (2009)	84	1960	2004	✓									27
54	Saci et al. (2009)	30	1988	2001	✓			✓		✓			✓	24
55	Yay and Oktayer (2009)	21	1975	2006			✓				✓			52
56	Bangake and Eggoh (2010)	25	1960	2006	✓	✓	✓		✓	✓	✓			12
57	Choong et al. (2010)	32	1988	2002					✓	✓				23
58	Dawson (2010)	29	1960	2002	✓									3
59	Dufrenot et al. (2010)	26	1980	2006	✓	✓		✓						12
60	Hwang et al. (2010)	20	1991	2004								✓		1
61	Lartey (2010)	74	1961	1995				✓						4
62	Leitão (2010)	31	1980	2006			✓	✓						6
63	Andini (2011)	71	1960	1995	✓	✓		✓						72
64	Azman-Saini and Smith (2011)	51	1981	2005		✓				✓			✓	4
65	Bangake and Eggoh (2011)	71	1960	2004	✓	✓	✓							12
66	Compton and Giedeman (2011)	88	1970	2004	✓	✓			✓		✓			40
67	Hassan et al. (2011)	50	1980	2005	✓	✓	✓	✓						8
68	Hassan et al. (2011)	20	1980	2007	✓	✓	✓							12
69	Kose et al. (2011)	84	1975	2004	✓	✓								14
70	Lartey and Farka (2011)	134	1970	2003				✓						5
71	Rousseau and Wachtel (2011)	84	1960	2004	✓	✓								30
72	Yilmazkuday (2011)	84	1965	2004	✓									8
73	Andersen et al. (2012)	88	1975	2009	✓	✓							✓	48
74	Bettin and Zazzaro (2012)	66	1970	2005	✓	✓	✓							24
75	Bordo and Rousseau (2012)	17	1880	2004	✓									20
76	Gantman and Dabos (2012)	98	1961	2005		✓								15

77	Kim et al. (2012)	63	1960	2007			✓			✓				40
78	Masoud and Hardaker (2012)	42	1995	2006			✓		✓	✓	✓			28
79	Tayebi (2012)	43	1996	2005	✓									1
80	Aizenman et al. (2013)	98	1990	2010		✓								10
81	Akisik (2013)	51	1997	2009			✓		✓					12
82	Gantman and Dabos (2013)	111	1961	2009		✓								4
83	Mercan and Gocer (2013)	5	1989	2010	✓									1
84	Narayan and Narayan (2013)	65	1995	2011			✓		✓	✓				6
85	Asghar and Hussain (2014)	15	1978	2012								✓		1
86	Ayouni et al. (2014)	54	1985	2008	✓	✓		✓	✓	✓			✓	12
87	Beck et al. (2014)	77	1980	2007									✓	36
88	Cheng et al. (2014)	30	1976	2005	✓				✓	✓				54
89	Gambocorta et al. (2014)	41	1991	2011			✓				✓			8
90	Kunieda et al. (2014)	109	1985	2009	✓	✓								48
91	Law and Singh (2014)	87	1980	2010	✓	✓		✓						21
92	Mhadhbi (2014)	84	1973	2012	✓		✓	✓						27
93	Ngare et al. (2014)	36	1980	2010	✓		✓		✓	✓	✓			48
94	Owen and Temesvary (2014)	75	1995	2010			✓							2
95	Rajabi and Muhammad (2014)	10	1990	2009			✓				✓			30
96	Rodriguez (2014)	39	1960	2000		✓								18
97	Arcand et al. (2015)	88	1960	2010		✓								13
98	Beitenlechner et al. (2015)	74	1960	2011	✓	✓								12
99	Brüeckner and Carneiro (2015)	175	1980	2010		✓						✓		10
100	Ductor and Grechyna (2015)	101	1970	2010	✓	✓	✓							11
101	Samargandi et al. (2015)	52	1980	2008								✓		36
102	Capelle-Blancard and Lebonne (2016)	24	1970	2008		✓							✓	8
103	Chowdhury (2016)	33	1979	2011	✓	✓	✓							8
104	Doumbia (2016)	22	1975	2009	✓	✓	✓							6
105	Ishtiaq et al. (2016)	113	1974	2013		✓			✓					12
106	Seven and Yetkiner (2016)	146	1991	2011		✓					✓	✓		24
107	Zhang et al. (2016)	49	1998	2011			✓				✓			46
108	Hamdi et al. (2017)	143	2006	2013		✓								12
109	Prochniak and Wasiak (2017)	34	1993	2013			✓		✓		✓			12
110	Rodriguez (2017)	123	1970	2010		✓								32
111	Williams (2017)	78	1982	2011	✓	✓	✓							27
112	Zou and Wang (2017)	156	1980	2011	✓	✓								10
113	Alexiou et al. (2018)	34	1998	2014			✓							20
114	Das et al. (2018)	43	2000	2014		✓								12
115	Hino (2018)	60	1980	2014	✓	✓	✓		✓	✓			✓	24
116	Lajili and Gilles (2018)	108	1984	2008		✓								12
117	Lee and Kim (2018)	87	1966	2010		✓								2
118	Lee and Lin (2018)	50	1984	2014					✓					2
119	Oro and Alagidede (2018)	30	2006	2015		✓								6
120	Rapp and Udoieva (2018)	32	1994	2013		✓		✓	✓	✓	✓		✓	30

121	Shen et al. (2018)	48	1988	2014	✓		✓		✓	✓	✓			108
122	Benczur et al. (2019)	21	1990	2014		✓	✓		✓					130
123	Bernier and Plouffe (2019)	23	1996	2014		✓				✓				10
124	Botev et al. (2019)	128	1995	2012		✓	✓		✓					6
125	Braun et al. (2019)	150	1978	2012		✓								28
126	Gaies et al. (2019)	66	1972	2011	✓									54
127	Guru and Yadav (2019)	4	1993	2014	✓	✓				✓	✓		✓	11
128	Hamdaoui and Maktouf (2019)	49	1980	2010	✓									7
129	Inekwe et al. (2019)	45	1987	2014					✓					2
130	Jalili et al. (2019)	31	1980	2015		✓								2
131	Jarrett et al. (2019)	30	1980	2016								✓		3
132	Khalid and Marasco (2019)	134	1989	2017		✓								56
133	Khan et al. (2019)	193	1990	2017		✓	✓							10
134	Mollaahmetoglu and Akcali (2019)	15	2003	2016		✓	✓							2
135	Neanidis (2019)	79	1973	2013		✓								18
136	Nguyen et al. (2019)	62	1980	2011			✓			✓			✓	14
137	Slesman et al. (2019)	77	1970	2010	✓	✓	✓	✓	✓		✓	✓		84
138	Sobiech (2019)	61	1970	2010		✓						✓	✓	6
139	Williams (2019)	81	1970	2014	✓	✓	✓							44
140	Yang (2019)	47	1970	2016	✓	✓			✓	✓				8
141	Younsi and Nafla (2019)	22	1993	2015	✓				✓					8
142	Bangake and Eggoh (2020)	60	1985	2015	✓	✓	✓						✓	16
143	Belazreg and Mtar (2020)	27	2001	2016		✓								1
144	Bucci et al. (2020)	44	1995	2011		✓								10
145	Cao and Kang (2020)	33	2000	2015	✓	✓							✓	12
146	Chu (2020)	99	1971	2015								✓		48
147	De la Cruz (2020)	99	1961	2010		✓								10
148	Demetriades and Rewilak (2020)	102	1998	2017		✓								8
149	Gaies et al. (2020)	72	1972	2011		✓								60
150	Khurshid et al. (2020)	58	1988	2014	✓	✓								6
151	Polemis et al. (2020)	40	1970	2014	✓	✓								4
152	Ramirez-Rondan et al. (2020)	80	1970	2015		✓								33
153	Sugiyanto and Yolanda (2020)	73	1991	2015	✓	✓			✓				✓	16
154	Cheng et al. (2021)	72	2000	2015								✓		25
155	Ghosh et al. (2021)	57	2008	2017		✓	✓		✓				✓	30
156	Khan et al. (2021)	10	1990	2016		✓								4
157	Mtar and Belazreg (2021)	27	2001	2016		✓								1
158	Raghutla and Chittedi (2021)	5	2000	2016			✓							1
159	Raheem et al. (2021)	70	1996	2017	✓	✓	✓						✓	16
160	Song et al. (2021)	120	2000	2019								✓		7
161	Sturn and Epstein (2021)	120	1965	2009		✓								32
162	Swamy and Dharani (2021)	7	1983	2013		✓	✓		✓					32
163	Uzar (2021)	7	2001	2017		✓								2
164	Van et al. (2021)	124	2004	2015		✓						✓		16

165	Wahidin et al. (2021)	44	1990	2017									✓	15
166	Ye et al. (2021)	81	1980	2015	✓				✓	✓				42
167	Ahmed et al. (2022)	138	1980	2020			✓							2
168	Boikos et al. (2022)	81	1973	2005		✓								66
169	Cavallaro and Villani (2022)	111	1995	2017		✓								4
170	Cheng and Hou (2022)	48	1971	2015	✓		✓							6
171	Hsu and Pereira (2022)	76	1980	2015								✓		27
172	Karadam and Ocal (2022)	82	1970	2010	✓	✓								4
173	Liu et al. (2022)	113	1990	2013									✓	80
174	Nguyen et al. (2022)	22	1980	2020	✓		✓		✓	✓	✓	✓	✓	14
175	Purewai and Haini (2022)	24	1980	2017								✓	✓	16
176	Selvasundaram et al. (2022)	5	1980	2019	✓	✓	✓							28
177	Kassi et al. (2023)	123	1990	2017	✓	✓						✓	✓	44

Notes: The supplement provides detailed bibliographic information of the selected research works. The estimation period may differ depending on the target countries.

Appendix Table A2. Names, definitions, and descriptive statistics of meta-independent variables

Variable name	Definition	Descriptive statistics		
		Mean	Median	S.D.
Financial depth	1 = if financial variable is financial depth, 0 = otherwise	0.167	0	0.373
Private credit to GDP	1 = if financial variable is private credit to GDP, 0 = otherwise	0.338	0	0.473
Bank credit to GDP	1 = if financial variable is bank credit to GDP, 0 = otherwise	0.109	0	0.312
Private credit to domestic credit	1 = if financial variable is private credit to domestic credit, 0 = otherwise	0.035	0	0.184
Market capitalization	1 = if financial variable is market capitalization, 0 = otherwise	0.089	0	0.285
Stock market volume	1 = if financial variable is stock market volume, 0 = otherwise	0.064	0	0.245
Stock market turnover ratio	1 = if financial variable is stock market turnover ratio, 0 = otherwise	0.054	0	0.225
Comprehensive financial development index	1 = if financial variable is comprehensive financial development index, 0 = otherwise	0.074	0	0.262
Other financial development indices	1 = if financial variable other than the above eight variables is used, 0 = otherwise	0.070	0	0.255
Publications from 2000 to 2004	1 = if publication year is during the period from 2000 to 2004, 0 = otherwise	0.118	0	0.323
Publications from 2005 to 2009	1 = if publication year is during the period from 2005 to 2009, 0 = otherwise	0.175	0	0.380
Publications from 2010 to 2014	1 = if publication year is during the period from 2010 to 2014, 0 = otherwise	0.219	0	0.414
Publications from 2015 to 2019	1 = if publication year is during the period from 2015 to 2019, 0 = otherwise	0.280	0	0.449
Publications from 2020 and later	1 = if publication year is in 2020 or later, 0 = otherwise	0.207	0	0.405
Publication year	Years of publication	2013.675	2014	6.369
Number of target countries	Total number of target countries	54.410	48	34.607
Proportion of developed economies	Proportion of developed economies in the total number of target countries	0.350	0.283	0.338
Proportion of developing economies	Proportion of developing economies in the total number of target countries	0.578	0.650	0.358
Proportion of emerging markets	Proportion of emerging markets in the total number of target countries	0.072	0	0.150
Average year of estimation	Average year of estimation period	1992.665	1992.5	10.100
Length of estimation	Years of estimation period	29.261	29	11.257
Decade	1 = if decade or several-year interval data is used for estimation, 0 = otherwise	0.398	0	0.490
Yearly	1 = if yearly data is used for estimation, 0 = otherwise	0.602	1	0.490
Non-OLS	1 = if an estimator other than OLS is used for estimation, 0 = otherwise	0.787	1	0.409
OLS	1 = if OLS estimator is used for estimation, 0 = otherwise	0.213	0	0.409
Control of endogeneity	1 = if endogeneity between growth and financial variables is controlled for, 0 = otherwise	0.086	0	0.281
GDP car capita	1 = if the unit of the growth variable is real GDP per capita, 0 = otherwise	0.911	1	0.284
Real GDP	1 = if the unit of the growth variable is real GDP, 0 = otherwise	0.083	0	0.276
Nominal GDP	1 = if the unit of the growth variable is nominal GDP, 0 = otherwise	0.006	0	0.075
Log transformation	1 = if the growth variable is log transformed, 0 = otherwise	0.260	0	0.439
Growth rate	1 = if the growth variable is the growth rate, 0 = otherwise	0.671	1	0.470
Lagged	1 = if the financial variable is lagged, 0 = otherwise	0.103	0	0.304
Macroeconomic stability	1 = if estimation simultaneously controls for macroeconomic stability, 0 = otherwise	0.569	1	0.495
Political stability	1 = if estimation simultaneously controls for political stability, 0 = otherwise	0.052	0	0.222
Trade openness	1 = if estimation simultaneously controls for trade openness, 0 = otherwise	0.600	1	0.490
Initial condition	1 = if estimation simultaneously controls for the initial condition, 0 = otherwise	0.404	0	0.491
Human capital	1 = if estimation simultaneously controls for human capital, 0 = otherwise	0.140	0	0.347
Investment	1 = if estimation simultaneously controls for investment including capital formation, 0 = otherwise	0.406	0	0.491
Education	1 = if estimation simultaneously controls for education level, 0 = otherwise	0.505	1	0.500
Institutional quality	1 = if estimation simultaneously controls for institutional quality, 0 = otherwise	0.131	0	0.337
Financial crisis	1 = if estimation simultaneously controls for financial crisis, 0 = otherwise	0.102	0	0.303
SE	Standard error of partial correlation coefficient	0.053	0.047	0.026

Note: The variables of financial depth, publications from 2000 to 2004, proportion of developed economies, yearly, non-OLS, and GDP per capita are default categories.

Appendix Table A3. Meta-regression analysis of model uncertainty and multicollinearity for the selection of moderators

Estimator	Bayesian model averaging				Weighted-average least squares		
	[1]				[2]		
Meta-independent variables/Model	Coef.	S.E.	*t*	PIP	Coef.	S.E.	*t*
Focus regressors							
Private credit to GDP	0.0013	0.0079	0.17	1.00	0.0001	0.0078	0.02
Bank credit to GDP	-0.0044	0.0100	-0.44	1.00	-0.0049	0.0099	-0.49
Private credit to domestic credit	0.0257	0.0146	1.76	1.00	0.0260	0.0145	1.80
Market capitalization	0.0595	0.0112	5.31	1.00	0.0628	0.0108	5.80
Stock market volume	0.0991	0.0119	8.30	1.00	0.0990	0.0118	8.41
Stock market turnover ratio	0.1093	0.0130	8.42	1.00	0.1079	0.0127	8.52
Comprehensive financial development index	0.0228	0.0119	1.92	1.00	0.0227	0.0116	1.95
Other financial development indices	-0.0223	0.0128	-1.75	1.00	-0.0167	0.0124	-1.35
Publications from 2005 to 2009	0.0015	0.0100	0.15	1.00	-0.0038	0.0100	-0.38
Publications from 2010 to 2014	-0.0044	0.0103	-0.43	1.00	-0.0122	0.0104	-1.17
Publications from 2015 to 2019	-0.0266	0.0105	-2.54	1.00	-0.0356	0.0121	-2.95
Publications from 2020 and later	-0.0005	0.0123	-0.04	1.00	-0.0094	0.0136	-0.69
SE	-0.2626	0.1223	-2.15	1.00	-0.2514	0.1242	-2.02
Auxiliary regressors							
Number of target countries	0.0000	0.0000	-0.05	0.02	-0.0001	0.0001	-1.23
Proportion of developing economies	0.0008	0.0036	0.21	0.06	0.0112	0.0078	1.45
Proportion of emerging markets	-0.0949	0.0210	-4.52	1.00	-0.0669	0.0202	-3.31
Average year of estimation	0.0000	0.0002	0.10	0.04	0.0002	0.0005	0.50
Length of estimation	0.0003	0.0004	0.71	0.39	0.0008	0.0004	2.23
Decade	0.0478	0.0072	6.60	1.00	0.0381	0.0064	5.97
OLS	0.0320	0.0068	4.74	1.00	0.0254	0.0064	3.96
Control of endogeneity	0.0001	0.0014	0.04	0.02	-0.0013	0.0094	-0.14
Real GDP	0.0342	0.0128	2.67	0.94	0.0283	0.0094	3.02
Nominal GDP	-0.0442	0.0532	-0.83	0.46	-0.0648	0.0336	-1.93
Log transformation	-0.0030	0.0093	-0.33	0.12	-0.0099	0.0128	-0.77
Growth rate	-0.0552	0.0103	-5.36	1.00	-0.0546	0.0125	-4.35
Lagged	-0.0030	0.0082	-0.37	0.15	-0.0203	0.0087	-2.32
Macroeconomic stability	-0.0102	0.0113	-0.90	0.50	-0.0175	0.0056	-3.16
Political stability	0.0226	0.0193	1.17	0.64	0.0370	0.0113	3.28
Trade openness	-0.0124	0.0112	-1.11	0.60	-0.0100	0.0057	-1.76
Initial condition	0.0024	0.0057	0.42	0.18	0.0137	0.0056	2.45
Human capital	-0.0002	0.0019	-0.10	0.02	-0.0054	0.0084	-0.65
Investment	-0.0242	0.0061	-3.97	0.99	-0.0183	0.0055	-3.30
Education	0.0000	0.0007	-0.01	0.02	-0.0026	0.0052	-0.49
Institutional quality	-0.0003	0.0024	-0.14	0.03	-0.0096	0.0076	-1.26
Financial crisis	-0.0324	0.0122	-2.67	0.94	-0.0229	0.0091	-2.51
K	3561				3561		

Notes: See Appendix Table A2 for the definitions and descriptive statistics of meta-independent variables. The estimate of the intercept is omitted. S.E. and PIP denote standard errors and posterior inclusion probability, respectively. In Model [1], the variables from private credit to GDP to publication in 2020 or later 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 A4. Meta-regression analysis of model uncertainty and multicollinearity for the selection of moderators: Estimation with publication year for robustness check

Estimator	Bayesian model averaging				Weighted-average least squares		
Meta-independent variables/Model	[1]				[2]		
	Coef.	S.E.	*t*	PIP	Coef.	S.E.	*t*
Focus regressors							
Private credit to GDP	0.0013	0.0079	0.16	1.00	-0.0007	0.0078	-0.09
Bank credit to GDP	-0.0054	0.0101	-0.54	1.00	-0.0081	0.0099	-0.82
Private credit to domestic credit	0.0246	0.0146	1.68	1.00	0.0242	0.0145	1.67
Market capitalization	0.0590	0.0112	5.27	1.00	0.0602	0.0108	5.60
Stock market volume	0.0960	0.0120	8.00	1.00	0.0953	0.0118	8.09
Stock market turnover ratio	0.1073	0.0130	8.22	1.00	0.1035	0.0127	8.17
Comprehensive financial development index	0.0285	0.0117	2.43	1.00	0.0279	0.0113	2.47
Other financial development indices	-0.0112	0.0126	-0.89	1.00	-0.0105	0.0123	-0.85
Publication year	-0.0021	0.0008	-2.59	1.00	-0.0025	0.0007	-3.68
SE	-0.1864	0.1216	-1.53	1.00	-0.1869	0.1228	-1.52
Auxiliary regressors							
Number of target countries	0.0000	0.0000	-0.01	0.02	-0.0001	0.0001	-0.95
Proportion of developing economies	0.0007	0.0034	0.20	0.06	0.0088	0.0078	1.13
Proportion of emerging markets	-0.0843	0.0233	-3.62	0.99	-0.0625	0.0198	-3.15
Average year of estimation	0.0003	0.0006	0.46	0.21	0.0007	0.0005	1.45
Length of estimation	0.0007	0.0006	1.27	0.73	0.0012	0.0004	3.04
Decade	0.0435	0.0074	5.88	1.00	0.0352	0.0063	5.63
OLS	0.0326	0.0067	4.90	1.00	0.0255	0.0063	4.03
Control of endogeneity	0.0000	0.0013	0.00	0.02	-0.0036	0.0093	-0.39
Real GDP	0.0352	0.0123	2.87	0.95	0.0263	0.0093	2.83
Nominal GDP	-0.0555	0.0562	-0.99	0.55	-0.0653	0.0327	-2.00
Log transformation	-0.0037	0.0105	-0.35	0.14	-0.0086	0.0127	-0.68
Growth rate	-0.0581	0.0111	-5.22	1.00	-0.0579	0.0125	-4.62
Lagged	-0.0063	0.0116	-0.55	0.27	-0.0219	0.0086	-2.55
Macroeconomic stability	-0.0091	0.0106	-0.86	0.47	-0.0167	0.0056	-2.96
Political stability	0.0181	0.0188	0.96	0.54	0.0338	0.0108	3.15
Trade openness	-0.0093	0.0102	-0.92	0.51	-0.0079	0.0059	-1.35
Initial condition	0.0022	0.0055	0.40	0.16	0.0129	0.0057	2.27
Human capital	-0.0001	0.0016	-0.07	0.02	0.0021	0.0087	0.24
Investment	-0.0229	0.0062	-3.71	0.99	-0.0205	0.0055	-3.75
Education	0.0000	0.0007	0.00	0.02	-0.0008	0.0055	-0.14
Institutional quality	-0.0003	0.0024	-0.14	0.03	-0.0088	0.0076	-1.16
Financial crisis	-0.0109	0.0136	-0.80	0.44	-0.0160	0.0092	-1.75
K	3561				3561		

Notes: See Appendix Table A2 for the definitions and descriptive statistics of meta-independent variables. The estimate of the intercept is omitted. S.E. and PIP denote standard errors and posterior inclusion probability, respectively. In Model [1], the variables from private credit to GDP to publication in 2020 or later 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 A5. Meta-regression analysis with selected moderators: Estimation with publication year for robustness check

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 (Financial depth)					
Private credit to GDP	-0.0065	-0.0066	0.0092	-0.0040	-0.0038
	(0.020)	(0.017)	(0.023)	(0.013)	(0.014)
Bank credit to GDP	-0.0040	0.0083	-0.0667	-0.0352	-0.0351
	(0.028)	(0.026)	(0.043)	(0.022)	(0.022)
Private credit to domestic credit	0.0042	-0.0103	-0.0204	0.0024	0.0023
	(0.026)	(0.024)	(0.041)	(0.024)	(0.024)
Market capitalization	0.0450	0.0418	0.0456	0.0352	0.0353
	(0.031)	(0.031)	(0.032)	(0.030)	(0.030)
Stock market volume	0.0919 ***	0.0867 ***	0.0620 **	0.1120 ***	0.1124 ***
	(0.029)	(0.028)	(0.030)	(0.027)	(0.027)
Stock market turnover ratio	0.0945 ***	0.0847 ***	0.0657 **	0.0789 **	0.0790 **
	(0.028)	(0.027)	(0.031)	(0.035)	(0.036)
Comprehensive financial development index	0.0116	-0.0103	0.0570	0.0421 **	0.0425 **
	(0.027)	(0.024)	(0.044)	(0.019)	(0.020)
Other financial development indices	-0.0192	-0.0223	-0.0005	-0.0187	-0.0190
	(0.031)	(0.030)	(0.033)	(0.022)	(0.022)
Publication period					
Publication year	-0.0018	-0.0015	-0.0051 ***	-0.0042 ***	-0.0043 ***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Selected moderators					
Proportion of emerging markets	-0.0723	-0.0775	-0.0835	-0.0287	-0.0258
	(0.053)	(0.050)	(0.082)	(0.071)	(0.074)
Length of estimation	0.0011	0.0014	0.0008	0.0009 *	0.0010
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Decade	0.0382 **	0.0326 *	0.0036	0.0313 *	0.0349 *
	(0.018)	(0.018)	(0.023)	(0.019)	(0.019)
OLS	0.0353 *	0.0306	0.0628 *	0.0203 ***	0.0196 **
	(0.019)	(0.021)	(0.033)	(0.008)	(0.008)
Real GDP	0.0467	0.0446	0.1022 **	0.0408 *	0.0371 *
	(0.031)	(0.029)	(0.040)	(0.023)	(0.022)
Nominal GDP	-0.0899 ***	-0.0695 ***	-0.1171 ***	-0.1347 ***	-0.1394 ***
	(0.025)	(0.025)	(0.029)	(0.025)	(0.025)
Growth rate	-0.0562 ***	-0.0526 ***	-0.0515 **	-0.0539 ***	-0.0553 ***
	(0.016)	(0.016)	(0.024)	(0.019)	(0.019)
Political stability	0.0411 *	0.0447 **	0.0061	0.0219	0.0220
	(0.024)	(0.021)	(0.035)	(0.014)	(0.014)
Trade openness	-0.0194	-0.0151	-0.0079	-0.0125	-0.0123
	(0.015)	(0.016)	(0.022)	(0.009)	(0.009)
Investment	-0.0243	-0.0215	-0.0307	-0.0161	-0.0148
	(0.015)	(0.016)	(0.022)	(0.013)	(0.013)
SE	-0.17124	-0.22647	-0.65668	-0.04682	-0.03041
	(0.3573)	(0.3980)	(0.4513)	(0.2499)	(0.2524)
Intercept	3.72308	2.99488	10.45378 ***	8.47657 ***	8.64636 ***
	(2.4919)	(2.6578)	(3.4782)	(2.5952)	(2.6887)
K	3561	3561	3561	3561	3561
R^2	0.132	0.130	0.168	-	0.117

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 A2 for definitions and descriptive statistics of the meta-independent variables. Selected moderators denote meta-independent variables with a PIP of 0.50 or more in the Bayesian model averaging (BMA) estimation and with a t value of 1.00 or more in the weighted-average least squares (WALS) estimation, as reported in Appendix Table A3.

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

[b] Hausman test: χ^2 = 19.63, p = 0.3539

Supplement
List of Literature Subject to Meta-analysis
(In order of Appendix Table A1)

1. Beck, Thorsten, Ross Levine and Norman Loayza (2000) Finance and the sources of growth, Journal of Financial Economics, 58:1-2, pp. 261-300.
2. Benhabib, Jess (2000) The role of financial development in growth and investment, Journal of Economic Growth, 5:4, pp. 341–360.
3. Levine, Ross, Norman Loayza and Thorsten Beck (2000) Financial intermediation and growth: Causality and causes, Journal of Monetary Economics, 46:1, pp. 31-77.
4. Rousseau, P.L. and P. Wachtel (2000) Equity markets and growth: Cross-country evidence on timing and outcomes, 1980-1995, Journal of Banking & Finance, 24:11, pp. 1933-1957.
5. Bekaert, Geert, Campbell R. Harvey and Christian Lundblad (2001) Emerging equity markets and economic development, Journal of Development Economics, 66:2, pp. 465–504.
6. Reisen, Helmut and Marcelo Soto (2001) Which types of capital inflows foster developing-country growth? International Finance, 4:1, pp. 1–14.
7. Edison, Hali J., Ross Levine, Luca Ricci and Torsten Sløk (2002) International financial integration and economic growth, Journal of International Money and Finance, 21:6, pp. 749–776.
8. Jaliliani, Hossein and Colin Kirkpatrick (2002) Financial development and poverty reduction in developing countries, International Journal of Finance and Economics, 7: 2, pp. 97–108.
9. Rousseau Peter L .and Paul Wachtel (2002) Inflation thresholds and the finance–growth nexus, Journal of International Money and Finance, 21:6, pp. 777–793.
10. Fuchs-Schündeln, Nicola and Norbert Funke (2003) Stock market liberalization financial and macroeconomic implications, Review of World Economics, 139:4, pp. 730-761.
11. Graff, Michael (2003) Financial development and economic growth in corporatist and liberal market economies, Emerging Markets Finance and Trade, 39: 2, pp. 47–69.
12. Güloğlu, Bülent (2003) Financial liberalisation and economic growth: A panel data approach, ISE Review, 7:27, pp. 35-58.
13. Hermes, Niels and Robert Lensink (2003) Foreign direct investment, financial development and economic growth, Journal of Development Studies, 40:1, pp. 142-163.
14. Rousseau, Peter L. (2003) Historical perspectives on financial development and economic growth, Federal Reserve Bank of St. Louis Review, 85:4, pp. 81-105.
15. Wachtel, Paul (2003) How much do we really know about growth and finance? Federal Reserve Bank of Atlanta Economic Review, 88:1, pp. 33-47.
16. Andres, Javier, Ignacio Hernando and J. David López-Salido (2004) The role of the financial system in the growth–inflation link: the OECD experience, European Journal of Political Economy, 20:4, pp. 941–961.
17. Beck, Thorsten and Ross Levine (2004) Stock markets, banks, and growth: Panel evidence, Journal of Banking & Finance, 28:3, pp. 423–442.
18. Berger, Allen N., Iftekhar Hassan and Leora F. Klapper (2004) Further evidence on the link between finance and growth: An international analysis of community banking and economic performance, Journal of Financial Services Research, 25:2-3, pp. 169-202.
19. Garretsen, Harry, Robert Lensink and Elmer Sterken (2004) Growth, financial development, societal norms and legal institutions, Journal of International Financial Markets, Institutions & Money, 14:2, pp. 165-183.
20. Rioja, Felix and Neven Valev (2004a) Finance and the sources of growth at various stages of economic development, Economic Inquiry, 42:1, pp. 127-140.
21. Rioja, Felix and Neven Valev (2004b) Does one size fit all? A reexamination of the finance and growth relationship, Journal of Development Economics, 74:2, pp. 429-447.
22. Bekaert, Geert, Campbell R. Harvey and Christian Lundblad (2005) Does financial liberalization spur growth? Journal of Financial Economics, 77:1, pp. 3-55.
23. Fink, Gerhard, Peter Haiss and Hans Christian Mantler (2005a) The finance-growth nexus: Market economies vs. transition countries, EI Working Paper No. 64, Europainstitut: Vienna.
24. Graff, Michael (2005) Socio-economic factors and the finance-growth nexus, European Journal of Finance, 11:3, pp. 183–205.
25. Hahn, Franz R. (2005) Finance–growth nexus and the p-bias: Evidence from OECD countries, Economic Notes, 34:1, pp. 113–126.

26. Jalilian, Hossein and Colin Kirkpatrick (2005) Does financial development contribute to poverty reduction? Journal of Development Studies, 41:4, pp. 636-656.
27. Bandyopadhyay, Debasis (2006) How financial development caused economic growth in APEC countries: Financial integration with FDI or privatization without FDI, Asia-Pacific Development Journal, 13:1, pp. 75-100.
28. Demetriades, Panicos and Siong Hook Law (2006) Finance, institutions and economic development, International Journal of Finance and Economics, 11:3, pp. 245-260.
29. Dreher, Axel (2006) Does globalization affect growth? Evidence from a new index of globalization, Applied Economics, 38:10, pp. 1091-1110.
30. Graff, Michael and Alexander Karmann (2006) What determines the finance-growth nexus? Empirical evidence for threshold models, Journal of Economics, 87:2, pp. 127-157.
31. Loayza, Norman V. and Romain Rancière (2006) Financial development, financial fragility, and growth, Journal of Money, Credit and Banking, 38: 4, pp. 1051-1076.
32. Padoan, Pier Carlo and Fabio Mariani (2006) Growth and finance: European integration and the Lisbon strategy, Journal of Common Market Studies, 44:1, pp. 77-112
33. Shen, Chung-Hua and Chien-Chiang Lee (2006) Same financial development yet different economic growth: Why, Journal of Money, Credit and Banking, 38:7, pp. 1907-1944.
34. Tang, Donny (2006) The effect of financial development on economic growth: evidence from the APEC countries, 1981–2000, Applied Economics, 38:16, pp. 1889–1904.
35. Apergis, Nicholas, Ioannis Filippidis, and Claire Economidou (2007) Financial deepening and economic growth linkages: A panel data analysis, Review of World Economics, 143: 1, pp. 179-198.
36. Kemal, A.R., Abdul Qayyum and Muhammad N. Hanif (2007) Financial development and economic growth: Evidence from a heterogeneous panel of high income countries, Lahore Journal of Economics, 12: 1, pp. 1-34.
37. Ketteni, Elena, Theofanis Mamuneas, Andreas Savvides and Thanasis Stengos (2007) Is the financial development and economic growth relationship nonlinear? Economics Bulletin, 15:14, pp. 1-12.
38. Liang, Hsin-Yu and Alan Reichert (2007) Economic growth and financial sector development, International Journal of Business and Finance Research, 1:1, pp. 68-78.
39. Ahlin, Christian and Jiaren Pang (2008) Are financial development and corruption control substitutes in promoting growth? Journal of Development Economics, 86 :2, pp. 414–433.
40. Ahmed, Syed, James Horner and Rafiqul Bhuyan Rafiq (2008) Financial development and economic growth: Experiences of selected developing economies, Review of Applied Economics, 4:1-2, pp. 1-18.
41. Cuadro-Sáez, Lucía and Alicia Garcia-Herrero (2008) Finance for growth does a balanced financial structure matter? Revue économique, 59:6, pp. 1075-1096.
42. Dawson, P. J. (2008) Financial development and economic growth in developing countries, Progress in Development Studies 8:4, pp. 325–331.
43. Honig, Adam (2008) Addressing causality in the effect of capital account liberalization on growth, Journal of Macroeconomics, 30:4, pp. 1602-1616.
44. Aghion, Philippe, Philippe Bacchetta, Romain Ranciere, and Kenneth Rogoff (2009) Exchange rate volatility and productivity growth: The role of financial development, Journal of Monetary Economics, 56:4, pp. 494–513.
45. Ahmad, Eatzaz and Aisha Malik (2009) Financial sector development and economic growth: An empirical analysis of developing countries, Journal of Economic Cooperation and Development, 30:1, pp. 17-40.
46. Akimov, Alexandr, Albert Wijeweera and Brian Dollery (2009) Financial development and economic growth: Evidence from transition economies, Applied Financial Economics, 19:10-12, pp. 999–1008.
47. Cooray, Arusha (2009) The financial sector and economic growth, Economic Record, 85, pp. S10–S21.
48. Fink, Gerhard, Peter Haissa, and Goran Vuksic (2009) Contribution of financial market segments at different stages of development: Transition, cohesion and mature economies compared, Journal of Financial Stability, 5:4, pp. 431–455.
49. Giedeman, Daniel and Ryan Compton (2009) A note on finance, inflation, and economic growth, Economics Bulletin, 29:2, pp. 749-759.
50. Giuliano, Paola, and Marta Ruiz-Arranz (2009) Remittances, financial development, and growth, Journal of Development Economics, 90:1, pp. 144–152.

51. Lee, Chien-Chiang and Chun-Ping Chang (2009) FDI, Financial development, and economic growth: International evidence, Journal of Applied Economics, 12:2, pp. 249-271.
52. Mukerji, Purba (2009) Ready for capital account convertibility? Journal of International Money and Finance, 28:6, pp. 1006–1021.
53. Rousseau, Peter L. and Hakan Yilmazkuday (2009) Inflation, financial development, and growth: A trilateral analysis, Economic Systems, 33:4, pp. 310–324.
54. Saci, Karima, Gianluigi Giorgioni and Ken Holden (2009) Does financial development affect growth? Applied Economics, 41:13, pp. 1701–1707.
55. Yay, Gülsün and Asuman Oktayer (2009) Financial development and economic growth: A comparative analysis, Romanian Journal of Economic Forecasting, 11:3, pp. 56-74.
56. Bangake, Chrysost and Jude C. Eggoh (2010) Finance-growth link in OECD countries: Evidence from panel causality and cointegration tests, Brussels Economic Review, 53:3-4, pp. 375-392.
57. Choong, Chee-Keong, Ahmad Zubaidi Baharumshah, Zulkornain Yusop and Muzafar Shah Habibullah (2010) Private capital flows, stock market and economic growth in developed and developing countries: A comparative analysis, Japan and the World Economy, 22:2, pp. 107–117.
58. Dawson, P. J. (2010) Financial development and economic growth: A panel approach, Applied Economics Letters, 17:7-9, pp. 741–745.
59. Dufrenot, Gilles, Valerie Mignon and Anne Peguin-Feissolle (2010) Testing the finance-growth link: Is there a difference between developed and developing countries? Economics Bulletin, 30:3, pp. 1794-1807.
60. Hwang, Jen-Te, Chien-Ping Chung and Chieh-Hsuan Wang (2010) Debt overhang, financial sector development and economic growth, Hitotsubashi Journal of Economics, 51:1, pp. 13-30.
61. Lartey, Emmanuel K. K. (2010) A note on the effect of financial development on economic growth, Applied Economics Letters, 17:7-9, pp. 685–687.
62. Leitão, Nuno Carlos (2010) Financial development and economic growth: A panel data approach, Theoretical and Applied Economics, 17:10, pp. 15-24.
63. Andini, Corrado (2011) Financial development and long-run growth: is the cross-sectional evidence robust? Applied Economics, 43:28, pp. 4269–4275.
64. Azman-Saini, W.N. W. and Peter Smith (2011) Finance and growth: New evidence on the role of insurance, South African Journal of Economics, 79:2, pp. 111-127.
65. Bangake, Chrysost and Jude C. Eggoh (2011) Further evidence on finance-growth causality: A panel data analysis, Economic Systems, 35:2, pp. 176-188.
66. Compton, Ryan A. and Daniel C. Giedeman (2011) Panel evidence on finance, institutions and economic growth, Applied Economics, 43:25, pp. 3523–3547.
67. Hassan, M. Kabir, Benito Sanchez and Jung-Suk Yu (2011) Financial development and economic growth in the organization of Islamic conference countries, Journal of King Abdulaziz University: Islamic Economics, 24:1, pp. 145-172.
68. Hassan, M. Kabir, Benito Sanchez and Jung-Suk Yu (2011) Financial development and economic growth: New evidence from panel data, Quarterly Review of Economics and Finance, 51:1, pp. 88-104.
69. Kose, M. Ayhan, Eswar S. Prasad and Ashley D. Taylor (2011) Thresholds in the process of international financial integration, Journal of International Money and Finance, 30:1, pp. 147–179..
70. Lartey, Emmanuel K. K. and Mira Farka (2011) Financial development, crises and growth, Applied Economics Letters, 18:8, pp. 711–714.
71. Rousseau, Peter L. and Paul Wachtel (2011) What is happening to the impact of financial deepening of economic growth? Economic Inquiry, 49:1, pp. 276–288.
72. Yilmazkuday, Hakan (2011) Thresholds in the finance-growth nexus: A cross-country analysis, World Bank Economic Review, 25:2, pp. 278–295.
73. Andersen, Thomas Barnebeck, Sam Jones and FinnTarp (2012) The finance–growth thesis: A sceptical assessment, Journal of African Economies, 21:1, pp. i57–i88.
74. Bettin, Giulia and Alberto Zazzaro (2012) Remittances and financial development: Substitutes or complements in economic growth? Bulletin of Economic Research, 64:4, pp. 509-536.
75. Bordo, Michael D. and Peter L. Rousseau (2012) Historical evidence on the finance-trade-growth nexus, Journal of Banking & Finance, 36:4, pp. 1236-1243.

76. Gantman, Ernesto R. and Marcelo P. Dabós (2012) A Fragile link? A new empirical analysis of the relationship between financial development and economic growth, Oxford Development Studies, 40:4, pp. 517–532.
77. Kim, Dong-Hyeon, Shu-Chin Lin and Yu-Bo Suen (2012) The simultaneous evolution of economic growth, financial development, and trade openness, Journal of International Trade & Economic Development, 21:4, pp. 513–537.
78. Masoud, Najeb and Glenn Hardaker (2012) The impact of financial development on economic growth: Empirical analysis of emerging market countries, Studies in Economics and Finance, 29:3, pp. 148-173.
79. Tayebi, Seyed Komail (2012) Effects of financial liberalization on macroeconomic volatilities: Applications to economic growth, exchange rate and exchange rate pass-through, Iranian Economic Review, 16:31, pp. 71-84.
80. Aizenman, Joshua, Yothin Jinjarak and Donghyun Park (2013) Capital flows and economic growth in the era of financial integration and crisis, 1990–2010, Open Economies Review, 24:3, pp. 371–396.
81. Akisik, Orhan (2013) Accounting regulation, financial development, and economic growth, Emerging Markets Finance & Trade, 49:1, pp. 33-67.
82. Gantman, Ernesto R. and Marcelo P. Dabós (2013) Finance and economic growth: new evidence from time series analysis (1961-2009) Applied Economics Letters, 20:7-9, pp. 893-896.
83. Mercan, Mehmet and İsmet Göçer (2013) The effect of financial development on economic growth in BRIC-T countries: Panel data analysis, Journal of Economic and Social Studies, 3:1, pp. 199-216.
84. Narayan, Paresh Kumar and Seema Narayan (2013) The short-run relationship between the financial system and economic growth: New evidence from regional panels, International Review of Financial Analysis, 29, pp. 70–78.
85. Ashghar, Nabila and Zakir Hussain (2014) Financial development, trade openness and economic growth in developing countries: Recent evidence from panel data, Pakistan Economic and Social Review, 52:2, pp. 99-126.
86. Ayouni, Saif Eddine, Fakhri Issaoui and Salem Brahim (2014) Financial liberalization, foreign direct investment and economic growth: A dynamic panel data validation, International Journal of Economics and Financial Issues, 4:3, pp. 677-697.
87. Beck, Thorsten, Hans Degryse, and Christiane Kneer (2014) Is more finance better? Disentangling intermediation and size effects of financial systems, Journal of Financial Stability, 10, pp. 50– 64.
88. Cheng, Su-Yin, Chia-Cheng Ho and Han Hou (2014) The Finance-growth relationship and the level of country development, Journal of Financial Services Research, 45:1, pp. 117-140.
89. Gambacorta, Leonardo, Jing Yang and Kostas Tsatsaronis (2014) Financial structure and growth, BIS Quarterly Review, March: 2014, pp. 21-35.
90. Kunieda, Takuma, Keisuke Okada and Akihisa Shibata (2014) Corruption, capital account liberalization, and economic growth: Theory and evidence, International Economics, 139, pp. 80–108.
91. Law, Siong Hook and Nirvikar Singh (2014) Does too much finance harm economic growth? Journal of Banking & Finance, 41, pp. 36-44.
92. Mhadhbi, Khalil (2014) Financial development and economic growth: A dynamic panel data analysis, International Journal of Econometrics and Financial Management, 2:2, pp. 48-58.
93. 220. Ngare, Everlyne, Esman Morekwa Nyamongo and Roseline N. Misati (2014) Stock market development and economic growth in Africa, Journal of Economics and Business, 74, pp. 24–39.
94. Owen, Ann L. and Judit Temesvary (2014) Heterogeneity in the growth and finance relationship: How does the impact of bank finance vary by country and type of lending? International Review of Economics and Finance, 31, pp. 275-288.
95. Rajabi, Ehsan, and Junaina Muhammad (2014) The stock markets, banks and growth nexus: Asian Islamic countries, Economic Notes, 43:2, pp. 137-165.
96. Rodriguez, Cesar M. (2014) Financial development, fiscal policy and volatility: Their effects on growth, Journal of International Trade & Economic Development, 23:2, pp. 223-266.
97. Arcand Jean Louis, Enrico Berkes and UgoPanizza (2015) Too much finance? Journal of Economic Growth, 20:2, pp. 105-148.
98. Breitenlechner, Max, Martin Gächter and Friedrich Sindermann (2015) The finance–growth

nexus in crisis, Economics Letters, 132: C, pp. 31–33.
99. Brüeckner, Markus and Markus Brüeckner (2015) The effects of volatility, fiscal policy cyclicality, and financial development on growth: Evidence for the eastern Caribbean, Policy Research Working Paper No. 7507, World Bank: Washington, D.C.
100. Ductor, Lorenzo and Daryna Grechyna (2015) Financial development, real sector, and economic growth, International Review of Economics and Finance, 37, pp. 393–405.
101. Samargandi, Nahla, Jan Fidrmuc and Sugata Ghosh (2015) Is the relationship between financial development and economic growth monotonic? Evidence from a sample of middle-income countries, World Development, 68, pp. 66–81.
102. Capelle-Blancard.G. and C. Labonne (2016) More bankers, more growth? Evidence from OECD countries, Economic Notes, 45:1, pp. 37–51.
103. Chowdhury, Murshed (2016) Financial development, remittances and economic growth: Evidence using a dynamic panel estimation, Margin — Journal of Applied Economic Research, 10:1, pp. 35–54.
104. Doumbia, Djeneba (2016) Financial development and economic growth in 43 advanced and developing economies over the period, 1975-2009: Evidence on no-linearity, Applied Econometrics and International Development, 16:1, pp. 13-22.
105. Ishtiaq, Muhammad, Muhammad Tariq Majeed, and Muhammad Sohail (2016) Financial sector, democracy and economic growth: A panel data analysis, Pakistan Development Review, 55:4, pp. 437–453.
106. Seven, Ünal and Hakan Yetkiner (2016) Financial intermediation and economic growth: Does income matter? Economic Systems, 40:1, pp. 39–58.
107. Zhang, Ling, Sheng Zhang and Na Tao (2016) Financial system risk tolerance capacity and economic growth: Evidence from a cross-country analysis, Global Economic Review, 45:2, pp. 97-115.
108. Hamdi, Helmi, Abdelaziz Hakimi and Rashid Sbia (2017) Finance and growth nexus: What role for institutions in developed and developing countries? Journal of Economic Development, 42:4, pp. 1-22.
109. Prochniak, Mariusz and Katarzyna Wasiak (2017) The impact of the financial system on economic growth in the context of the global crisis: empirical evidence for the EU and OECD countries, Empirica, 44:2, pp. 295-337.
110. Rodriguez, Cesar M. (2017) The growth effects of financial openness and exchange rates, International Review of Economics and Finance, 48, pp. 492-512.
111. Williams, Kevin (2017) Does democracy dampen the effect of finance on economic growth? Empirical Economics, 52:2, pp. 635-658.
112. Zou, Jingxian and Yaqi Wang (2017) Undervaluation, financial development, and economic growth, Asian Development Review, 34:1, pp. 116-143.
113. Alexiou, Constantinos, Sofoklis Vogiazas and Joseph G. Nellis (2018) Reassessing the relationship between the financial sector and economic growth: Dynamic panel evidence, International Journal of Finance and Economy, 23:2, pp. 155–173.
114. Das, Anupam, Murshed Chowdhury and Sariah Seaborn (2018) ICT diffusion, financial development and economic growth: New evidence from low and lower middle-income countries, Journal of the Knowledge Economics, 9, pp. 928-947.
115. Hino, Tomoko (2018) Impact of foreign direct investment and financial market development on economic growth, Journal of International Economic Studies, 32, pp. 25–37.
116. Lajili, Oualid and Philippe Gilles (2018) Financial liberalization, political openness and growth in developing countries: Relationship and transmission channels, Journal of Economic Development, 43:1, pp. 1-27.
117. Lee, Il Houng and Kyunghun Kim (2018) Exchange rate flexibility, financial market openness, and economic growth, Asian Economic Papers, 17:1, pp. 145-162.
118. Lee, Chien-Chiang and Chun-Wei Lin (2018) Economic growth, financial market, and twin crises, Journal of International Trade & Economic Development, 27:8, pp. 937-967.
119. Oro, Oro Ufuo and Paul Alagidede (2018) The nature of the finance–growth relationship: Evidence from a panel of oil-producing countries, Economic Analysis and Policy, 60, pp. 89-102.
120. Rapp, Marc Steffen and Iuliia A. Udoieva (2018) What matters in the finance–growth nexus of advanced economies? Evidence from OECD countries, Applied Economics, 50:6, pp. 676-690.
121. Shen, Chung-Hua, Xingyu Fan, Dengshi Huang, Hongquan Zhu and Meng-Wen Wu (2018)

Financial development and economic growth: Do outliers matter? Emerging Markets Finance & Trade, 54:13, pp. 2925–2947.
122. Benczúr, Péter, Stelios Karagiannis, and Virmantas Kvedaras (2019) Finance and economic growth: Financing structure and non-linear impact, Journal of Macroeconomics, 62, 103048.
123. Bernier, Maxence and Michael Plouffe (2019) Financial innovation, economic growth, and the consequences of macroprudential policies, Research in Economics, 73:2, pp. 162–173.
124. Botev, Jaroslava, Balázs Égert and Fredj Jawadi (2019) The nonlinear relationship between economic growth and financial development: Evidence from developing, emerging and advanced economies, International Economics, 160, pp. 3-13.
125. Braun, Matias, Francisco Parro and Patricio Valenzuela (2019) Does Finance Alter the Relation Between Inequality and Growth? Economic Inquiry, 57:1, pp. 410-428.
126. Gaies, Brahim, Stephane Goutte and Khaled Guesmi (2019) What interactions between financial globalization and instability? Growth in developing countries, Journal of International Development, 31:1, pp. 39-79.
127. Guru, Biplab Kumar and Inder Sekhar Yadav (2019) Financial development and economic growth: panel evidence from BRICS, Journal of Economics, Finance and Administrative Science, 24:47, pp. 113-126.
128. Hamdaoui, Mekki and Samir Maktouf (2019) Overall effects of financial liberalization: financial crisis versus economic growth, International Review of Applied Economics, 33:4, pp. 568-595.
129. Inekwe, John Nkwoma, Yi Jin and Maria Rebecca Valenzuela (2019) Financial conditions and economic growth, International Review of Economics and Finance, 61, pp. 128-140.
130. Jalili, Zahra, Mohammad Reza Salmani Bishak, Mohammad Ali Motafakker Azad, Behzad Salmani and Jaafar Haghighat (2019) Resource-economic growth nexus, role of governance, financial development, globalization, and war: A dynamic approach, Journal of Economic Integration, 34:3, pp. 520-545.
131. Jarrett, Uchechukwu, Kamiar Mohaddes and Hamid Mohtadi (2019) Oil price volatility, financial institutions and economic growth, Energy Policy, 126, pp. 131-144.
132. Khalid, Ahmed M. and Antonio Marasco (2019) Do channels of financial integration matter for FDI’s impact on growth? Empirical evidence using a panel, Applied Economics, 51:37, pp. 4025-4045.
133. Khan, Sher, Zhuangzhuang Peng and Yongdong Li (2019) Energy consumption, environmental degradation, economic growth and financial development in globe: Dynamic simultaneous equations panel analysis, Energy Reports, 5, pp. 1089-1102.
134. Mollaahmetoğlu, Ebubekir and Burçay Yaşar Akçalı (2019) The missing-link between financial development and economic growth: Financial innovation, Procedia Computer Science, 158, pp. 696–704.
135. Neanidis, Kyriakos C. (2019) Volatile capital flows and economic growth: The role of bankingsupervision, Journal of Financial Stability, 40, pp. 77-93.
136. Nguyen, Yen Ngoc, Kym Brown and Michael Skully (2019) Impact of finance on growth: Does it vary with development levels or cyclical conditions? Journal of Policy Modeling, 41:6, pp. 1195-1209.
137. Slesman, Ly, Ahmad Zubaidi Baharumshah and W.N.W. Azman-Saini (2019) Political institutions and finance-growth nexus in emerging markets and developing countries: A tale of one threshold, Quarterly Review of Economics and Finance, 72, pp. 80-100.
138. Sobiech, Izabela (2019) Remittances, finance and growth: Does financial development foster the impact of remittances on economic growth? World Development, 113, pp. 4-59.
139. Williams, Kevin (2019) Do political institutions improve the diminishing effect of financial deepening on growth? Evidence from developing countries, Journal of Economics and Business, 103, pp. 13-24.
140. Yang, Fan (2019) The impact of financial development on economic growth in middle-income countries, Journal of International Financial Markets, Institutions & Money, 59, pp. 74-89.
141. Younsi, Moheddine and Amine Nafla (2019) Financial stability, monetary policy, and economic growth: Panel data evidence from developed and developing countries, Journal of the Knowledge Economics, 10, pp. 238-260.
142. Bangake, Chrysost and Jude Eggoh (2020) Financial development thresholds and the remittances-growth nexus, Journal of Quantitative Economics, 18(2), pp. 425-445.
143. Belazreg, Walid and Kais Mtar (2020) Modelling the causal linkages between trade openness,

innovation, financial development and economic growth in OECD Countries, Applied Economics Letters, 27(1) pp. 5-8.
144. Bucchi, Alberto, Simone Marsiglio and Catherine Prettner (2020) On the (nonmonotonic) relation between economic growth and finance, Macroeconomic Dynamics, 24:1, pp. 93-112.
145. Cao, Shijun and Sung Jin Kang (2020) Personal remittances and financial development for economic growth in economic transition countries, International Economic Journal, 34:3, pp. 472–492.
146. Chu, Lan Khanh (2020) Financial structure and economic growth nexus revisited, Borsa Istanbul Review, 20(1), pp. 24-36.
147. De la Cruz, Jennifer (2020) Financial development and economic growth: New evidence, Economía, 43(85), pp. 47-64.
148. Demetriades, Panicos O. and Johan M. Rewilak (2020) Recovering the finance-growth nexus, Economics Letters, 196, Article 109563.
149. Gaies, Brahim, Stéphane Goutte, Khaled Guesmi (2020) Does financial globalization still spur growth in emerging and developing countries? Considering exchange rates, Research in International Business and Finance, 52, 101113.
150. Khurshid, Adnan, Yin Kedong, Adrian Cantemir Calin, Cristina Georgiana Zeldea, Sun Qiang and Duan Wenqi (2020) Is the relationship between remittances and economic growth influenced by the governance and development of the financial sector? New evidence from the developing countries, Romanian Journal of Economic Forecasting, 23:1, pp. 37-56.
151. Polemis, Michael L., Thanasis Stengos and Nickolaos G. Tzeremes (2020) Revisiting the impact of financial depth on growth: A semiparametric approach, Finance Research Letters, 36, Article 101322.
152. Ramírez-Rondán, N. R., Marco E. Terrones and Andrea Vilchez (2020) Does financial sector development affect the growth gains from trade openness? Review of World Economics, 156, pp. 475-515.
153. Sugiyanto, Catur and Zefania Yolanda (2020) The effect of financial deepening on economic growth, inequality, and poverty: Evidence from 73 countries, South East European Journal of Economics and Business, 15:2, pp. 15-27.
154. Cheng, Chih-Yang, Mei-Se Chien, and Chien-Chiang Lee (2021) ICT diffusion, financial development, and economic growth: An international cross-country analysis, Economic Modelling, 94, pp. 662–671.
155. Ghosh, Taniya, Prashant Mehul Parab and Sohini Sahu (2021) Analyzing the importance of forward orientation in financial development-economic growth nexus: Evidence from big data, Journal of Behavioral Finance, 22:3, pp. 280-288.
156. Khan, Irfan, Fujun Hou, Muhammad Irfan, Abdulrasheed Zakari, and Hoang Phong Le (2021) Does energy trilemma a driver of economic growth? The roles of energy use, population growth, and financial development, Renewable and Sustainable Energy Reviews, 146, Article 111157.
157. Mtar, Kais and Walid Belazreg (2021) Causal nexus between innovation, financial development, and economic growth: The case of OECD countries, Journal of the Knowledge Economy, 12, pp. 310-341.
158. Raghutla, Chandrashekar and Krishna Reddy Chittedi (2021) Financial development, real sector and economic growth: Evidence from emerging market economies, International Journal of Finance and Economics, 26(4), pp. 6156-6167.
159. Raheem, Ibrahim D., Kazeem B. Ajide, and Xuan V. Vo (2021) The hype of social capital in the finance-growth nexus, Economic Notes, 50(3), Article e12192.
160. Song, Yang, Dayu Liu and Qiaoru Wang (2021) The dual-financial-threshold effect in the “club convergence” of economic growth: a dynamic panel threshold model, Empirical Economics, 61(5), pp. 2713–2737.
161. Sturn, Simon, and Gerald Epstein (2021) How much should we trust five-year averaging to purge business cycle effects? A reassessment of the finance-growth and capital accumulation-unemployment nexus, Economic Modelling, 96, pp. 242–256.
162. Swamy, Vighneswara and Munusamy Dharani (2021) Thresholds in finance–growth nexus: Evidence from G-7 economies, Australian Economic Papers, 60(4), pp. 1-40.
163. Uzar, Umut (2021) Is finance a curse? Reinvestigate the relationship between finance and economic growth, Journal of Sustainable Finance & Investment. (Early View)
164. Van, Loan Thi-Hong, Anh The Vo, Nhan Thien Nguyen, and Duc Hong Vo (2021) Financial inclusion and economic growth: An international evidence, Emerging Markets Finance and

Trade, 57(1), pp. 239-263.
165. Wahidin, Deni, Alexandr Akimov, and Eduardo Roca (2021) The impact of bond market development on economic growth before and after the global financial crisis: Evidence from developed and developing countries, International Review of Financial Analysis, 77, Article 101865.
166. Ye, Dezhu, Yunjue Huang and Fanqing Zeng (2021) Does structural matching between finance and the real economy promote economic growth? International Review of Economics and Finance, 73, pp. 11-29.
167. Ahmed, Jalle, Raies, Umar Farooq, and Bilal Haider Subhani (2022) The moderating role of information and communication technology in the nexus between financial development, economic growth and energy consumption, OPEC Energy Review, 46(4), pp. 399-412.
168. Boikos, Spyridon, Theodore Panagiotidis and Georgios Voucharas (2022) Financial development, reforms and growth, Economic Modelling, 108, Article 105734.
169. Cavallaro, Eleonora and Ilaria Villani (2022) Beyond financial deepening: Rethinking the finance-growth relationship in an uneven world, Economic Modelling, 116, Article 106009.
170. Cheng, Su-Yin and Han Hou (2022) Innovation, financial development, and growth: evidences from industrial and emerging countries, Economic Change and Restructuring, 55(3), pp. 1629–1653.
171. Hsu, Mike and Javier Pereira (2022) Multidimensional financial development, trade liberalization, and productivity growth, International Economic Journal, 36(1), pp. 103-128.
172. Karadam, Duygu Yolcu and Nadir Öcal (2022) Analysis of distinct asymmetries in financial integration growth nexus for industrial, emerging and developing countries, International Journal of Finance and Economics, 27(2), pp. 2326-2344.
173. Liu, Pei, Yuchao Pengb, Yukun Shic, and Junhong Yang (2022) Financial structures, political risk and economic growth, European Journal of Finance, 28(4-5), pp. 356-376.
174. Nguyen, Ha Minh, Quan Thai-Thuong Le, Chi Minh Ho, Thang Cong Nguyen and Duc Hong Vo (2022) Does financial development matter for economic growth in the emerging markets? Borsa Istanbul Review, 22:4, pp. 688-698.
175. Purewal, Kulvinder and Hazwan Haini (2022) Re-examining the effect of financial markets and institutions on economic growth: evidence from the OECD countries, Economic Change and Restructuring, 55, pp. 311-333.
176. Selvasundaram, K., S. Sagathevan and Murtala Abdu (2022) Financial development and economic growth in BRICS revisited: An application of cross-sectional augmented ARDL, International Social Science Journal, 72(245), pp. 799-812.
177. Kassi, Diby Francois, Yao Li, and Zhankui Dong (2023) The mitigating effect of governance quality on the finance-renewable energy-growth nexus: Some international evidence, International Journal of Finance & Economics, 28(1), pp. 316-354.