Lisbon School of Economics & Management
Universidade de Lisboa

Seminar

2021/2022

Thematic area: Monetary and Financial Economics

Financial Development and Economic Growth in the 21st century

In a Context of Different Levels of Human Development

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Lisbon, 2022

Abstract

This paper will analyze the influence that financial development exerts over economic growth, and how it changes according to different levels of country development. The analysis will be made using a panel of 82 countries with different development levels, over the period of 2000 to 2019. The nine indices and real GDP/capita from the IMF's databases will be used to measure financial development and economic growth, respectively. The panel data analysis features two structural equations estimated using the estimators of random effects, fixed effects, and the Generalized Method of Moments (GMM) one and two-step after Arellano and Bover (1995) and Blundell and Bond (1998). Moreover, potential panel Granger causality will be tested using the Dumitrescu and Hurlin (2012) Non-Granger causality test. This study will fill a gap in the existing literature through the study of the relationship between financial development and economic growth according to development levels, and not income. The division will follow the tiers put forward by the Social Progress Index (SPI). The paper concludes that the strength and direction of influence of financial development on economic growth are not the same for different levels of development. The impact of financial institutions fades as countries reach higher levels of human development and the access and depth of the financial system are the most relevant subdomains of financial development to determine growth. Furthermore, there is evidence to state that financial development Granger-causes economic growth, although not generally for all countries.

Key Words: financial development, economic growth, developed countries, developing countries, social progress index (SPI), financial development index.

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1. Introduction

The long-lasting debate on the causes of economic growth undoubtedly involves inquiries about the financial system, i.e., the mechanism that transfers funds from agents with excess funds to agents who are in shortage. The pioneering papers on the topic from King and Levine (1993 a and b) point toward the critical role of the financial system in the process of economic growth.

Our research question is concerned with the relationship between financial development and economic growth, namely, how the financial sector impacts economic growth and potential changes in the direction (positive, negative, or no impact) as well as the magnitude of the impact, if different development levels are examined. More specifically, we mean to address it during the period from 2000 to 2019. The aforementioned relationship was studied by Patrick (1966) who proposed a stage of development theory, and it was also studied in the work of Calderón and Liu (2003), which we mean to test using modern data and more recent periods. For this purpose, we used Gross Domestic Product per capita data from the IMF database to characterize economic growth and the nine Financial Development Indices developed by the IMF to characterize financial development. The paper uses panel data analysis (random effects, fixed effects, and General Method of Moments one and two-step estimators) over 82 countries with different development levels sorted according to their ranking in the Social Progress Index (Stern et al, 2021**).** We also provide an overview of how the countries with the different levels of the SPI stand in terms of their GDP/capita levels and growth rates across financial development levels (measured with the financial development index). We categorize them in the highest, lowest, and medium levels of financial development because of the relation established with both GDP/capita levels and growth rates. Two hypotheses were formulated to understand if there is any impact of finance on growth and how this impact can change across development levels.

The contribution of this paper is to bring a pioneering perspective on the relationship established between growth and finance conditional on the human development levels of the different economies using panel data estimation methods: fixed and random effects models and GMM one and two-step. This study will be a forerunner in using the proposed combination of metrics, namely the SPI and the IMF's financial development indices to evaluate financial development to study the formerly mentioned relationship. Using the IMF's financial development indices is also relevant because existing literature tends to reduce the measurement of financial development down to financial depth measures, e.g., private credit ratios or stock market capitalization, without accounting for the multidimensional nature of the development of the financial system. Our motivation was a literature gap in understanding how the relationships between growth and finance are affected by the stages of development of countries when they are measured by their social development levels, e.g., measured with the Social Progress Index (SPI).

In section 2, we provide a summary of the strand of literature regarding our research question. In section 3, we formalize the hypotheses underlying our study, and then we provide the framework used to obtain the results. This section will also introduce the subpanels of countries chosen in terms of their stance on financial development and economic growth. The results are provided and analyzed in section 4. The paper is concluded in section 5 where we comment on the overall findings and indicate where we believe there is room for future research.

2. Literature Review

To begin the study of the topic, this paper makes a brief overview of the main findings present in the literature. The most popular relationship studied in the literature between the development of the financial system and the growth of economic activity is that the first leads to the second. King and Levine (1993 a and b) highlight the causality that financial development exerts over economic growth through the Schumpeterian innovation cycle. In their analysis of 80 countries, which included developed and developing countries, they used the variables ratio of claims on the nonfinancial private sector to total, domestic credit (excluding credit to central banks), and the ratio of claims on the nonfinancial private sector to GDP, which are the proportion of credit allocated to private enterprises by the financial system expressed in terms of domestic credit and GDP respectively. Their results demonstrate the positive effect that financial development has on growth. The authors call for the fact that financial services increase the rate of capital accumulation and also improve capital allocation efficiency. Furthermore, they also stress that the level of financial intermediation explains long-run growth rates of economic activity. Levine (1997) theorized that the financial system was able to strengthen economic growth through risk amelioration, reducing asymmetric information, reducing moral hazard (in agent versus principal issues), mobilization of savings, and facilitating exchange. Levine et al. (2000) focus on liquid liabilities of the financial system in relation to GDP, defined as currency plus demand and interest-bearing liabilities of financial intermediaries, and the ratio of credit value by financial intermediaries to the private sector to GDP to define financial development. The authors conclude that there is a relevant positive relationship between the exogenous component financial intermediaries' development, obtained through dummy instrumental variables related to legal origins and long-run economic growth. Financial intermediation appears central in the influence of financial development on economic growth for many authors. The argument lies in the role that the banking system has in identifying productive investments or the entrepreneurs with the most likely to succeed ideas and providing funding to those investments or entrepreneurs (Schumpeter 1934).

In broader terms, financial development was found by Khan and Senhadji (2003) to be a significant driver of economic growth. Calderón and Liu (2003) go further and study the relationship between financial development measures, i.e., the ratio of broad money (M2) to GDP, the ratio of credits provided by financial intermediaries to the private sector to GDP, and the ratio of bank credit to the private sector to GDP, to conclude that they reinforce each other and that their effect on economic growth is positive.

Ibrahim and Alagidede (2018) and Ductor and Grechyna (2015), confirm the positive effect of financial development on consistently achieving and sustaining economic growth. Both make use of domestic private credit, capital formation, and inflation as variables. Ibrahim and Alagidede (2018) center the analysis on Sub-Saharan African countries and include a multiplicative interaction term of the difference between growth in finance and that of real sector output and investment and inflation which the authors refer to as excess finance, whereas Ductor and Grechyna (2015) add the effect of money through the money aggregate M2, as well as make use of a broader set of 101 countries. Despite the positive relationship found by both, the authors highlight the importance of the development of the real sector as a key piece of the transmission of financial development into economic growth. Cheng et al. (2020) used data from 72 countries (high-income, middle- and low-income) between 2000 and 2015, and created a financial development index combining three indicators: M3 to GDP, banking credit to GDP, and stock market capitalization to GDP, the paper concludes that broad financial development is detrimental to economic growth and that in middle-income and low-income countries it might be due to excess lending due to deficiencies in financial institutions' reliability and regulation.

Despite many authors agreeing that there is a one-way relationship between financial development to economic growth, it is not a consensus in the literature. Lucas (1988) says that economists "badly over-stress" the impact of financial development on growth. Taivan (2016) in his study of the period 1980 to 2010 concludes that there is little evidence that demonstrates that financial development is necessary and a precondition to economic growth, this was also the conclusion of Shan (2001). On financial market grounds, Naceur et al. (2008) find no impact on economic growth, the authors over the periods between 1979 and 2005.

There are also authors in the literature that stand for neutrality and mixed evidence in this relationship. Loayza and Ranciere (2002) were able to find evidence that there can be a long-run positive relationship between financial intermediation and economic growth while at the same time there is a trade-off in the short run, explained mostly by the occurrence of financial crises. Pradhan et.al (2014) find no influencing relationship between the two, concluding the existence of neutrality.

Literature that addresses changes in either the strength or direction of the links between growth and finance is becoming more popular in recent years but works on this can be found as early as 1966 when Patrick (1966) proposed the stages of development hypothesis, in which the direction of causality is conditional on the stage of development. On the "neoclassical" growth stage, the industrialization and the acceleration of the real economy support a supply-leading (economic growth leading to financial development) stance but when countries reach the "Keynesian" growth stage, it shifts to a demand-leading (financial development leading to economic growth) relationship. Calderón and Liu (2003) in their analysis of a set of 109 industrial and developing countries, using a set of regional dummy variables to understand how the relationship changes in different regions conclude that the levels of development and income of the country influence the impact of financial development, through financial institutions, on economic growth. The authors end up with the same conclusion as Patrick (1966) and conclude also

that financial intermediaries in developing countries have larger relative effects on growth when compared to developed ones. Hassan et al (2011) use domestic credit to the private sector as a percentage of GDP and broad money (M3) and find that financial development is detrimental to growth in high-income countries, however, this relationship is inverted when moving to middle- and low-income countries where the effect is positive. From Ruiz (2018), with a study of 116 economies divided into industrialized and developing economies, it is possible to extract that there is a positive effect of finance on growth which is stronger in industrialized countries, similarly to what Egert and Jawadi (2018) found using a sample of 100 countries. Yang (2019) puts forward that financial development significantly influences economic growth in middle and high-income countries. Nguyen et al. (2021) analyze the period between 1980 and 2020, using the financial development index developed by the IMF, the ratio of financial system deposits to GDP, the ratio of stock market capitalization to GDP, the ratio of stock market total value traded to GDP, and the stock market turnover ratio to define financial development. Results show that financial development leads to economic growth with greater effects greater in middle- and low-income countries. At a more specific level within financial markets, Nguyen et al (2019) use stock and bond markets to proxy financial development between 1980 and 2011. The authors separate the effects of the stock and bond markets on economic growth to find that middle-income countries experience a causal relationship flowing from both to economic growth but in high-income countries, only the bond market is relevant to determine growth.

3. Methodology and Data

To address the formalization of some of the questions we posed in the introduction and that are presented also in the literature, we came up with two testable hypotheses and a framework to analyze them and the relationship central to this paper. Hypothesis I: Financial development is a determinant of economic growth. Here we address the topic of King and Levine (1993 a and b) to ultimately try to understand if economic growth is determined by financial development. And the second: Hypothesis II: The relationship between financial development and economic growth changes according to development levels, measured by the SPI. That is, the relationship expressed in Hypothesis I, if it holds, will have different magnitudes, or even be inverted (to positive, negative, or neutral) if the analysis is performed on higher or lower SPI tier countries.

In order to provide an answer for our hypotheses, we made use of the summary indices created by the IMF (Svirydzenka, 2016) regarding financial development and real Gross Domestic Product per Capita measured in Purchasing Power Parity adjusted United States 2017 international dollars as a measure of economic growth. The measurement of financial development using these indices was already done by Nguyen et al. (2021) to evaluate similar research questions. We understand the constraints of using GDP/capita, but the scope of our study here is to evaluate the relationships and not to question their definitions. As consequence, we will work with the following definitions: financial development as the

increases in the access to, efficiency, and level of activity (depth) of the financial system, and economic growth as increases in the yearly real GDP/capita.

Svirydzenka (2016) under the IMF badge worked through 9 indices, at three levels of specificity. Financial development index (FD): The broadest, which provides the vastest overview of the financial system in one single index, including everything from stock market capitalization in GDP to lending deposit spread. The mid-level indices: the financial markets index (FM), which provides an overview of the measures related to financial market functioning, and the financial institutions index (FI), which provides information about the development of financial institutions. And lastly, the specific measures that provide the most stringent impression about the following domains within financial institutions and markets: depth: financial institutions depth index (FID) and financial markets depth index (FMD), i.e., the measures of "how much" financial activity is taking place; access: financial institutions access index (FIA) and financial markets access index (FMA), that informs about the access of economic agents to the two branches of the financial system; efficiency: financial institutions efficiency index (FIE) and financial markets efficiency index (FME), that characterize how efficiently the resources employed in the financial system are being used. For more information on the metrics included in each of the indices see Annex Table 1, for other technical details, such as sources of those metrics and the methodology behind the indices, see Svirydzenka (2016).

Availability of data became a serious concern due to the fact that the study involves developing economies that tend to have significantly less available data. Additionally, the availability of data from the indices allows full comparison between countries due to harmonization in their calculation for all countries under analysis. The IMF's collection of financial development indices provides accurate data on an acceptable basis and a relatively large sample from developing countries to carry out a suitable panel analysis. The sturdiest reason behind choosing IMF's financial development indices was the drawback of using a single or a small number of variables to evaluate financial development. A significant array of the literature presents usually only measures of financial depth with the ratio of private credit to GDP and with a stock market capitalization in GDP to capture financial development (Svirydzenka, 2016). We find this to be too reductive in representing this phenomenon, since it is important to lay emphasis on how fast the financial system is evolving, for instance, the emergence of shadow banking or crypto assets, which suggests that measuring traditional financial system activity individually as opposed to multidimensional aggregates to represent financial development is too inflexible to provide a decent summary.

Annex Table 2 provides an overview of the variables used for the models described in subsection 3.3 and whose estimated results are reported in section 4. Annex Table 3 provides the descriptive statistics of each variable (mean, standard deviation, number of observations, number of countries, number of periods) and from this table the conclusion elapsed is that the panel is strongly balanced, implying that there are observations for all countries, for all periods, and for all variables.

3.1 Choice of subpanels: The Social Progress Index

To understand and investigate the conditional relationship between economic growth and financial development, our criterion was the 2021 Social Progress Index (SPI) by Stern et al (2021), provided by the Social Progress Imperative. From the countries contained in the SPI, we selected 82 out of the 168 due to data availability matching with the data from the IMF's financial development indices but keeping in mind that the sample of 82 contains countries from virtually all macroeconomic performances (e.g., developed, developing, backward, industrializing economies), and covering all regions of the world.

The Social Progress Imperative defines the social progress of a country as a combination of three main frameworks: the capacity to provide basic human needs, its ability to promote superior quality of life, and the capability to encourage conditions for its citizens to reach their individual potential. The index is a summary produced by gathering each metric within each dimension[1] for 168 countries and merging everything in a score ranging from 0 to 100. The obtained scores for each country are ranked from the highest to the lowest clustered in tiers. Each tier refers to a level of social development and is composed of countries that share broad similarities in social/human development matters. Six tiers are displayed with tier 1 representing the highest scoring countries while tier 6 represents the lowest scoring.

Each subpanel will comprise its corresponding SPI tier, e.g., subpanel 1 includes the countries of tier 1 except for subpanel 5 which includes both tiers 5 and 6 to ensure statistical robustness of the results for countries with lower scores.[2] Annex Table 4 in the annex section provides a summary of the countries included in each tier and subpanel that will be used for the panel analysis.

The motivation for the choice of the SPI lies partly on its relative completeness when opposed to other social/human development indices and partly on its comprehensiveness in assessing the development level of a given country. Unlike other metrics for human development, such as the Human Development Index from the United Nations, the SPI holds ground on current and effective domains and is outcome-based rather than based on expectations, e.g., education attainments rather than education expectations are used.

This metric poses some challenges too. The first is the availability of data on financial indices for lower-tier countries, which led this study to merge tiers 5 and 6 into one subpanel. The second is related to the choice of which year's score to use since this implies a mismatch between the periods available of data for the other variables. A plausible solution could be the use of the average score of the countries for the past 20 years, however, this would potentially mask any evolution in the sample. Another solution is to use the most recently available data (2021) as the nature of the index makes it reasonable to assume that the result each year is certainly an accumulation of the country's past 20 years of social progress. We opted for the second solution because we found it strongly plausible to assume that the current position of the countries in the SPI ranking is an outcome of their historical evolution.

[1] Stern et al. (2021) for the detailed index.
[2] Further explored in the annex section.

3.2 Subpanels descriptive analysis

Before analyzing the panel results, we first provide an overview of the countries analyzed and their stance on financial and economic growth, using the 20-year average of the variables GDP/capita level and growth and Financial Development Index over the period comprising 2000-2019.

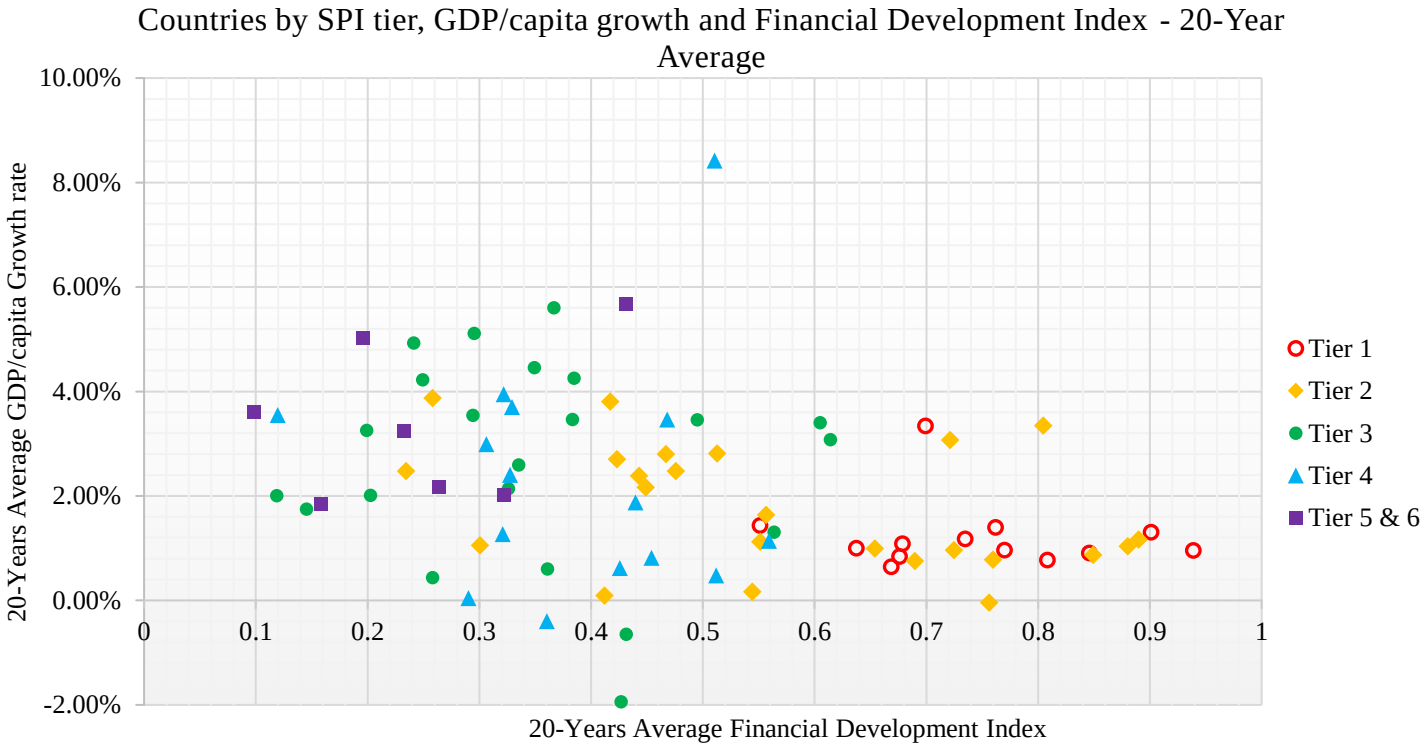

Figure 1: Countries by SPI tier, GDP/capita growth and Financial Development Index – 20-Year Average

Source: Authors' calculations.

On a broader perspective, according to Figure 1 that presents the plot of the 20-year average of the financial development index and GDP/capita growth rates across SPI tiers and countries, higher-ranked countries in the SPI are associated with higher financial development levels but come short on GDP/capita growth rates. Conversely, lower scores on the SPI come about with lower financial development levels but higher GDP/capita growth rates. This fact is also highlighted by the correlation between the financial development index and GDP/capita growth rates which exhibit a value of -15.28% in tier 1 decrease to -42.19% in tier 2 increases to -7.57% in tier 3, becoming positive, yet, next to insignificant at 0.30% in tier 4 and further increasing for tiers 5 and 6 to 32.01% (see Annex Table 6

for the correlation results). The pooled-country result is that higher levels of financial development can be traced to lower rates of GDP/capita growth and *vice-versa*, showing a negative correlation between the financial development index and GDP/capita growth rates of 35%. Figure 1 also shows that most countries that have high levels of financial (0.6<) development have an average income per capita growth below 2%, which includes all countries in tier 1, except New Zealand. Contrarywise, the majority of countries that have higher rates of growth (>2%) are the ones with mid-low (<0.6) financial development and are mostly from tiers 3 and below. For countries of the lowest tiers, this trend is even stronger, with all countries having average growth rates starting from around 2% and reaching higher rates while showing the lowest levels of financial development.

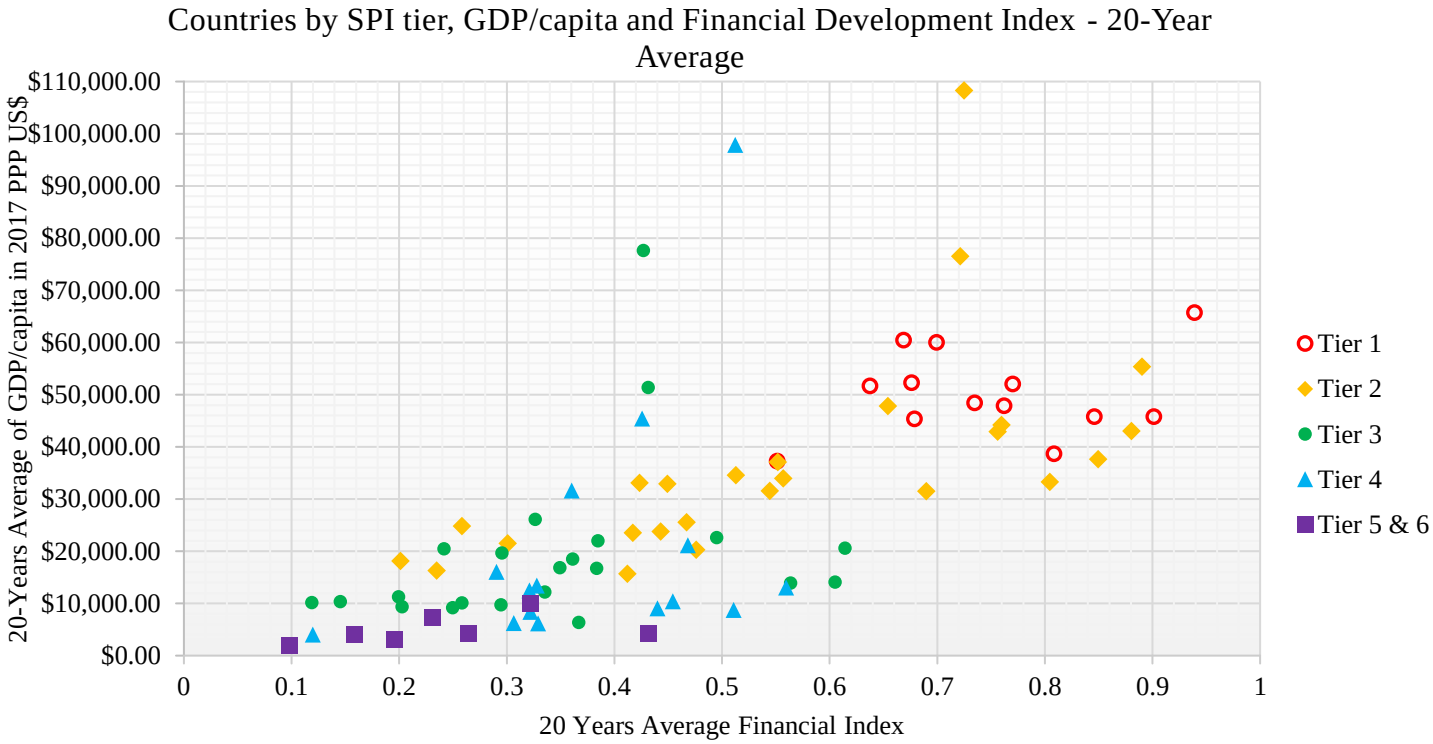

Figure 2: Countries by SPI tier, GDP/capita (International 2017 PPP $USD) and Financial Development Index – 20-Year Average

Source: Authors' calculations.

When GDP/capita is analyzed per tier (Figure 2, that displays the plot of the financial development index in its 20-year average against the 20-year average of GDP/capita levels across tier, by country), an explicit trend emerges – as lower tiers are reached, lower levels of GDP/capita are correspondingly found. The SPI Executive Report (2021) also highlights this conclusion and characterizes it as a strongly positive relationship. The same paper indicates that this relationship is not linear, meaning that countries with lower GDP/capita are more prone to improve the SPI Score as GDP/capita levels increase than higher-income countries. Despite the verified trend, some countries have similar levels of GDP/capita and do not share a similar position in the SPI tiers, thus the level of social development is not solely

derived from the income per capita. Likewise, countries with a similar level of financial development do not necessarily have similar GDP/capita levels. Despite low-income countries tending to be the ones less financially developed, the figures are not so evident, especially for countries with financial indices ranging from 0.4 to 0.6, where countries with different levels of GDP/capita can be found. Tiers 1 and 2 prevail in the upper-right region of the graph– the highest tiers, meaning that the most financially developed and highest-income countries are the ones that also have the highest social progress scores. The correlation between financial development and GDP/capita levels for the pooled countries is 68%, as opposed to the negative correlation between the financial development index and GDP/capita growth rates (Annex table 6 for the correlation calculations).

The sample of 82 countries can be divided into three major groups according to the relationships expressed between financial development and economic activity: countries with the financial development index between 0.6 and 1 which are the countries that also display the lowest GDP/capita growth rates but also the highest levels of GDP/capita. The ones with the financial development index between 0.4 and 0.6, which is the middle-income group that has medium-high GDP/capita growth rates. Finally, the countries with the financial development index values below 0.4, which have the lowest levels of GDP/capita but at the same time are the fastest-growing economies out of the sample. We provide an overview of what these groups entail in terms of geopolitical, geographical, and socioeconomic aspects. Annex table 5 displays the countries present in each of these 3 groups

Countries with a financial development index between 0.6 and 1

Amongst the 24 countries, 22 belong to tiers 1 and 2 while only two of them, Thailand and Malaysia are from tier 3. The majority of those nations are high-income (above 30, 000US$/capita), industrialized, and integrated into the OECD cluster. All G10 members are included in this group. Accordingly, 62% of those countries are considered to be "full democracies" by Democracy Index 2021[3] made by the Economist Intelligence Unit, meaning that they have excellent performance in terms of government functioning, media freedom and diversity, political culture, and independence of the judiciary system. The remaining 38% of countries are said to be "flawed democracies", which are countries that, despite having free and fair elections, and basic social individual guarantees, still display some issues, especially regarding the political participation as well as the quality of governance and political culture. Regarding the geopolitical aspects of those nations, 58% are European Union countries, 66,6% are European countries (none from Eastern Europe), and 21% are from Asia. No African, Latin American, Middle East, Central Asian, Southern Asian, or Northern Asian nation is showing 20-year averages that would place them in the upper levels of financial development.

[3]Democracy Index 2021: The China Challenge, Economist Intelligence Unit (2022), London: EIU. Available at: https://www.eiu.com/n/campaigns/democracy-index-2021

Countries with a financial development index between 0.4 and 0.6

In contrast with the first group which includes only upper-tier countries, countries with an intermedium level of financial development integrate almost every tier of the SPI: one country in tier 1 (New Zealand), ten countries in tier 2, four countries in tier 3, seven countries in tier 4 and one country in Tier 5 (India).

The countries of this group are geographically spread, but it is possible to divide them into 4 subsets. The first subset is the BRICS (Brazil, Russia, India, China, and South Africa) which is a group of countries characterized by having fast industrialization processes and fast-growing economies over the last 20 years. The second subset of countries are the Eastern European economies, which have been developing areas such as education and have been implementing new regulations regarding their financial systems and trade structures, e.g., reducing barriers to trade. The two last subsets, the Arabian Peninsula countries and Barbados, Chile, and Namibia have been following similar policy paths as the Eastern European economies but have also improved other areas such as innovation and R&D.[4] Most of the countries in the group of medium financial development countries are producers of commodities.

Countries with a financial development index below 0.4

This group of countries includes countries from Latin America and the Caribbean, South America, nearly all the regions in the African continent, South and East Asia, and two Eastern European countries. The majority belongs to the lowest tiers of the SPI. Four countries from Tier 2, sixteen countries from Tier 3, eight countries from Tier 4, and six countries from Tier 5 & 6.

Latin America and the Caribbean region is characterized by having slow economic growth. Despite the challenges, efforts have been made by these nations to overcome poverty and improve education, infrastructures, and digitalization. The countries from this group that can be found in the East Asia and Pacific region present rapid urbanization but the delivery of opportunities to populations struggle to keep up with the pace of the increasing urban development, namely the access to jobs, infrastructures, housing, and sanitation is not the same for all regions. Beyond that, another factor that makes it difficult to proceed towards development is due to frequent risks of natural disasters. In the case of South Asia, poverty, fragile and unstable governments, and exposure to natural disasters are factors that characterize and impact many countries. It is also characterized by structurally distorted economies in some regions. The African region of this group is depicted by lack of opportunities, access to education, and other basic services to the population. Moreover, some societies can sometimes present a non-secure environment with propensity for violence and conflicts. Although the African region is still considered to be the poorest region in the world, improvements have been made to reduce poverty. Programs have

[4] More information available at: www.oecd.org/economy/ and www.oecdbetterlifeindex.org.

been implemented to deliver opportunities to individuals for their personal development and to prepare the economies for transitioning to technology and digital sectors.[5]

3.3 Econometric models

This part of the methodology deals with the econometric methods and structural equations to be estimated. The two equations that will be estimated are:

Equation 1: GDP/capita explained by the mid-level financial development indices

$$\ln Ypop_{i,t} = \alpha + \beta_1 \times AugFI_{i,t} + \beta_2 \times AugFM_{i,t} + c_i + \varepsilon_t$$

Equation 2: GDP/capita explained by specific financial development indices

$$\ln Ypop_{i,t} = \alpha + \beta_1 AugFID_{i,t} + \beta_2 AugFIA_{i,t} + \beta_3 AugFIE_{i,t} + \beta_4 AugFMD_{i,t} + \beta_5 AugFMA_{i,t} + \beta_6 AugFME_{i,t} + c_i + \varepsilon_t$$

Where the subscript i denotes the countries (cross-units) and t the period, c_i denotes the country-specific effects, α the intercept, the β_j's the coefficients of the corresponding variables, and ε_t the error term. The models will have the natural logarithm of GDP/capita measured in PPP 2017 dollars (lnYpop) as the dependent variable.[6] The independent variables will be the indices developed by the IMF, in turns according to their specificity levels: Financial markets index and financial institutions index (Equation 1), at the middle level of specificity and financial institutions access (FIA), depth (FID) and efficiency (FIE) indices jointly with financial markets access (FMA), depth (FMD), and efficiency (FME) indices. (Equation 2) at the most specific level. The independent variables were transformed, and the new transformed variables will be prefixed with "Aug". The following transformation on each of the previous indices was done: multiplying the index by 100 and taking its natural logarithm. The underlying reasoning for the transformation is twofold: first, to extract the elasticities on each of the estimated models, that is, what is the percentage increase in GDP/capita given a 1% increase in the different explanatory variables used. Second, to create a better notional understanding of what changes in the indices entail.

The estimation will be done with four methods for each of the 5 subpanels: the standard approach of random and fixed effects estimators for panel data and the General Method of Moments (GMM) robust dynamic estimators one and two-step estimations, developed by Arellano and Bover (1995) and Blundell and Bond (1998). The first two regression methods evaluate the static relationships, the differences lie only in the way the fixed country effects are dealt with since in the first they are assumed to be zero and

[5] More information available at: www.worldbank.org/en/region/lac/overview; www.worldbank.org/en/region/eap/publication/east-asia-and-pacific-cities-expanding-opportunities-for-the-urban-poor; www.unicef.org/rosa/social-inclusion-and-policy; www.worldbank.org/en/region/afr/brief/social-inclusion-in-africa.

[6] As the unit root tests hinted at present unit rots, the log transformation was applied (lnYpop) to dispose of non-stationarity. For the complete results of the unit root tests on the variables please see Annex Table 7 and Annex Table 8
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the latter assumed there are country-fixed effects and adds them to the error term. The other two estimation methods, the GMM one, and two-step allow the grasp of dynamic relationships and are able to deal with endogenous regressors and reduce bias in the estimates. They are designed for panels with a reduced number of periods and a large number of countries (Roodman, 2009). Using four different estimation methods, it is possible to ensure the robustness of the results if the same estimates point towards the same conclusion all or most methods.

A Non-Granger causality test (Dumitrescu and Hurlin, 2012) of the broadest measure (financial development index) on GDP/capita, considering 1,2,3, and 4 lags will also be performed because it allows the evaluation of the proceeding (or not) nature of the index relative to economic growth.

The results will be presented in the next section.

4. Results

Non-Granger causality test (Dumitrescu and Hurlin, 2012)

Lag order	1			2			3			4		
Statistics	W-bar	Z-bar	Z-bar tilde	W-bar	Z-bar	Z-bar tilde	W-bar	Z-bar	Z-bar tilde	W-bar	Z-bar	Z-bar tilde
Pooled data	2.685	10.789	7.728	4.757	12.485	7.631	6.738	13.818	6.526	8.925	15.767	4.390
(p-values)		0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.000
Subpanel 1	1.369	0.940	0.450	6.928	8.885	5.794	8.740	8.449	4.340	1.030	8.962	2.855
(p-values)		0.347	0.653		0.000	0.000		0.000	0.000		0.000	0.004
Subpanel 2	3.001	7.075	5.142	5.500	8.750	5.520	7.412	9.007	4.417	9.426	9.593	2.790
(p-values)		0.000	0.000		0.000	0.000		0.000	0.000		0.000	0.005
Subpanel 3	2.557	5.164	3.671	3.929	4.523	2.584	6.986	7.632	3.661	8.796	7.953	2.186
(p-values)		0.000	0.000		0.000	0.010		0.000	0.000		0.000	0.029
Subpanel 4	3.563	7.018	5.186	3.069	2.070	0.962	3.534	0.845	-0.201	5.379	1.889	-0.125
(p-values)		0.000	0.000		0.039	0.336		0.398	0.840		0.059	0.901
Subpanel 5	2.523	2.849	2.021	4.298	3.040	1.801	6.696	3.993	1.880	1.228	6.761	2.171
(p-values)		0.004	0.043		0.002	0.072		0.000	0.060		0.000	0.030

Table 1: Results from the Dumitrescu and Hurlin (2012) Non-Granger causality test

Source: Authors' calculations using STATA statistical software.

Dumitrescu and Hurlin (2012) non-Granger causality test consist of a null hypothesis that there is no Granger causality for all countries (cross-units) of the panel against an alternative that there is causality for at least one country in the panel[7]. The results from the test demonstrate that there is evidence pointing toward the existence of panel Granger causality between economic growth and financial development, more precisely the financial development index in at least one country for the pooled data given the past 1-4 years of the index. The results for the non-Granger causality tests for subpanels are rather homogenous, this implies that the countries in our sample tend to have financial development being followed by economic growth. The results in subpanels 3 and 5 are slightly weaker, as the rejection statistics are not as robust. The only exceptions are subpanel 4, where the existence of Granger causality

[7] P-values below 10% or 5% indicate that the null hypothesis is rejected at those levels and there is evidence to state that there is Granger-causality in at least one country in the panel being tested.

from financial development to GDP/capita can be rejected for 2, 3 and 4 lags and subpanel 1, where Granger causality with 1 year precedency is not observed.

GDP/capita explained by general institutions and markets: equation 1 results.

Dependent variable				Financial Institutions		Financial markets		Intercept	
ln(GDP/capita)	Model	Obs	Wald/F	Coefficient		Coefficient		Coefficient	
Pooled data	RE	1640	0.000	0.838	***	0.016		6.638	***
	FE		0.000	0.827	***	0.007		6.712	***
	GMM 1		0.000	1.176	***	0.809	**	2.643	**
	GMM 2		0.000	1.142	***	0.407	***	4.168	***
Subpanel 1	RE	260	0.024	-0.186		0.161	**	10.935	***
	FE		0.112	-0.195		0.157	*	10.989	***
	GMM 1		0.000	-0.392		0.336		11.081	***
	GMM 2		0.000	-0.435		0.300		11.436	***
Subpanel 2	RE	500	0.000	0.838	***	-0.012		6.990	***
	FE		0.000	0.832	***	-0.024		7.059	***
	GMM 1		0.000	1.017	***	0.006		6.190	***
	GMM 2		0.000	1.014	***	0.009		6.196	***
Subpanel 3	RE	440	0.000	0.747	***	-0.027		7.021	***
	FE		0.000	0.749	***	-0.032		7.031	***
	GMM 1		0.000	0.776	**	0.437		5.535	***
	GMM 2		0.000	0.684	*	0.450		5.789	***
Subpanel 4	RE	300	0.000	1.028	***	0.101	**	5.417	***
	FE		0.000	1.032	***	0.098	*	5.410	***
	GMM 1		0.000	1.315	***	-0.063		4.915	***
	GMM 2		0.000	1.137	***	-0.021		5.422	***
Subpanel 5	RE	140	0.000	1.177	***	-0.063		4.734	***
	FE		0.005	1.175	***	-0.075		4.770	***
	GMM 1		0.000	1.030	***	-0.263		5.730	***
	GMM 2		0.000	0.834		-0.004		5.887	***

Table 2: Results for Equation 1, economic growth explained by financial development mid-level indices

Source: Authors' calculations using STATA statistical software.

*** Statistically significant at a 1% level
** Statistically significant at a 5% level
* Statistically significant at a 10% level
Robust standard errors used

RE-Random effects estimation, FE-Fixed effects estimation, GMM 1 and 2- one step and two-step Generalized Method of Moments estimation, respectively.

The results from Table 2 (Equation 1) show that the financial institutions index (FI) is a positive determinant of economic growth for the pooled-country analysis. Here we find evidence that improving the overall functioning of financial institutions is able to expand GDP/capita by near 1% for each extra 1% in the FI index. The financial markets index (FM) is of no use to explain GDP/capita when static relationships are considered. However, going to the dynamic differences' estimators, the coefficients become statistically significant albeit showing a smaller magnitude when compared to financial institutions. These results provide an answer to Hypothesis I: improving the financial system will improve the economic performance of countries, highlighting the more noteworthy role of financial institutions, and confirming the findings of King and Levine (1993) a and b) and Khan and Senhadji (2003).

Comparing the subpanels, for financial institutions (FI), only subpanel 1 shows different results, and that is, for subpanel 1 financial institutions have no impact on economic growth. All of the other subpanels share both significance and economic magnitude with the pooled results.

On the pooled analysis, financial markets were able to produce a dynamic effect on GDP/capita, this conclusion is less evident in the subpanel context: it doesn't hold for subpanels individually. For subpanels 1,2,3 and 5 financial markets display no effect on economic growth. Subpanel 4, the countries with mid- and low-income but not the lowest income economies show a more interesting result, and that is, there is only a static effect on GDP/capita of around 1% (having statical significance in both the random and fixed effects models), yet it is not sufficient to claim that there is a robust positive effect.

GDP/capita explained by specific domains within institutions and markets: equation 2 results

Dependent variable				Financial Institutions			Financial Markets			
ln(GDP/capita)				Access	Depth	Efficiency	Access	Depth	Efficiency	Intercept
	Model	Obs	Wald/F	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Pooled data	RE	1640	0.000	0.335 ***	0.096 *	0.137 ***	0.030	0.054 **	-0.031 ***	7.664 ***
	FE		0.000	0.331 ***	0.092	0.139 ***	0.021	0.050 **	-0.032 ***	7.726 ***
	GMM 1		0.000	0.717 ***	-0.486 *	-1.133 **	0.239 *	0.377 ***	-0.039	7.687 ***
	GMM 2		0.000	0.693 ***	-0.287 *	-0.248	0.414 **	0.561 ***	-0.057	10.729 ***
Subpanel 1	RE	260	0.000	-0.119 **	0.018	-0.110	0.050	0.125 ***	0.006	10.917 ***
	FE		0.002	-0.139 *	0.017	-0.083	0.030	0.128 ***	0.010	10.941 ***
	GMM 1		0.000	-0.113	-0.025	-0.837 ***	0.219 **	0.383 *	0.010	12.330 ***
	GMM 2		0.000	-0.217	-0.554	-0.382	0.151	0.376	-0.019	13.563 ***
Subpanel 2	RE	500	0.000	0.277 ***	0.327 ***	0.199 ***	-0.003	0.002	-0.020	7.271 ***
	FE		0.000	0.274 ***	0.328 ***	0.198 ***	-0.007	-0.006	-0.020	7.323 ***
	GMM 1		0.000	0.275	0.477 ***	0.345	0.115	-0.050	-0.027	5.890 ***
	GMM 2		0.000	0.242	0.548 *	0.388	0.122	-0.076	-0.014	5.632 ***
Subpanel 3	RE	440	0.000	0.367 ***	-0.064	0.172 ***	0.053 **	0.045	-0.053 **	7.789 ***
	FE		0.000	0.363 ***	-0.049	0.166 **	0.051 ***	0.036	-0.053 **	7.811 ***
	GMM 1		0.000	0.431	-0.634	0.053	0.002	0.681 ***	-0.090 *	8.198 ***
	GMM 2		0.000	0.422 **	-0.342	0.140	0.031	0.356	-0.065	7.751 ***
Subpanel 4	RE	300	0.000	0.380 ***	0.077	0.180 *	-0.005	0.069 **	-0.017	7.151 ***
	FE		0.000	0.378 ***	0.085	0.179	-0.011	0.067 *	-0.016	7.155 ***
	GMM 1		0.000	0.597 ***	-0.688 ***	-0.253	0.303 ***	0.489 ***	-0.277 **	9.107 **
	GMM 2		0.000	0.444 **	-0.143	0.434	0.009	0.084	-0.016	6.484 ***
Subpanel 5	RE	140	0.000	0.155	-0.265	0.578	0.048	0.319 ***	-0.092	5.717 **
	FE		0.003	0.425 ***	0.094	-0.124	0.055	0.092 **	-0.063 **	7.586 *
	GMM 1		0.000	0.308	-0.430	1.100	-0.076	0.187	-0.083 *	4.088
	GMM 2		0.000	0.564	-1.358	-2.182	-0.707	0.524	0.440	17.774

Table 3: Results for Equation 2, economic growth explained by financial development specific indices

Source: Authors' calculations using STATA statistical software.

*** Statistically significant at a 1% level
** Statistically significant at a 5% level
* Statistically significant at a 10% level
Robust standard errors used

Table 3 presents the estimates for Equation 2, and from its analysis, it is possible to settle that access to financial institutions (FIA) is a positive determinant of growth, the elasticity ranges from around 0.33% to 0.72% for the pooled data. Financial institutions depth (FID) is significant for the two static

regressions[8] but shows a very small elasticity of around 0.09%, rendering it not a strong determinant of GDP/capita. On the dynamic estimations, the impact reverses, and its effect is negative and more significant, implying that increasing FID leads to a fall in GDP/capita ranging from 0.29% to 0.49%. Financial institutions' efficiency induces positive effects on GDP/capita on static models and negative on the dynamic, nonetheless, this last one poses a much stronger reduction, ranging from 0.25% to 1.14%. Access to financial markets is not significant for the random and fixed effects and is significant for the others. The impact is also a relatively weak positive, with elasticities of 0.41% and 0.24% for the GMM one and two-step estimations, respectively. Financial markets depth determines GDP/capita with statistical significance for all equations although the impact is next to irrelevant for the static. The dynamic impact is almost tenfold stronger at 0.38% for the one-step and 0.56% for the two-step. Financial markets efficiency negatively affects GDP/capita for the first regressions and loses significance on the dynamic estimations. The impact it shows on the random and fixed effects regressions is of very small economic meaning, with elasticities around -0.03%.

Considering again these specific indices within financial institutions and markets, the results for the subpanels are not homogenous. In the first-tier countries, access to financial institutions (FIA) has the reverse effect of the result in pooled data on economic growth, although there is only statistical significance for a negative impact on GDP/capita in static estimations with not too impressive coefficients of -0.12% and -0.14% for the random and fixed effects models, respectively. Subpanel 2 shows similar results to subpanel 1 in what regards to the models that are significant, but the effect is positive instead, maintaining no significance in the dynamic estimations and with the magnitude of the results not too different from pooled analysis effect of FIA. In subpanels 3 and 4, the evidence revealed is that these countries benefit in GDP/capita when they improve access to financial institutions, similarly to the general trend of the pooled analysis. The depth of financial institutions (FID) is not significant to determine growth in subpanels 1, 3, and 4. The estimations for subpanel 2 contradict the pooled results, with FID being a positive determinant of growth both at static and dynamic estimations. In subpanel 1, the impact of the efficiency of institutions (FIE) is similar to the pooled result. Both contradict the effects expressed in countries belonging to the second and third tiers of the SPI, in which FIE exerts only static effects on GDP/capita. The case for no effect of FIE on economic growth is expressed in subpanel 4 (and also 5).

The effects obtained for domains connected to financial markets are slightly more consensual than institutions, this holds if subpanel 2 is not included because there is not a statistically significant effect of financial market subindices on economic growth for these countries. The depth and efficiency of financial markets indicate results that confirm most of the pooled data results. Subpanel 5 is the outlier for both institutions and markets because the results demonstrate that measuring financial development in its more specific domains shows little evidence of any impact at all.

[8] There is no statical significance at 10% level for the fixed effects regression, however, the reported p-value is of 10.1%.

The estimated coefficients for equations 1 and 2 reveal that there is evidence to believe Hypothesis II: the strength and direction of influence (detrimental or beneficial) of financial development on economic growth are not the same for different levels of development. In more general terms, seven conclusions emerge. First, financial development, although not generally and with varying strengths can have a positive effect on economic growth (Hypothesis I). Second, in general terms, the static impacts of financial development appear weaker when compared to dynamic effects. Third, the most developed economies (belonging to tier 1, also the economies with the lowest growth rates and highest levels of financial development) enjoy little or no growth with the improvement of the financial system in specific domains, similarly to the lower SPI scoring countries (in tiers 5 and 6, which have the lowest levels of financial development and higher GDP/capita growth rates) which demonstrate weak effects of access to, depth and efficiency of the financial system on growth too, albeit higher. This first conclusion could hint at an inverted "U" relationship between financial development and economic growth as it is possible to observe both highest and lowest SPI scores in the same stance. It should also be noted that if the economies of countries from tiers 5 and 6, that have the lowest levels of financial development are growing and it is not due to the financial system evolution, and if the economies from tier 1 are growing slower but have the highest levels of financial development, then it could mean that the development of the financial system could be led by economic growth. Fourth, the functioning of financial institutions has a positive impact for all tiers except for tier 1, where it has no impact, implying that the positive effect of financial institutions fuels out as countries achieve the highest SPI score. Fifth, the positive effect of financial institutions tends to decrease with the increase in human development levels (with the exception of subpanel 2 where the effect increases slightly comparatively to subpanel 3 but in subpanel 1 the effect ceases to exist), meaning that stronger financial institutions benefit fewer countries that are more developed. This is also illustrated by the fact that there is no significant impact of the financial institutions index for tier 1, as previously mentioned. Sixth, financial markets are not strong drivers of economic growth, for all levels of development. Seventh, the access and depth of the financial system come as the most relevant subdomains of financial development to determine growth. This result comes as no surprise given that depth was the main domain used in the literature concerned with the effect of financial development on economic growth.

5. Conclusion and final remarks

The results obtained from our models on each of our subpanels revealed in the evidence that leads to the confirmation of Hypothesis I and Hypothesis II: the financial system can be a driver of economic growth, although not always generally and the strength and direction of influence (detrimental or beneficial) of financial development on economic growth are not the same for different levels of development. On the general matter of the financial development, the most developed economies

(belonging to tier 1 and being the economies with the lowest growth rates and highest levels of financial development) enjoy little or no growth with the improvement of the financial system in specific domains. Taking into account the development of financial institutions, our findings suggest the functioning of financial institutions has a positive impact on economic growth in most of our subpanels. However, this positive effect weakens with higher levels of Social Progress culminating in the finding of no impact of this metric for countries belonging to tier 1. Considering financial markets, the result obtained was that financial markets' development has a null to poor significance to economic growth, for all levels of human development. The results also suggest that access to and depth of the financial system, i.e., "how much" financial activity is taking place and access of economic agents to the two branches of the financial system are the key subdomain drivers of economic growth. We also found out from analyzing the countries that there is a strong correlation between the financial development index and levels of GDP/capita and not so strong but negative correlation with growth rates of the GDP/capita.

The conclusions reached by this paper are in line with the results obtained by Calderón and Liu (2003), Hassan et al (2011), and Nguyen et al. (2021), i.e., the confirmation of Hypothesis II (the strength and direction of influence (detrimental or beneficial) of financial development on economic growth are not the same for different levels of development).

One limitation that also functions as a possible future pick-up point is the use of the Social Progress Index, it is an aggregate measure of selected domains that can fail to capture some of the relevant aspects of human and social development. Using other measures to evaluate human and social development can be useful to test the robustness of the results obtained.

Future work on this topic can explore further the social and human development levels and how they affect the connections between finance and growth, for instance, not only the influence of the financial sector on economic growth (as we studied here) but the reverse relationship, i.e., the impact of economic growth on the financial sector. Evidence found in this paper reveals that the economies of the lowest tiers have the lowest levels of financial development and are still growing not as a consequence of the financial system. The highest tier economies are sluggishly growing but at the same time have the highest levels of financial development, so financial development could be led by economic growth instead or even be a mutually reinforcing relationship. In line with this last suggestion, a study that considers the possibility of a threshold for financial development levels for which the relationship it has with growth suffers changes would also be relevant. We also find that it could also be insightful to explore our results but accounting for pre- and post-2007 financial crisis, if the crisis had a significant effect on the relationship between the financial sector and economic growth then it could mask any evolution over the grouped periods of 2000-2019.

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Appendix

Annex tables

Category	Indicators
Financial Institutions	
Depth	Private-sector credit to GDP
	Pension fund assets to GDP
	Mutual fund assets to GDP
	Insurance premiums, life and non-life to GDP
Access	Bank branches per 100,000 adults
	ATMs per 100,000 adults
Efficiency	Net interest margin
	Lending-deposits spread
	Non-interest income to total income
	Overhead costs to total assets
	Return on assets
	Return on equity
Financial Markets	
Depth	Stock market capitalization to GDP
	Stocks traded to GDP
	International debt securities of government to GDP
	Total debt securities of financial corporations to GDP
	Total debt securities of nonfinancial corporations to GDP
Access	Percent of market capitalization outside of top 10 largest companies
	Total number of issuers of debt (domestic and external, nonfinancial and financial corporations)
Efficiency	Stock market turnover ratio (stocks traded to capitalization)

Annex Table 1:Composition of financial development indices

Source: Adapted from Svirydzenka (2016).

Variable name	Short name	Description	Source
Financial Development Index	FD	Measure of financial development	IMF databases
Financial Institutions Access Index	FIA	Measure of financial development	IMF databases
Financial Institutions Depth Index	FID	Measure of financial development	IMF databases
Financial Institutions Efficiency Index	FIE	Measure of financial development	IMF databases
Financial Institutions Index	FI	Measure of financial development	IMF databases
Financial Markets Access Index	FMA	Measure of financial development	IMF databases
Financial Markets Depth Index	FMD	Measure of financial development	IMF databases
Financial Markets Efficiency Index	FME	Measure of financial development	IMF databases
Financial Markets Index	FM	Measure of financial development	IMF databases
Gross Domestic Product per capita	Ypop	GDP expressed in constant international 2017 dollars per person. Data are derived by dividing constant price purchasing-power parity (PPP) GDP by total population.	IMF databases
Natural logarithm of GDP per capita, PPP (constant 2017 international $)	lnYpop		Own calculations
Natural log of Financial Institutions Access Index x100	AugFIA		Own calculations
Natural log of Financial Institutions Depth Index x100	AugFID		Own calculations
Natural log of Financial Institutions Efficiency Index x100	AugFIE		Own calculations
Natural log of Financial Institutions Index x100	AugFI		Own calculations
Natural log of Financial Markets Access Index x100	AugFMA		Own calculations
Natural log of Financial Markets Depth Index x100	AugFMD		Own calculations
Natural log of Financial Markets Efficiency Index x100	AugFME		Own calculations
Natural log of Financial Markets Index x100	AugFM		Own calculations

Annex Table 2: Variables description, short name and sources

Source: Authors.

Variable		Mean	Std. dev.	Min	Max	Observations
Ypop	overall	28,450.95	22,102.35	1,394.00	116,493.50	N = 1640
	between	21,831.39	1,998.46	108,332.40		n = 82
	within	4,174.87	5,897.18	58,004.32		T = 20
FD	overall	0.4722	0.2200	0.0616	1.0000	N = 1640
	between	0.2162	0.0981	0.9390		n = 82
	within	0.0469	0.3059	0.6173		T = 20
FIA	overall	0.4541	0.2690	0.0141	1.0000	N = 1640
	between	0.2558	0.0368	0.9980		n = 82
	within	0.0876	0.0908	0.7787		T = 20
FID	overall	0.4014	0.2812	0.0247	1.0000	N = 1640
	between	0.2777	0.0533	0.9625		n = 82
	within	0.0536	0.1172	0.6194		T = 20
FIE	overall	0.6222	0.1085	0.1161	0.8700	N = 1640
	between	0.0859	0.3862	0.7658		n = 82
	within	0.0669	0.3023	0.9106		T = 20
FI	overall	0.5197	0.2139	0.0846	1.0000	N = 1640
	between	0.2077	0.1792	0.9611		n = 82
	within	0.0558	0.3014	0.7067		T = 20
FMA	overall	0.4068	0.2745	0.0006	1.0000	N = 1640
	between	0.2648	0.0020	1.0000		n = 82
	within	0.0778	-0.0338	0.7805		T = 20
FMD	overall	0.3923	0.2967	0.0076	1.0000	N = 1640
	between	0.2881	0.0145	0.9836		n = 82
	within	0.0771	0.0997	0.7001		T = 20
FME	overall	0.4232	0.3724	0.0006	1.0000	N = 1640
	between	0.3471	0.0024	1.0000		n = 82
	within	0.1399	-0.2477	1.2680		T = 20
FM	overall	0.4104	0.2557	0.0125	1.0000	N = 1640
	between	0.2483	0.0140	0.8921		n = 82
	within	0.0666	0.1471	0.6683		T = 20
lnYpop	overall	9.9231	0.8832	7.2399	11.6656	N = 1640
	between	0.8728	7.5804	11.5915		n = 82
	within	0.1646	9.0911	10.6242		T = 20
AugFIA	overall	3.5744	0.7886	0.3447	4.6052	N = 1640
	between	0.7312	1.1790	4.6032		n = 82
	within	0.3056	2.1083	4.8104		T = 20
AugFID	overall	3.3930	0.8303	0.9046	4.6052	N = 1640
	between	0.8116	1.6137	4.5662		n = 82
	within	0.1959	2.2870	4.1612		T = 20
AugFIE	overall	4.1122	0.2054	2.4515	4.4659	N = 1640
	between	0.1559	3.5811	4.3374		n = 82
	within	0.1347	2.9825	4.6764		T = 20
AugFI	overall	3.8558	0.4534	2.1356	4.6052	N = 1640
	between	0.4334	2.8786	4.5652		n = 82
	within	0.1411	3.0432	4.3508		T = 20
AugFMA	overall	3.1189	1.5322	-2.7629	4.6052	N = 1640
	between	1.5106	-2.0106	4.6052		n = 82
	within	0.3035	0.7869	5.2837		T = 20
AugFMD	overall	3.2510	1.0556	-0.2742	4.6052	N = 1640
	between	1.0151	0.3389	4.5885		n = 82
	within	0.3095	1.2605	4.3785		T = 20
AugFME	overall	3.0556	1.4544	-2.8003	4.6052	N = 1640
	between	1.3710	-1.4356	4.6052		n = 82
	within	0.5073	-0.7888	5.4836		T = 20
AugFM	overall	3.3928	0.9633	0.2206	4.6052	N = 1640
	between	0.9388	0.3298	4.4908		n = 82
	within	0.2382	1.5416	4.8064		T = 20

Annex Table 3: Variables statistically descriptive overview

Source: Authors' calculations using STATA statistical software.

Country	Tier	Subpanel	Country	Tier	Subpanel
Australia	1	1	Ecuador	3	3
Austria	1	1	Jamaica	3	3
Canada	1	1	Kazakhstan	3	3
Denmark	1	1	Kuwait	3	3
Finland	1	1	Malaysia	3	3
Germany	1	1	Mauritius	3	3
Ireland	1	1	Mexico	3	3
Japan	1	1	Panama	3	3
The Netherlands	1	1	Paraguay	3	3
New Zealand	1	1	Peru	3	3
Norway	1	1	Romania	3	3
Sweden	1	1	Russia	3	3
Switzerland	1	1	Sri Lanka	3	3
Argentina	2	2	Thailand	3	3
Barbados	2	2	Trinidad and Tobago	3	3
Belgium	2	2	Tunisia	3	3
Chile	2	2	Ukraine	3	3
Costa Rica	2	2	United Arab Emirates	3	3
Croatia	2	2	Vietnam	3	3
Cyprus	2	2	Botswana	4	4
Czech Republic	2	2	China	4	4
France	2	2	Ghana	4	4
Greece	2	2	Indonesia	4	4
Hungary	2	2	Iran	4	4
Israel	2	2	Jordan	4	4
Italy	2	2	Lebanon	4	4
Korea	2	2	Morocco	4	4
Luxembourg	2	2	Namibia	4	4
Malta	2	2	Oman	4	4
Poland	2	2	Philippines	4	4
Portugal	2	2	Qatar	4	4
Singapore	2	2	Saudi Arabia	4	4
Slovak	2	2	South Africa	4	4
Slovenia	2	2	Turkey	4	4
Spain	2	2	Bangladesh	5	5
United Kingdom	2	2	Egypt	5	5
United States	2	2	India	5	5
Uruguay	2	2	Kenya	5	5
Brazil	3	3	Nigeria	5	5
Bulgaria	3	3	Tanzania	5	5
Colombia	3	3	Pakistan	6	5

Annex Table 4: Countries by SPI Tier and subpanel

Source: Authors

Country	SPI tier	Country	SPI tier
Countries with a financial development index between 0.6 and 1		Countries with a financial development below 0.4	
Australia	1	Argentina	2
Austria	1	Costa Rica	2
Canada	1	Slovakia	2
Denmark	1	Uruguay	2
Finland	1	Bulgaria	3
Germany	1	Colombia	3
Ireland	1	Ecuador	3
Japan	1	Jamaica	3
Netherlands	1	Kazakhstan	3
Norway	1	Mauritius	3
Sweden	1	Mexico	3
Switzerland	1	Panama	3
Belgium	2	Paraguay	3
France	2	Peru	3
Italy	2	Romania	3
Luxembourg	2	Sri Lanka	3
Portugal	2	Trinidad and T	3
Singapore	2	Tunisia	3
South Korea	2	Ukraine	3
Spain	2	Vietnam	3
United Kingdom	2	Botswana	4
United States	2	Ghana	4
Malaysia	3	Indonesia	4
Thailand	3	Iran	4
Countries with a financial development index between 0.4 and 0.6		Lebanon	4
New Zealand	1	Morocco	4
Barbados	2	Oman	4
Chile	2	Philippines	4
Croatia	2	Bangladesh	5
Cyprus	2	Egypt	5
Czech Republic	2	Kenya	5
Greece	2	Nigeria	5
Hungary	2	Tanzania	5
Israel	2	Pakistan	6
Malta	2		
Poland	2		
Slovenia	2		
Brazil	3		
Kuwait	3		
Russia	3		
United Arab Emirates	3		
China	4		
Jordan	4		
Namibia	4		
Qatar	4		
Saudi Arabia	4		
South Africa	4		
Turkey	4		
India	5		

Annex Table 5: Countries divided by the relationship between the 20-year averages of financial development and GDP/capita levels and growth rates

Source: Authors.

	Financial Development Index and GDP/capita growth rates	Financial Development Index and GDP/capita
Pooled data	-35.02%	68.01%
Tier 1	-15.28%	22.64%
Tier 2	-42.19%	60.28%
Tier 3	-7.57%	30.49%
Tier 4	0.30%	39.15%
Tier 5&6	32.01%	43.98%

Annex Table 6: Correlation coefficient of the 20-year averages between the Financial Development and Index and GDP/capita level and growth rates

Source: Authors' calculations using STATA statistical software.

Unit root tests	Variable	FD	FIA	FID	FIE	FI	FMA	FMD	FME	FM	Ypop
Levin-Liu	t-statistic	-8.575	0.645	-5.488	-10.536	-7.168	-5.464	-6.331	-45.507	-6.235	1.999
	P-value	0.000	0.741	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.977
Dickey–Fuller with Fisher unit-roots	Inverse Chi²	253.762	143.535	205.749	425.432	230.418	287.980	230.496	603.318	271.948	121.315
	P-value	0.000	0.874	0.015	0.000	0.001	0.000	0.001	0.000	0.000	0.995
	Inverse normal	-2.584	3.477	1.256	-7.313	0.777	-4.493	-3.541	-9.621	-4.900	5.106
	P-value	0.005	1.000	0.895	0.000	0.782	0.000	0.000	0.000	0.000	1.000
	Inverse logit	-3.371	3.215	0.453	-9.931	-0.316	-5.070	-3.599	-17.067	-4.976	5.571
	P-value	0.000	0.999	0.675	0.000	0.376	0.000	0.000	0.000	0.000	1.000
	Modified inverse Chi²	4.956	-1.130	2.305	14.435	3.667	6.846	3.672	24.257	5.960	-2.357
	P-value	0.000	0.871	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.991
Hadri (2000) panel unit root	Homoskedastic disturbances across units	63.414	86.471	72.746	39.014	83.296	43.832	57.020	45.777	48.309	80.921
	P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Heteroskedastic disturbances across units	52.453	72.008	66.166	33.906	70.799	35.736	42.855	61.867	31.454	82.101
	P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Serial Dependence: Controlling for serial dependence in errors (lags= 3)	16.764	20.837	19.439	12.578	21.533	13.212	15.782	13.916	13.119	20.822
	P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pesaran's Covariate-augmented Dickey-Fuller	T-bar	-2.152	-2.071	-2.119	-2.089	-2.274	-1.801	-2.131	-1.724	-1.996	-1.339
	P-value	0.000	0.001	0.000	0.001	0.000	0.266	0.000	0.521	0.010	1.000

Annex Table 7: Unit root tests for non-transformed variables

Source: Authors' calculations using STATA statistical software.

Unit root tests	Variable	AugFIA	AugFID	AugFIE	AugFI	AugFMA	AugFMD	AugFME	AugFM	lnYpop
Levin-Liu	t-statistic	-3.311	-10.344	-13.529	-9.429	-6.464	-7.522	-27.509	-7.280	-5.772
	P-value	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dickey–Fuller with Fisher unit-roots	Inverse Chi²	184.009	311.207	489.985	299.235	309.848	283.600	457.029	289.010	188.110
	P-value	0.136	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.096
	Inverse normal	1.734	-2.317	-8.425	-0.978	-5.452	-5.031	-6.213	-5.558	0.707
	P-value	0.959	0.010	0.000	0.164	0.000	0.000	0.000	0.000	0.760
	Inverse logit	1.286	-3.984	-12.084	-3.087	-6.096	-5.434	-11.286	-5.690	0.685
	P-value	0.901	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.753
	Modified inverse Chi²	1.105	8.128	18.000	7.467	8.053	6.604	16.180	6.903	1.331
	P-value	0.135	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.092
Hadri (2000) panel unit root	Homoskedastic disturbances across units	94.958	74.317	36.817	84.280	27.385	53.389	39.975	47.618	96.834
	P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Heteroskedastic disturbances across units	72.076	65.546	32.943	70.079	35.282	44.848	64.178	32.211	81.963
	P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Serial Dependence: Controlling for serial dependence in errors (lags= 3)	23.055	19.976	12.011	22.263	8.012	14.577	12.831	13.221	24.897
	P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pesaran's Covariate-augmented Dickey-Fuller	T-bar	-2.023	-2.170	-2.171	-2.515	-1.771	-2.272	-1.487	-2.066	-1.612
	P-value	0.005	0.000	0.000	0.000	0.360	0.000	0.984	0.002	0.850

Annex Table 8: Unit root tests for transformed variables

Source: Authors' calculations using STATA statistical software.

Tiers data review

Tier	Number of countries positioned in this tier	Number of countries with data availability from (at least) 2000-2019	Countries with data available/ Countries in the tier	Number of Observations (20 periods for each country)
1	14	13	93%	260
2	28	25	89%	500
3	36	22	61%	440
4	30	15	50%	300
5	34	6	18%	120
6	26	1	4%	20
Total	168	82	49%	1640

Annex Table 9: Data availability for the SPI scores

Source: Authors' calculation based on the 2021 Social Progress Index (SPI) by Stern et al (2021).

Regarding data availability, some asymmetries could be found. As shown in Annex Table 9, countries with higher SPI scores are better represented: Tier 1 which has 92.86% of their countries with 20 years of data available for variables selected. As lower tiers are reached, the ratio gets considerably low reaching only 3.85% in tier 6.

Further, regarding the number of countries in each tier, it can be noticed that tiers 2, 3, 4, and 5 contain the largest samples, thus, also considering the ratio of tier representation, it implies a higher number of observations for tiers 2, 3, and 4.

Due to this data distribution, this paper merged tiers 5 and 6 into one single subpanel to acquire statistical robustness when estimating the equations in section 4 presented in 3.3 Econometric models.

Tier	Coefficient of variation of GDP/capita	Coefficient of variation of the Financial Development Index	Coefficient of variation of GDP/capita Growth Rate
1	17%	15%	56%
2	55%	37%	64%
3	82%	39%	510%
4	119%	30%	103%
5 & 6	55%	11%	327%

Annex Table 10: Coefficients of variation of selected variables by SPI tier

Source: Authors' calculations.

In terms of the dispersion range of the available data for the three selected variables by tier generally higher degrees of variation are found on tiers 3,4, and 5&6, which implies that these tiers are the least homogeneous in what concerns financial development and economic growth over time.

Some exceptions are displayed in the Financial Index, where Tier 2 shows a high variation coefficient, while Tier 1 and Tier 5 & 6 display similar results. From the same analysis, it was verified some extravagant results for tiers 4 regarding the GDP/capita variation coefficient and tiers 3, 4, and 5 GDP/capita growth rate which indicates that they have a very dispersed 20-year data.