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The Impact of Financial Sector Development and Sophistication on Sustainable Economic Growth

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Abstract: The drivers of economic growth and development are among the most important issues explored by economic theory. Sustainability of economic development was previously linked by various economic schools of thought to natural resources (agriculture, land, minerals, metals etc.), labor force (including skills, productivity, and education), entrepreneurship or technology and innovation. Capital was later introduced by classical economic theory as the key element. Without significant capital accumulation, all other production factors remain idle. The value added of the production process is a result of the existence, the accessibility and the cost of capital. Therefore, the development and the sophistication of the financial sector has gradually become very important for any nation interested in sustainable growth. This paper investigates the impact of financial sector development, sophistication and performance on economic growth based on a panel regression methodology. We found statistically significant results that confirm the importance of this connection and that are very consistent with economic theory and previous relevant articles and studies.

Keywords: economic development; economic growth; capital; sustainable growth and development; financial sector

1. Introduction

Economic development is one of the central issues explored by economic theory. Economic development is a broader concept than economic growth, comprising very complex mechanisms for distributing the wealth from economic growth and giving importance to various social aspects. However, economic development is always conditioned by economic growth (in the absence of economic growth, sustainable economic development cannot be achieved). Understanding the main drivers of sustainable growth of a nation is important for finding sound solutions to business cycles, for the identification of the most appropriate anti-cyclical public policies and for the enforcement of regulations and institutions in this respect. Capital is placed at the center of these drivers of economic sustainable growth. Capital formation and accumulation should be the key element of any strategy for economic growth. The quality of financial institutions, of regulations and regulatory bodies, the market sophistication and competition significantly improve the cost of capital and tend to lower the risks associated with various financing options. The aim of this paper is to investigate, based on a quantitative analysis (panel data regressions), the importance of financial system development and sophistication for sustainable economic growth. In our model we propose three different dimensions for financial system development and inclusion: (1) financial system development, (2) financial system sophistication and accessibility, and (3) financial system performance, with each of these described by the relevant quantitative and qualitative variables. Our findings are statistically consistent and in line

with previous studies. There are not so many studies in this area, especially with data covering the last economic cycle. Many of studies are focused on the impact of financial inclusion (financial market accessibility) and less on the impact of financial market growth and development or the impact of the financial system's performance on economic growth.

2. Literature Review

There is a large number of theories that attempt to provide an explanation for the process of economic growth and development. Among them, those that point to the accumulation of capital seem to be the most solid ones. Such theories argue that the increase in welfare in society is a result of the process of accumulation in the stock of capital in that particular society. Such a stock of capital leads to the build-up of real capital goods that allow the processes of diversification of production (new lines of production), adoption of more efficient production processes (longer lines of production) and the increase in the availability of consumer goods in such a society, both in terms of quantity and of quality. The building of the stock of capital may be the result of either the process of domestic saving or the import of capital from other economies.

While the core explanation for economic development resides in the accumulation of capital, there are also some mediating factors that can be traced as causality relations. This is a consequence of the fact that the accumulation of capital occurs in a certain institutional framework. The first basic general framework is the institutional framework related to the property rights regime and sound money. Claessens and Laeven argue that "a firm operating in a market with weak property rights may be led to invest more in fixed assets relative to intangible assets because it finds it relatively more difficult to secure returns from intangible assets than from fixed assets" [1] (p. 2402). In such a system, there are correct incentives for all the parties involved: (i) surplus saving units (SSU) provide the incentive to allocate income towards savings and long term, positive real interest rates will encourage this and parties choose between alternative competitive saving channels; (ii) deficit saving units (DSU) are looking for capital in order to finance investment projects with the highest expected rate of return; and (iii) financial intermediaries allocate capital towards the most attractive investment projects as presented by DSUs, and they are able to restructure and repackage savings into investment.

As Wachtel argued, "development economists up until the 1970s often advocated explicit manipulation of the financial sector in order to achieve development goals" [2] (p. 33). Later, economists such as Goldsmith and McKinnon advocated the path of liberalization. The competition among all participants allows the financial sector to correctly and efficiently perform the function of allocation. Profit maximization will lead also to the selection of the most profitable projects at each level of the financial supply chain, which will optimize the allocation of resources in the economy and to what can be termed economic growth. The inclusion of political pressures would most probably lead to the selection of alternative projects that are not maximizing the rate of return at one level of the capital channel, which would in turn lead to an underperforming of the economy in general, besides distorting the correct incentives for market participants.

All of these aspects are embodied in what is called the development of the financial sector. Modern literature that links this aspect with economic growth is vast and increasing, with a respectable tradition. While it does not always trace the causality relation to the accumulation of capital, it succeeds in highlighting the role of the financial sector in the process of most efficiently channeling savings or imported capital into investments. Moreover, the entire debate has been directed towards what is called the policy of "financial liberalization/deregulation" due the fact that in the vast majority of countries (less than, maybe, the most developed nations), the financial sector has been distorted by wide and systematic interventions by governments (the so-called "repressed financial sectors").

The core challenge for a vast majority of countries has been the choice of the right path towards reform of this sector and its positioning in a correct institutional setting. There are three potential causality relations that have been explored in the literature linking the financial sector to economic growth. On the one hand, there is the supply side perspective (also named "supply leading response")

which argues that the development of the financial sector is a condition for economic growth. Without access to certain financial services and some specific functions that a "liberalized" financial sector under a framework of correct institutions performs, the real economy will not be able to significantly take off. On the other hand, the demand side perspective (also named "demand following response") considers that without a real economic sector that demands certain types of financial goods and services, there could be no development in the financial sector. The third approach, sometimes called "the feed-back hypothesis", is that there is no strong or stable causality relation between the two processes. It seems this dilemma was first discussed in the modern economic literature by King and Levine [3] (p. 718), who explore the factors in the period 1960–1989 that had an impact in 80 countries on what they term "growth indicators" (per capita GDP growth, the rate of capital accumulation, and improvements in economic efficiency). The authors take four factors that are considered measurements of financial sector deepening: liquid liabilities of the financial sector to GDP, the ratio of domestic money bank domestic assets to deposit money bank domestic assets plus central bank domestic assets, the ratio of claims on the nonfinancial private sector to total domestic credit (excluding credit to money banks), and the ratio of claims on the nonfinancial private sector to GDP. They found that these factors have a significant positive impact on growth indicators, so they -concur with the first type of explanation. The core mechanism in this respect is the so-called resource-mobilization mechanism. That is, the ability of the financial sector—and especially the banking sector—"to overcome project indivisibilities and to encourage investors to accept longer time horizons for payoffs widens the first bottleneck through which a young economy must pass".

Classaens and Leaven [4] (p. 179) found that, in the banking sector, "the degree of competition is an important aspect of financial sector functioning" and, in consequence, "external financially dependent sectors grow faster in more-competitive banking systems". Ahmed and Ansari, debating financial widening and financial deepening, apply the analysis to the South Asian economies of India, Pakistan and Sri Lanka, and find strong evidence supporting this causation, namely, "a high degree of association between financial sector development and economic growth" [5] (p. 515). De Gregorio and Guidotti find that "by and large, financial development leads to improved growth performance" but they conclude, assessing the case of Latin American countries, that "there may be instances where unregulated financial liberalization and expectations of government bailouts can lead to a negative relationship between the degree of financial intermediation and growth" [6] (p. 445).

On the other hand, certain opinions focus on the idea that the development of the financial sector is a result of the economic growth. As Patrick highlights, "the more rapid the growth rate of real national income, the greater will be the demand by enterprises of external funds (the saving of others) and therefore financial intermediation, since under most circumstances, firms will be less able to finance expansion from internally generated depreciation allowances and retained profits (the proportion of external funds in the total source of enterprise funds will rise)" [7] (p. 175). For example, Blanco concludes that "while economic growth causes financial development, financial development does not cause economic growth" [8] (p. 224). The author analyzed 18 Latin American countries for the 1962 to 2005 period. Nyasha and Odhiambo [9] (pp. 112–113) conclude that "the causal relationship between financial development and economic growth is not so clear-cut and that the notion that financial development leads automatically to economic growth is merely based on prima facie or superficial evidence". Their article, which was a comprehensive review of the international literature on the causality relation in question, "differs fundamentally from previous studies in that it has divided financial development into bank-based and market-based financial developments, and it has closely focused on bank-based financial development and economic growth".

In this respect, Benczur, Karagiannis and Kvedaras, focusing on high income countries from OECD, EU and EMU found that "bank credit and debt security have a significantly negative impact on growth, whereas stock market financing tends to have a significantly positive influence. In terms of bank and stock market financing, we find that the latter is more beneficial for growth, at least in high-income economies" [10] (p. 6). Others like Petkovsky and Kyojevsky [11] (p. 64) found that, in the

case of 16 transition countries from Central and Eastern Europe, from 1991 to 2011, "the contribution of the relatively underdeveloped credit markets to growth has been rather limited". The authors employed three indicators: the ratio of private credit in relation to GDP (as a measure for financial development), the ratio of quasi money (M2–M1, RQM) as a measure of the size of the banking sector in a developing country and interest rate margin (IM) as an estimator of the efficiency of the banking sector. From the three indicators, only RQM has a minor positive effect to financial development.

An IMF Working paper authored by Ben Naceur, Blotevogel, Fischer and Shi concluded that "financial development does not appear to be a magic bullet for economic growth. We cannot confirm earlier findings of an unambiguously positive relationship between financial development, investment, and productivity. The relationship is more complex" [12] (p. 2). The paper used a sample of 145 countries for the 1960–2011 period.

Taivan and Nene concluded, after conducting an analysis on 10 countries from the Southern African Development Community for the 1994–2013 period, that "financial liberalization failed to increase economic growth for 80% and 70% of the sample when broad money and domestic credit were used to measure financial development, respectively" [13] (p. 81). In the same vein, Gries, Kraft and Meierrieks found, in the case of 16 sub-Saharan African countries, that "finance, growth and openness do not share significant long-run relationships for most of the sample" [14] (p. 1858).

In the same vein, for 7 sub-Saharan countries, Kagochi, Nasser and Ekebede found that, using the panel Granger causality test, "stock market development has positive and significant effect on economic growth while banking development indicators impact on economic growth is uncertain" [15] (p. 61). Other papers, like Batuo, Mlambo and Asongu found that "financial development and liberalization have a statistically significant effect on financial instability. However, financial instability is shown to have a harmful effect on economic growth, this being more pronounced in the pre-liberalization period compared to the post-liberalization period" [16] (p. 6). Hence Nyasha and Odhiambo conclude that "the argument that the financial development always leads to economic growth should be taken with extreme caution" [17] (p. 223).

Moreover, Patrick points out that the causality relation between the two phenomena seems to change over time. He advances the hypothesis that "before sustained modern industrial growth gets underway, supply-leading may induce real innovation-type investment. As the process of real growth occurs, the supply leading impetus gradually becomes less important, and the demand following financial response becomes dominant" [7] (p. 177). Such a hypothesis was moderately supported by Jung [18] (p 344) who concluded that in the case of less developed countries, there is "a supply leading causality pattern more frequently than a demand following pattern". Moreover, Loayza and Ranciere [19] (p. 1051) discovered that "a positive long-run relationship between financial intermediation and output growth coexists with a mostly negative short-run relationship" by analyzing a data set of 82 countries for the period of 1960–2000. In the same spirit, Arcand, Berkes and Panizza found that "financial depth starts having a negative effect on output growth when credit to the private sector reaches 100% of GDP" [20] (p. 105).

Such a "too much finance" hypothesis is also confirmed by Popov who, despite acknowledging that "the bulk of the empirical evidence suggests that banks and markets have an independent positive effect on economic growth", also discovered that "the positive effect of finance on growth dissipates beyond a threshold level of financial development, and that some types of finance, such as mortgage credit, are considerably less conducive to sustainable economic development than other types of finance, such as enterprise credit" [21] (p. 7).

Moreover, the impact of the financial crisis on the relationship between finance and growth is another area of recent exploration in the financial literature. Prochniak and Wasiak argue, based on a study of 28 EU and 34 OECD economies in the period of 1993–2013, that the relationship between the level of financial sector and economic growth is nonlinear while "an excessively large size of the financial system ... may negatively impact GDP dynamics" [22] (p. 1).

Similarly, Haiss, Juvan and Mahlberg after studying 26 European countries from 1990 to 2009, concluded that "the fragility of financial markets, which is reflected in the increasing number and impact (costs) of financial crises can, however, not be neglected. Our findings suggest that under the prevailing conditions, the financial sector is not capable of dampening unsustainable levels of indebtedness, risk-taking and leverage or to avoid euphoria in the markets" [23] (p. 17). Reviewing the existing literature that links financial development, financial crises, and economic growth, Loayza, Ouazad and Ranciere highlight that "the main finding of this literature is that financial deepening leads to a trade-off between higher economic growth and higher crisis risk; and its main conclusion is that, for at least middle-income countries, the positive growth effects outweigh the negative crisis risk impact" [24] (p. 26).

3. Finance: Sound and Unsound

Finance has a natural and important role in the modern market economy. Because they are based on the extended social division of labor, markets need money and monetary calculation to actually function. The indispensable role of monetary calculation for modern economies emerged as somewhat of a byproduct of the so-called socialist calculation debate ignited by Ludwig von Mises in the 1920s. In a famous article [25], the Austrian economist argued that there would be no markets for the factors of production and, therefore, no genuine prices for them without private property rights over the means of production—the essence of the socialist reform program. Thus, a cogent, real expression of production costs, and subsequently, of profits and losses becomes impossible. The same ill effect can result from the absence of money (even given private property rights over the means of production and the freedom to exchange—buy and/or sell—them), as well as from a prohibition to exchange factors of production (given private property and money). Taken in this sense—the "spreading" of monetary calculation in ever more intricate corners of the economy—financial development and sophistication is not only a natural phenomenon, it is an indispensable one. For complex economies, that is. Ludwig von Mises repeatedly points out that capital goods or factors of production are always the substance of capital, but without monetary calculation which reduces all heterogeneous goods to a common denominator, the synthetic concept of capital would be meaningless. Thus, he argues in a certain context that in socialist systems there are capital goods, but there is no capital. Likewise, there is an anecdote about central planners in the Soviet Union thinking about replicating some of the elements and aspects of the capitalist world economies, but they get really stuck when considering the issue of including a financial market in the central plan (an idea abandoned, after some reflection, as totally out of context). Additionally, there are as many policy or systemic options in favor of less financial depth as there are options for relatively less complex economies. Moreover, the crucial role of monetary calculation must be associated with the important role of the capitalist entrepreneurs in the same framework mentioned previously, namely the modern complex, extended division of labor based economies.

The same Ludwig von Mises, in his magnum opus entitled *Human Action*, examines the distinction that can be made between entrepreneurs and managers [26] (Chap. XV.10 and XXVI.5). He sees managers as some sort of junior assistants to capitalist entrepreneurs, as executants of the details that fill in the broad fundamental carvings by means of which the entrepreneurs create, design, expand, merge, reduce or dismantle business units, and thus assigns, in a way, the space of maneuvering that pertains to both economic functions. Thus, the operating field of managers is the corporation and its proximal economic environment is taken somehow as given while the sphere of activity of capitalist entrepreneurs, is the financial market—the stock exchange, the banking sector and the capital markets in general. The latter, the entrepreneurs, create the structure of the economy by their actions, expanding some sectors and restricting others. Their judgments, covered of course by the scarce resources they allocate to implement them, make up the foundation in which, afterwards, managers and workers are employed to fill in the operational details. They also bear the ultimate uncertainty inherent in all these processes (operationalized in the phenomenon of losses). Thus, we could metaphorically say that the

"brain" of the market is the financial market. The ultimate decision making in the economy takes place at this level—or in these (financial) markets. In this sense, again, it is only normal and proper—and a good sign or something to be at least expected—that a modern complex economy gradually becomes more and more financially developed.

Of course, the financial sector also has an intermediary role to fulfill. Thus, it can also be judged by means of the theory of intermediation. According to this, a middleman can intervene between two parties according to a set of contracts, only if he can offer a better deal to both. For instance, a real estate agency can interpose itself between the buyers and sellers of apartments or houses only if it can offer a higher price to the seller and a lower one to the buyer. Intermediaries either create markets that did not exist, or they lower the costs of existing ones. In this respect, financial intermediation can be seen as a means by which the cost of the meeting of savers of capital and borrowers of capital is lowered. Stock exchanges, investment banks, investment funds, insurance companies, etc., are the intermediaries in the financial sphere. Of course, there are limits to intermediation. Even though, in the long run it can progress indefinitely within a more minutely divided structure of the economy, in the short run, there is only so much intermediation that can profitably take place.

The classical economics principle of the tendency of entrepreneurs to disinvest from less profitable businesses and to invest in more profitable ones applies. Thus, there are diminishing marginal returns to intermediation, in general, and to financial intermediation in particular. In terms of financial development, this implies that normally nobody should worry about there being too much of it. It will always be with us, so to speak, and progress at a certain pace and reach a certain level, but not go beyond the natural threshold of its usefulness. The above having been said, it should be added that wherever things can go right, they can also go wrong. Thus, a theory of the natural and proper development of the financial sector, must necessarily come—if it is to deliver in its scientific function—with an explanation of distorted, unnatural, aberrant or malign developments; as much as a theory of health presupposes a theory of disease (and vice versa). Hayek has said—in the context of discussing the theory of the business cycle—that before explaining how things can go wrong, one must explain how they can be right in the first place. We would also stress the reciprocal statement which we think Hayek would also endorse (pleading as he was for the full picture of the spectrum of possibilities).

The first thing that must be said in this discussion is that simple statistics that show a certain historical increase in the proportion of the financial sector in the economy are not sufficient by them self to speak of the problematic financial depth and financial inclusion of the economy. Neither is the rhythm of growth or the magnitude of growth enough. These figures can at most, be the empirical trigger for analyzing the phenomenon more closely, but as such they need a theoretical framework based on which to argue that such and such an expansion of the financial sector is too great or too fast or too ubiquitous. Otherwise, several questions are left begging: What is the proper proportion of the financial sector in the economy? What are the sectors that should become more capital intensive? What is the adequate rhythm for financial development? Further, there are two types of disturbances which affect the economy as a whole, the financial sector included.

The first category is called exogenous, and comprises impactful events such as natural disasters, wars, epidemics, etc. There is a line of inquiry here on the connection between disaster relief in general, or "crisis management" and the growth in the financial needs of the public sector and, therefore, with a certain part and type of financial sector. However, this is a topic in itself that requires another full paper. Analyses of this type can be found in Higgs [27], for instance. The second type of disturbance is one that can more fruitfully be discussed in the context of the financial sectors' development debate. Namely, it consists of disturbances or distortions of the economy in general, which can have a financially developed profile (unnatural, forced, malign financial development and depth). The main vehicle of this type of disturbance is what has been called artificial credit expansion by Mises [26], de Soto [28], Rothbard [29], Hülsmann [30] and others. While natural growth of the supply of credit in the economy is dependent (and limited) by the amount of savings, artificial credit expansion is possible whenever

the supply of credit can exceed real savings. The main route to allow this possibility is the (fiat money and central bank dependent) fractional reserve banking system that we have inherited in the aftermath of the Peel Act of 1844 [30]. The main theory that describes this phenomenon is the theory of the business or trade cycle (or, simply, the theory of economic crises). Nevertheless, a byproduct of this is a possible theory of artificial or abnormal financial development.

To show that this is the case, we make use of three concepts: Cantillon effects, regime uncertainty and total demand. The redistributive or Cantillon effects of the increases in the money supply refer to the transfer of wealth which occurs in the said phenomenon. Namely, whenever the quantity of money in an economy is increased, the first receivers of the new money confront an unchanged structure of prices, thus being able, other things equal, to buy more real goods than previously. As the wave of new money propagates itself, it successively reaches persons whose buying prices have risen but not as much as their selling prices (and/or nominal income from the new money)—who still gain in the process. After a certain point in the process, some groups discover that their selling prices (and/or nominal income increase from the new money) have increased to an insufficient extent and do not cover the increase in their buying prices, thus, they lose. At the end of the spectrum the last receivers of the new money can be found and they lose the most.

Otherwise put, the first receivers of the new money gain at the expense of the last receivers. Inflation—in the sense of an increase in the money supply— has a redistributive aspect, which also makes it relevant politically. The relevance of Cantillon effects for the financial development debate is as follows: in the last century or so we have entered the era of constant increases in the money supply; the financial sector is definitely closer to the issuer of new money (the central bank plus banking sector); and moreover, after 1971 the world has entered the era of fiat money, producible ad libitum with virtually zero costs; thus, it is only fair to expect disproportionate growth in the financial sector, and that it is even at the expense of other sectors. Regime uncertainty [31] is also a concept that can shed light on exacerbated financial depth, only in a somewhat negative manner. Even though in its standard form, the regime uncertainty idea is meant to explain the stoppage of investment due to the uncertainty of the future actions of the government with respect to the property rights of investors in their own investments. However, the other side of regime uncertainty is the maintenance of an overextended financial sector (which obtains nothing else than the sum of the maintenance of more firms, banks, investment funds and other financial intermediaries). A regime of the quantitative easing type can induce the expectation that the monetary and financial authorities of a country will do whatever is necessary to prevent the need for a more severe restructuring process. Thus, lines of business, projects and even whole firms are kept active and not abandoned as they would be if unconventional policies had not been undertaken. In a way, the two faces of regime uncertainty are: investor do not invest, but neither do they restructure. Thus, a possible interpretation of the maintenance of an expanded financial sector is provided by the anticipation that the relevant authorities will continue to lend support. Also, even if it is clear that, in the end, not everyone will actually be supported, a tragedy of the commons-like problem arises: the hope is that others will restructure and maybe we will not need to (given the mentioned support).

Lastly, a possible route for investigating the dynamics of financial markets is to look at them not through the traditional supply and demand instrument, but through the Wicsteed-ean variant of total demand and stock analysis. Žukauskas and Hülsmann [32] argue that it is appropriate to approach the financial sector in this manner. While for perishable products, the well-known supply versus demand analysis is more relevant, for relatively unperishable (or at least durable goods or assets) the idea that supply means not so much the creation of new goods and assets as the expression of a "reservation demand" for those goods or assets seems more appropriate. In this logic, the relevant interplay is between the total stock of goods and the total demand for those goods, the latter comprising demand in exchange ("traditional" demand) and reservation demand (expressed by the sellers who abstain from giving in exchange the aforementioned assets; which is, therefore, a demand to hold). It must be mentioned that in terms of price determination, both ways lead to the same result. In the total demand

versus total stock variant, the actual volume of transactions remains unknown, but on the other hand the speculative aspect of the supply side is better brought to light. Seen in this light, it becomes plausible that, given a certain monetary and financial policy, the dynamic of financial markets will be more pronounced by comparison to non-financial sectors. Policy measures reinforces the dynamic of total demand (especially the reservation demand to hold) to a greater degree than in sectors with perishable goods where suppliers cannot but consider getting rid of their products at the best price as soon as available. If we add the context of regime uncertainty, the idea that financial sector prices rise disproportionately as compared to non-financial ones becomes palatable.

4. Research Hypothesis and Methodology

4.1. Research Methodology

Due to the limited amount of available country data, our research uses a panel data framework [33]. Our empirical investigation on the impact of financial sector development on economic growth proposes two proxies: real GDP growth rate and real GDP per capita growth rate. We grouped the explanatory variables into three different categories, according to our research questions and hypothesis: (i) the development of the financial system (FinSystDev) is described by the following variables: commercial bank branches (per 100,000 adults), domestic credit provided by financial sector (% of GDP); domestic credit to private sector by banks, market capitalization of listed domestic companies to GDP, net foreign assets to GDP and stocks traded, total value (% of GDP); (ii) the sophistication and accessibility of the financial system (FinSophAcc) is proxied by the following indicators: financial market sophistication, ease of access to loans and local equity market access; and (iii) the performance of the financial system (FinPerfom) is described by the bank nonperforming loans to total gross loans and by the soundness of banks. The linear panel regression model we tested has the following equations (i is the index for country and t is the index for time, $\varepsilon_{i,t}$ is the error assumed to vary stochastically and non-stochastically over i and t):

$$\text{EcGrowth}_{i,t} = c + \alpha_1 x \text{FinSystDev}_{i,t} + \alpha_2 x \text{FinSophAcc}_{i,t} + \alpha_2 x \text{FinSophAcc}_{i,t} + \alpha_3 x\ \text{FinPerform}_{i,t} + \varepsilon_{i,t}$$

Our methodology is consistent with the following previous studies: Rana and Barua [34] used panel regression and tested the impact on economic growth (proxied by GDP growth rate) of five variables selected for financial development (Domestic Credit Provided by Financial Sector, Total Debt Services, Gross Domestic Savings, Broad Money, and Trade Balance); Mercan and Gocer [35] used panel regression on five developing countries with data covering 1989–2010 to test the influence of financial development (proxied only by M2 to GDP) on the GDP growth rate and used foreign direct investments to GDP and total foreign trade to GDP (exports + imports) as controlling variables; Fufa and Kim [36] used dynamic GMM panel regression on 64 countries with data covering 1989–2012, the impact of the stock markets (described by the value of the traded shares divided by the total value of listed share, the value of all domestic shares traded in the stock market divided by GDP and the total value of listed shares in the stock market divided by GDP) and the banking system (deposit money banks to the private sector as a share of GDP, credit issued by deposit banks and other financial institutions, excluding central banks, to the private sector divided by GDP and by broad money M3 to GDP) on economic growth estimated by the real per capita GDP growth rate; Eryılmaz and others [37] applied panel data regression on 23 OECD countries using GDP per capita as the dependent variable and the ratio of domestic total credit to GDP and ratio of total domestic savings to GDP as a financial development indicator (independent variable); and Chen and others [38] investigated the impact of financial inclusion (decomposed by four dimensions: availability of financial services, usability of financial services, utility of financial services and receptivity of financial services) on the non-performing loans rate using a panel data regression in 31 provinces of China with data covering 2005–2016.

4.2. Research Hypothesis

Our empirical research aims to explore the influence of financial system development, sophistication and performance on the economic growth based on a panel data research framework. The general assumption behind our study is derived from classical economics, which recognized capital and capital accumulation as one of the main drivers of sustainable economic growth. Without capital, all the other production factors (entrepreneurship, natural resources and labor) remain unused. The research hypotheses are summarized in Table 1.

Table 1. The summary of the main research hypotheses.

Research Hypotheses	Theoretical Background	Explanatory Variables
Hypothesis 1: Economic growth is influenced by the development of financial system	The development of financial markets and institutions ensures a better capital allocation towards the most profitable investments. Lowering the risk and the cost of capital are the major functions of a well-functioning and competitive financial system. The diminished barriers against capital allocation and savings (including international transfers) significantly boost the role of financial system in the economic development (the capital will always quit those investment projects where productivity and efficiency are decreasing).	Commercial bank branches (per 100,000 adults): Code LogBranches. Domestic credit provided by financial sector (% of GDP): Code LogDomCre. Domestic credit to private sector by banks (% of GDP): Code LogDomCrePri. Market capitalization of listed domestic companies to GDP (%): Code LogMarketCap. Net foreign assets to GDP (%): Code LogNetAssets. Stocks traded, total value (% of GDP): Code LogStocks.
Hypothesis 2: The sophistication and accessibility of financial systems influence economic growth	The depth of a financial system is a sign of competitiveness, and of improved financial market structure. Higher accessibility means lower transaction costs. The sophistication of a financial system means modern financial instruments that boost savings and investments. Existing capital can find the most appropriate and attractive investment projects that maximize profit for the shareholders.	Financial market sophistication (GCI): Code LogFinMarkSoph. Ease to access to loans (GCI): Code LogAccessLoans. Local equity market access (GCI): Code LogAccessEquity.
Hypothesis 3: The performance of financial services is influencing economic growth	The quality of financial services is a sign of professionalism of the people working and managing the financing mechanisms and financial portfolios for the benefit of individual investors. The skills and risk tolerance of financial specialists are determinant for the involvement of the financial institutions in more complex financing mechanisms or in more complex business or investment projects.	Bank nonperforming loans to total gross loans (%): Code LogNonperfLoans. Soundness of banks (GCI): Code LogSoudness.

5. Data Sample and Descriptive Statistics

We selected 45 low income, middle income and high income countries from the total number of countries (by eliminating those with incomplete data for selected variables. The data covers a ten-year period (2006–2015) and the total number of observations is 450. Therefore, the panel of data is a balanced one (we obtained data for all the included countries); this is a fixed panel (we got data for all observed years) and a wide panel (larger number of countries—45 countries—compared with the number of observed years—10 years only). The World Bank Database provided the data for: GDP real growth rate, real GDP per capita, Commercial bank branches (per 100,000 adults, Domestic credit provided by financial sector (% of GDP), Domestic credit to private sector by banks (% of GDP), Market capitalization of listed domestic companies to GDP (%), Net foreign assets to GDP (%), Stocks traded, total value (% of GDP), and Bank nonperforming loans to total gross loans (%). The World Economic Forum provided the data for: Financial market sophistication (GCI); Ease of access to loans (GCI); Local equity market access (GCI), Soundness of banks (GCI). Description statistics on the sample is presented in Appendix A. The number of years with available data included in the panel (10 years) is significantly reduced as compared to the cross-sections (45 countries). The presence of potential stationary problems was tested by using four different panel unit root tests commonly used in similar studies: the Levin, Lin and Chu test [39], Im, Pesaran and Shin test [40], Lean and Smyth test [41] and Wang PP-Fisher Chi-square test [42]. The results of these tests are presented in Appendix B. All data series included in the panel data have no stationary problems, according to the outputs of the tests. Co-integration between panel data series was tested using Kao residual co-integration test that rejected the null hypothesis of "no co-integration" (see the test summary in Appendix C).

6. Results and Comments

The first step was to determine the estimators for each explanatory variable using unrestricted panel LS methodology. F-statistic, Adjusted R-squared and Durbin-Watson test results were used to select the most relevant estimating unrestricted panel LS models. The results are presented in Table 2. The results regarding economic growth estimated by real GDP growth rate provided by the unrestricted panel LS models indicate (see Table 2): (1) economic growth is positively and statistically significantly (5% confidence level) explained by the number of commercial banks' branches (per 100,000 adults) and by the stocks traded, total value (% of GDP); (2) economic growth is positively and statistically significantly (5% confidence level) influenced by financial market sophistication, by ease of access to loans and by local equity market access; (3) economic growth is negatively and statistically significantly (5% confidence level) determined by bank nonperforming loans to total gross loans and positively and statistically significantly (5% confidence level) determined by the soundness of banks; and (4) economic growth is negatively and not statistically relevantly (5% confidence level) influenced by domestic credit provided by the financial sector, positively and not statistically relevantly (5% confidence level) influenced by domestic credit to private sector by banks (% of GDP), negative and not statistically relevantly (5% confidence level) influenced by market capitalization of listed domestic companies to GDP, and negative and not statistically relevantly (5% confidence level) influenced by net foreign assets to GDP.

Table 2. Unrestricted panel Least Squares estimations (economic growth).

Dimension	Explanatory Variables	Economic Growth 1 (LOGGDPGROWTH)	Economic Growth 2 (LOGGDPcap)
Financial system development (FinSystDev$_{i,t}$)	LOGBRANCHES	0.5823 2.4907	0.0591 2.9935
	LOGDOMCRE	−0.3698 −1.8152	−0.0385 −2.3486
	LOGDOMCREPRI	0.0962 0.4087	−0.0462 −2.1895
	LOGMARKETCAP	−0.0986 −1.6604	−0.0227 −4.6386
	NETASSETS	−0.0496 −0.6075	0.0046 0.6503
	LOGSTOCKS	0.0870 1.6640	0.0040 0.9112
Financial system sophistication and accessibility (FinSophAcc$_{i,t}$)	LOGACCESSLOANS	1.4021 5.3341	0.1226 5.5380
	LOGFINMARKSOPH	1.6315 4.5472	0.1363 4.7714
	LOGACCESSEQUITY	1.3694 3.8700	0.0876 2.9725
Financial system performance (FinPerform$_{i,t}$)	LOGNONPERFLOANS	−0.7676 −9.4885	−0.0509 −7.6754
	LOGSOUNDNESS	1.8465 6.1588	0.1332 5.4022
	Intercept	1.0484 103.3381	0.0185 20.4679 [1]

[1] Source: own estimations, values indicates coefficient and *t*-statistic.

The results concerning the economic growth measured by GDP per capita growth rate provided by the unrestricted panel LS models indicate that (see Table 2): (1) economic development is positively and statistically significantly (5%) explained by the number of commercial bank branches (per 100,000 adults) only, positively but not statistically significantly explained by net foreign assets

to GDP, and by stocks traded, total value (% of GDP); (2) economic development is negatively and statistically significantly influenced by domestic credit to GDP, by the domestic credit to private sector provided by banks and by the market capitalization of listed domestic companies to GDP; (3) economic development is positively and statistically significantly influenced by all the variables associated with the sophistication and accessibility of financial system (financial market sophistication, by ease of access to loans and by local equity market access); and (4) economic development is negatively and statistically significantly influenced by bank nonperforming loans to total gross loans, and positively and statistically significantly influenced by the soundness of banks.

The panel we used is a strongly balanced one (having data for all countries and for all years). One of the major problems with panel data analysis consists in the presence of influences on the predictor variables determined by individual characteristics of countries included in the model (panel data fixed effects). The presence of these time-invariant influences can be removed and is tested by using a least square dummy variable model (LSDV model) or using F-statistic of redundant fixed effects tests. The results of these fixed-effects tests are summarized in Appendix D (Table A6 for economic growth estimators and Table A7 for economic development estimators). The tests rejected the null hypothesis in both cases—period and cross-section fixed effects and for all models. The estimators should be adjusted with fixed effects (period and/or cross-section).

In both cases (economic growth estimate by real GDP growth rate and by GDP per capita growth rate) the estimators did not change their sign after removing fixed effects from the panel data (Table 3 contains the estimators for economic growth with fixed effect adjustments and Table 4 contains the estimators for economic development). We can also observe that, in almost all cases, the fixed effects adjustments significantly improved the statistical relevance of estimators. All the estimators for economic growth are now statistically significant. In the case of economic growth estimated by GDP per capita growth rate, only the estimator for net foreign assets to GDP remained statistically not so relevant (see Table 4). Controlling for fixed effects in our estimators confirmed the robustness of our results.

Table 3. Estimators after fixed effects adjustments (Economic growth estimated by real GDP growth rate—LogGDPGrowth).

Dimension	Explanatory Variables	Unrestricted Panel LS Estimators	Estimators after Fixed Effects Applied
Financial system development (FinSystDev$_{i,t}$)	LOGBRANCHES	0.582254 2.490699	0.533623 3.898785
	LOGDOMCRE	−0.369787 −1.815195	−0.226063 −2.066875
	LOGDOMCREPRI	−0.577357 −2.248994	−0.418064 −4.108439
	LOGMARKETCAP	−0.098624 −1.660389	−0.132268 −5.636587
	NETASSETS	−0.049621 −0.6074	−0.09235 −1.922422
	LOGSTOCKS	0.086991 1.663958	0.073097 3.159398
Financial system sophistication and accessibility (FinSophAcc$_{i,t}$)	LOGACCESSLOANS	1.402088 5.334107	0.860183 5.199923
	LOGFINMARKSOPH	1.631541 4.547181	0.631137 5.075843
	LOGACCESSEQUITY	1.369386 3.869978	0.638248 4.343454
Financial system performance (FinPerform$_{i,t}$)	LOGNONPERFLOANS	−0.767577 −9.488508	−0.623775 −15.25213
	LOGSOUNDNESS	1.846504 6.158831	1.113716 8.541776
	Intercept	1.048409 103.3381	1.039673 262.5345

Source: own estimations, values indicates coefficient and *t*-statistic.

Table 4. Estimators after fixed effects adjustments (Economic growth estimate by GDP per capita—LogGDPCAP).

Dimension	Explanatory Variables	Unrestricted Panel LS Estimators	Estimators after Fixed Effects Applied
Financial system development (FinSystDev$_{i,t}$)	LOGBRANCHES	0.0591 2.9935	0.0612 3.8937
	LOGDOMCRE	−0.0385 −2.3486	−0.0493 −3.3372
	LOGDOMCREPRI	−0.0462 −2.1895	−0.0477 −2.5350
	LOGMARKETCAP	−0.0227 −4.6386	−0.0203 −6.3425
	NETASSETS	0.0046 0.6503	0.0059 1.3500
	LOGSTOCKS	0.0040 0.9112	0.0081 2.4407
Financial system sophistication and accessibility (FinSophAcc$_{i,t}$)	LOGACCESSLOANS	0.1226 5.5380	0.0871 4.6218
	LOGFINMARKSOPH	0.1363 4.7714	0.0844 4.3166
	LOGACCESSEQUITY	0.0876 2.9725	0.0484 2.4082
Financial system performance (FinPerform$_{i,t}$)	LOGNONPERFLOANS	−0.0509 −7.6754	−0.0508 −8.7903
	LOGSOUNDNESS	0.1332 5.4022	0.0733 5.9756
	Intercept	0.0185 20.4679	0.0174 32.7304

Source: own estimations: values indicates coefficient and *t*-statistic.

The second major problem with panel LS estimators consists in the presence of random effects. Our analysis tests the impact of three different levels (the development of financial system, the sophistication and accessibility of financial system and the quality of financial services) observed at the level of each included country by multiple variables. The presence of random effects is tested using the Hausman test. The results are presented in Appendix E (for both dependent variables, economic growth and economic development). According to the results of these tests we can conclude that, in some cases, the presence of heteroscedasticity (period and cross-section) is influencing the estimators.

The value of new estimators obtained by introducing random effects are presented in Table 5 for both dependent variables (real GDP growth rate and GDP per capita growth rate). As in the case of fixed effects, adjustments with random effects improves the statistical significance for almost all estimators (both cases). The stocks traded, total value (% of GDP) and the net foreign assets to GDP remain the only variables not statistically significant to explain economic growth. However, the estimators are more consistent in the case of fixed effects than in the case of random effects (as suggested also by the Hausman tests). Moreover, the estimators are consistent and robust, with the adjustment for fixed effect and random effects not changing the sign for all the considered explanatory variables.

Table 5. Estimators after random effects adjustments (real GDP growth rate & GDP per capita growth rate).

Dimensions	Explanatory Variables	Economic Growth 1		Economic growth 2	
		Initial Estim.	Estim. after RE Corrections	Initial Estim.	Estim. after RE Corrections
Financial system development (FinSystDev$_{i,t}$)	LOGBRANCHES	0.5823 2.4907	0.5900 3.6237	0.0591 2.9935	0.0584 4.6041
	LOGDOMCRE	−0.3698 −1.8152	−0.4341 −2.9546	−0.0385 −2.3486	−0.0569 −3.8710
	LOGDOMCREPRI	−0.5774 −2.2490	−0.6101 −2.9747	−0.0462 −2.1895	-0.0661 −3.4540
	LOGMARKETCAP	−0.0986 −1.6604	−0.1128 −2.0715	−0.0227 −4.6386	−0.0226 −4.8831
	NETASSETS	−0.0496 −0.6075	−0.0475 −0.6252	0.0046 0.6503	0.0047 1.3064
	LOGSTOCKS	0.0870 1.6640	0.0845 1.8908	0.0040 0.9112	0.0042 1.0013
Financial system sophistication and accessibility (FinSophAcc$_{i,t}$)	LOGACCESSLOANS	1.4021 5.3341	1.3309 3.6734	0.1226 5.5380	0.0803 3.7794
	LOGFINMARKSOPH	1.6315 4.5472	1.3833 5.1583	0.1363 4.7714	0.1185 4.2699
	LOGACCESSEQUITY	1.3694 3.8700	1.3207 3.4234	0.0876 2.9725	0.1095 3.3738
Financial system performance (FinPerform$_{i,t}$)	LOGNONPERFLOANS	−0.7676 −9.4885	−0.7407 −7.4158	−0.0509 −7.6754	−0.0501 −8.3006
	LOGSOUNDNESS	1.8465 6.1588	1.3491 4.1724	0.1332 5.4022	0.1128 4.3797
	Intercept	1.0484 103.3	1.0558 96.1	0.0185 20.4	0.0166 15.8

Source: own estimations: values indicates coefficient and *t*-statistic.

If we compare the estimators provided by the unrestricted panel LS, panel restricted LS (fixed effects) and panel EGLS (random effects) presented in Appendix F we can finally conclude that our results are robust and consistent (not changing their sign and without major changes regarding the statistical significance appreciated by *t*-statistics). Moreover, fixed effects have more positive impact than random effects: the selected panel is sensitive to both problems but is more sensitive to individual characteristics of each country included in the panel than to the existence of heteroscedasticity.

7. Concluding Remarks

Capital is an important production factor. Its importance is due to its role in any production process—the factor that connects all the others (natural resources, labor and entrepreneurship) in any endeavor to supply the market with the most wanted goods and services. Without capital, the other factors remain unused or underused. Therefore, economic theory is clearly stating that accumulation of capital is probably the most important driver for sustainable economic growth. Capital is merely the result of capital accumulation by saving. Saving and investment are, in their turn, stimulated by the development and sophistication of the financial system. Other alternatives to saving, including various exposures to risk and uncertainty, are stimulating capital savers to postpone present consumption and to invest more. The diversification and depth of the financial sector is reducing the cost of capital, reducing transaction costs and allowing better sharing of investment risks.

Our study confirmed that domestic monetary and credit expansion have a negative impact on economic growth (the estimators are statistically significant, robust and consistent). However, the territorial expansion of the financial sector (number of branches), the increasing stocks traded and net foreign assets have a positive impact on economic growth. On the other hand, the sophistication of financial system and financial inclusion (accessibility, market sophistication) positively influences

economic growth and development (the estimators are statistically significant, robust and consistent). Thirdly, the quality of financial system (markets, institutions, instruments) positively influences economic growth (the estimators are statistically significant, robust and consistent). The outputs are more sensitive to the individual characteristics of countries included in the panel data than to the heteroscedasticity.

Therefore, this study confirms that the significant monetary correction and the credit expansion during and after the last financial crisis (covered by the panel data) are diminishing economic growth. The results are consistent with the conclusion that the credit expansion fueled by monetary quantitative easing and lowered interest rates has a negative influence on the real GDP growth rate due to the impact on GDP deflation or inflation (the quantitative theory of money). Moreover, the results confirm that the effectiveness of the banking sector in sustainable economic growth is less than that of capital markets (the long-term financing model of the USA, primarily based on capital markets compared with the EU case where the universal banks are dominating business financing schemes).

Our findings are consistent with other relevant previous studies that confirm a positive impact of financial development on economic growth (Rana and Barua [34], Mercan and Gocer [35], Eryilmaz et al. [37], Krozner et al. [43]). However, our empirical findings proved that some indicators associated with the financial system development dimension have an inconclusive impact (consistent with Andini and Andini [44], Samargandi and others [45], Bangake and Eggoh [46]).

The limitations of our findings are the following: our study is limited only to the impact of financial development and inclusion on economic growth (economic development is a broader concept, not all economic growth is transformed by nations into economic development); we did not remove the crisis time (2007–2010) from the time series in order to find if the results are significantly influenced by this issue (on the other hand, we appreciate that the inclusion of the full economic cycle, including both recession and boom is somewhat more relevant); our findings are limited to countries we included in the panel (many less developed countries were excluded due to the lack of full data covering all indicators included in our research) and the results are sensitive to the explanatory variables selected to describe the financial system's development, sophistication and performance; and the empirical model did not include controlling variables (such as the trade balance, trade openness, public deficit or foreign direct investments) and the econometric model does not mix the explaining variables that describe the selected three dimensions for financial development.

The future development of our research will be focused on the extension of variables describing each dimension proposed by this study, mixing variables into a weighted index based on various methodologies, introducing a few controlling variables (FDIs, international trade balance, public deficit, public debt) and using a structural quantile function for further investigating the fixed effects of the panel. Moreover, we intend to extend this investigation on economic development, by proposing a relevant indicator that mixes economic growth with other social and economic indicators addressing related aspects such as poverty, access to education, innovation, income inequality, etc. Sustainability of economic growth and development is another aspect that can be deeper investigated by our further studies.

Finally, the results of our study support some policy recommendations: improvement in the soundness of banking activity (by capitalization, limitation of unnatural credit expansion and development), the limitation of the financing of public sector from private financial markets, to reconsider the role of capital markets in the long-term financing of the private sector and to continue to reduce the barriers against savings and investments globally.

Concluding, we consider that sustainable development is very strongly influenced by financial markets and institutions. Monetary policy is important for its stimulus features that strongly distort the most important prices of the economy (interest rates, foreign exchange rates), which are fundamental in any economic calculation. Additionally, the dynamic of financial markets, their structure and depth (sophistication, diversification, accessibility) are also dependent on the quality of modern monetary

policies. Unconventional monetary policies (such as quantitative easing) do not seem to have the expected impact, undermining the robustness and sustainability of economic growth and development.

Appendix A. Panel Data Brief Descriptive Statistics

Table A1. Panel data brief descriptive statistics.

	LOGGDPGROWTH	LOGGDPCAP	LOGBRANCHES	LOGDOMCRE	LOGDOMCREPRI
Mean	1.041525	4.388283	1.371723	1.985139	1.843586
Median	1.072741	4.442819	1.372315	2.049855	1.865148
Std. Dev.	0.221311	0.347147	0.312574	0.289931	0.279090
Skewness	−6.629364	−1.707708	0.129803	−0.750704	−0.524569
Kurtosis	82.86933	8.235568	2.752112	3.358014	3.030309
Jarque-Bera	122904.4	732.6796	2.415823	44.67000	20.65514

Table A2. Panel data brief descriptive statistics (cont.)

	LOGMARKETCAP	NETASSETS	LOGSTOCKS	LOGFINMARKSOPH	LOGACCESSLOANS
Mean	−0.263883	0.432161	1.153944	0.656491	0.517839
Median	−0.291126	0.164194	1.298091	0.658592	0.531039
Std. Dev.	0.459498	1.089670	0.835590	0.073551	0.121943
Skewness	0.494555	4.675663	−0.585912	−0.448075	−0.569318
Kurtosis	3.904279	26.96980	2.895135	3.306492	2.874763
Jarque-Bera	33.67607	12412.48	25.95314	16.81917	24.60335

Table A3. Panel data brief descriptive statistics (cont.)

	LOGACCESSEQUITY	LOGNONPERFLOANS	LOGSOUNDNESS
Mean	0.622226	0.532541	0.728446
Median	0.639970	0.535330	0.748038
Std. Dev.	0.101601	0.405937	0.091144
Skewness	−0.541065	−0.156177	−2.176191
Kurtosis	2.686838	3.593302	10.40553
Jarque-Bera	23.79513	8.429469	1383.471

Appendix B. Unit Root Tests

Table A4. Unit Root tests.

Variable/Unit Root Tests	Indicators	Levin, Lin & Chu	Im, Pesaran & Shin	ADF-Fisher Chi-Square	PP-Fisher Chi-Square
LogGDPGrowth	Statistic	−15.5341	−5.64375	194.055	274.37
	Prob.	0.000	0.000	0.000	0.000
LogGDPcap	Statistic	−46.8268	−13.7486	305.397	336.132
	Prob.	0.000	0.000	0.000	0.000
LogBranches	Statistic	−11.0924	−2.67059	133.728	229.611
	Prob.	0.000	0.004	0.002	0.000
LogDomCre	Statistic	−18.8189	−4.93379	180.55	256.293
	Prob.	0.000	0.000	0.000	0.000
LogDomCrePri	Statistic	−12.2248	−3.82141	160.945	204.738
	Prob.	0.000	0.000	0.000	0.000
LogMarketCap	Statistic	−42.163	−21.7994	495.99	506.662
	Prob.	0.000	0.000	0.000	0.000
NetAssets	Statistic	−17.3729	−5.64915	199.274	320.445
	Prob.	0.000	0.000	0.000	0.000
LogStocks	Statistic	−9.11903	−5.37514	189.271	418.452
	Prob.	0.000	0.000	0.000	0.000
LogFinMarkSoph	Statistic	−5.96967	−2.24924	127.077	349.654
	Prob.	0.000	0.012	0.006	0.000
LogAccessLoans	Statistic	−32.2106	−9.33737	243.515	167.662
	Prob.	0.000	0.000	0.000	0.000
LogAccessEquity	Statistic	−12.1865	−1.97343	120.573	75.0534
	Prob.	0.000	0.024	0.017	0.871
LogNonperfLoans	Statistic	−8.97097	−2.18719	127.415	175.449
	Prob.	0.000	0.014	0.006	0.000
LogSoundness	Statistic	−19.0436	−6.77041	218.37	198.317
	Prob.	0.000	0.000	0.000	0.000

Appendix C. Panel Data Series Co-Integration Test

Table A5. Kao Residual cointegration test.

			t-Statistic	Prob.
ADF			−2.889035	0.0019
	Residual variance		0.060227	
	HAC variance		0.017964	
Variable	Coefficient	Std. Error	*t*-Statistic	Prob.
RESID(−1)	−1.222174	0.076548	−15.96608	0.0000
D(RESID(−1))	0.167366	0.052833	3.167844	0.0017
R-squared	0.530739	Mean dependent var		−0.004811
Adjusted R-squared	0.529428	S.D. dependent var		0.270501
S.E. of regression	0.185559	Akaike info criterion		−0.525345
Sum squared resid	12.32673	Schwarz criterion		−0.503756
Log likelihood	96.56218	Hannan-Quinn criter		−0.516761
Durbin-Watson stat	2.281564			

Appendix D. Redundant Fixed Effects Tests

Table A6. Redundant fixed effects tests: LogGDPGrowth as dependent variable.

Explanatory Variables	Period Fixed Effects				Cross-Section Random Effects			
	F	Prob.	Chi-Sq.	Prob.	F	Prob.	Chi-Sq.	Prob.
LOGBRANCHES LOGACCESSLOANS LOGNONPERFLOANS	5.3028	0.00	41.5150	0.00	2.1746	0.00	96.1711	0.00
LOGDOMCRE LOGFINMARKSOPH LOGNONPERFLOANS	5.8232	0.00	45.3695	0.00	2.2621	0.00	99.5987	0.00
LOGDOMCREPRI LOGFINMARKSOPH LOGSOUNDNESS	9.3779	0.00	70.7570	0.00	2.2754	0.00	100.1168	0.00
LOGMARKETCAP LOGFINMARKSOPH LOGNONPERFLOANS	5.7138	0.00	44.5617	0.00	2.2942	0.00	100.8483	0.00
NETASSETS LOGFINMARKSOPH LOGNONPERFLOANS	5.7441	0.00	44.7857	0.00	2.1945	0.00	96.9528	0.00
LOGSTOCKS LOGACCESSEQUITY LOGSOUNDNESS	9.2929	0.00	70.1676	0.00	2.2901	0.00	100.6903	0.00

Table A7. Redundant fixed effects tests: LogGDPCAP as dependent variable.

Explanatory Variables	Period Fixed Effects				Cross-Section Random Effects			
	F	Prob.	Chi-Sq.	Prob.	F	Prob.	Chi-Sq.	Prob.
LOGBRANCHES LOGACCESSLOANS LOGNONPERFLOANS	10.951	0.00	81.502	0.00	2.132	0.00	94.503	0.00
LOGDOMCRE LOGACCESSLOANS LOGNONPERFLOANS	12.524	0.00	91.969	0.00	2.205	0.00	97.372	0.00
LOGDOMCREPRI LOGFINMARKSOPH LOGSOUNDNESS	15.803	0.00	112.957	0.00	1.579	0.01	72.017	0.005
LOGMARKETCAP LOGFINMARKSOPH LOGNONPERFLOANS	8.8695	0.00	67.2218	0.00	2.134	0.00	94.5725	0.00
NETASSETS LOGACCESSEQUITY LOGSOUNDNESS	16.034	0.00	114.397	0.00	1.723	0.004	78.0249	0.001
LOGSTOCKS LOGACCESSEQUITY LOGSOUNDNESS	15.873	0.00	113.399	0.00	1.743	0.003	78.8107	0.001

Appendix E. Hausman Tests on Random Effects

Table A8. Hausman test on random effects (period and cross-section)—explained variable is LogGDPGrowth.

Explanatory Variables	Period Random Effects		Cross-Section Random Effects	
	Chi-Sq. Statistic	Prob.	Chi-Sq. Statistic	Prob.
LOGBRANCHES LOGACCESSLOANS LOGNONPERFLOANS	13.5347	0.0036	4.0898	0.2519
LOGDOMCRE LOGFINMARKSOPH LOGNONPERFLOANS	24.7838	0.00	11.1876	0.0108
LOGDOMCREPRI LOGFINMARKSOPH LOGSOUNDNESS	4.2224	0.2384	22.9134	0,00
LOGMARKETCAP LOGFINMARKSOPH LOGNONPERFLOANS	14.7627	0.0020	16.7193	0.0008
NETASSETS LOGFINMARKSOPH LOGNONPERFLOANS	21.6610	0.0001	9.9995	0.0186
LOGSTOCKS LOGACCESSEQUITY LOGSOUNDNESS	3.685378	0.2975	26.0941	0.0000

Table A9. Hausman test on random effects (period and cross-section)—explained variable is LogGDPCAP.

Explanatory Variables	Period Random Effects		Cross-Section Random Effects	
	Chi-Sq. Statistic	Prob.	Chi-Sq. Statistic	Prob.
LOGBRANCHES LOGACCESSLOANS LOGNONPERFLOANS	19.7881	0.0002	8.2987	0.0402
LOGDOMCRE LOGACCESSLOANS LOGNONPERFLOANS	12.9505	0.0047	6.5512	0.0877
LOGDOMCREPRI LOGFINMARKSOPH LOGSOUNDNESS	7.0184	0.0713	9.8291	0.0201
LOGMARKETCAP LOGFINMARKSOPH LOGNONPERFLOANS	11.9735	0.0075	11.9252	0.0076
NETASSETS LOGACCESSEQUITY LOGSOUNDNESS	5.7609	0.1238	6.2116	0.1018
LOGSTOCKS LOGACCESSEQUITY LOGSOUNDNESS	5.8919	0.1170	6.0322	0.1101

Appendix F

Table A10. Estimators for unrestricted panel LS (initial), after FE corrections, after RE corrections (comparative analysis).

Explanatory Variables	Economic Growth 1 (LogGDPGrowth			Economic Growth 2 (LogGDPCAP)		
	Unrestricted Panel LS Estimators	Estimators after Fixed Effects Applied	Estimators after RE Corrections	Unrestricted Panel LS Estimators	Estimators after Fixed Effects Applied	Estimators after RE Corrections
LOGBRANCHES	0.5823	0.5336	0.5900	0.0591	0.0612	0.0584
	2.4907	3.8988	3.6237	2.9935	3.8937	4.6041
LOGDOMCRE	−0.3698	−0.2261	−0.4341	−0.0385	−0.0493	−0.0569
	−1.8152	−2.0669	−2.9546	−2.3486	−3.3372	−3.8710
LOGDOMCREPRI	−0.5774	−0.4181	−0.6101	−0.0462	−0.0477	−0.0661
	−2.2490	−4.1084	−2.9747	−2.1895	−2.5350	−3.4540
LOGMARKETCAP	−0.0986	−0.1323	−0.1128	−0.0227	−0.0203	−0.0226
	−1.6604	−5.6366	−2.0715	−4.6386	−6.3425	−4.8831
NETASSETS	−0.0496	−0.0924	−0.0475	0.0046	0.0059	0.0047
	−0.6075	−1.9224	−0.6252	0.6503	1.3500	1.3064
LOGSTOCKS	0.0870	0.0731	0.0845	0.0040	0.0081	0.0042
	1.6640	3.1594	1.8908	0.9112	2.4407	1.0013
LOGACCESSLOANS	1.4021	0.8602	1.3309	0.1226	0.0871	0.0803
	5.3341	5.1999	3.6734	5.5380	4.6218	3.7794
LOGFINMARKSOPH	1.6315	0.6311	1.3833	0.1363	0.0844	0.1185
	4.5472	5.0758	5.1583	4.7714	4.3166	4.2699
LOGACCESSEQUITY	1.3694	0.6382	1.3207	0.0876	0.0484	0.1095
	3.8700	4.3435	3.4234	2.9725	2.4082	3.3738
LOGNONPERFLOANS	−0.7676	−0.6238	−0.7407	−0.0509	−0.0508	−0.0501
	−9.4885	−15.2521	−7.4158	−7.6754	−8.7903	−8.3006
LOGSOUNDNESS	1.8465	1.1137	1.3491	0.1332	0.0733	0.1128
	6.1588	8.5418	4.1724	5.4022	5.9756	4.3797
Intercept	1.0484	1.0397	1.0558	0.0185	0.0174	0.0166
	103.3381	262.5345	96.1360	20.4679	32.7304	15.8348

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