Asian Journal of Economics and Finance. **2025**, 7, 1-2 : 23-52
ISSN: 2582-340X
https://DOI:10.47509/AJEF.2025.v07i01-02.02

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Academic Open Access Publishing
www.arfjournals.com

The Finance Growth Nexus, Institutions Matter: Evidence from the A10 Countries of the EU

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ARTICLEINFO

Received: 12 January 2025

Revised: 08 February 2025

Accepted: 19 February 2025

Online: 02 June 2025

To cite this paper:

Ejike Udeogu, Anca M. Voicu, Shampa Roy-Mukherjee, Saadet Deger & Somnath Sen (2025). The Finance Growth Nexus, Institutions Matter: Evidence from the A10 Countries of the EU. *Asian Journal of Economics and Finance*. 7(1-2), 23-52. https://DOI: 10.47509/AJEF.2025.v07i01-02.02

Abstract: The biggest single expansion of the European Union (EU), in terms of population and territory, occurred in 2004 when ten new members, often called the A10, joined the fifteen existing members. The first decade of the 21st century also saw unprecedented levels of growth in these countries, a 'Golden Age' of economic growth – which many have partly attributed to the accession process and concomitant institutional change, and partly due to the free trade strategies pursued within the largest single market in the world. This paper looks at the financial aspect of this burgeoning real economic expansion and investigates the role of financial development in economic growth. Using a panel model with data covering periods from 1997–2020, and allowing for spatial correlation, we distinguish between indicators of financial institutions and financial markets. Within each sub-category, we check for the impact effect of financial depth, access, and efficiency – the three major criteria for economic growth. We find that financial development pertaining to financial *institutions* is of significant importance, while financial *markets* have relatively lower effects. This implies that the institutional and regulatory structure, as provided by the accession to the EU, may have played the most crucial role in stimulating economic growth. The 'Golden Age', we contend, was catalyzed by financial development broadly, and financial deepening, in particular. However, it was predominantly spurred by the growth of financial institutions arguably facilitated by the accession to the EU.

Keywords: Transition economies; Economic growth; Financial development, Financial institutions.

JEL Codes: E 50, E58, F36, G21, G28

1. Introduction

The role of finance in facilitating a country's general economic development has grown ever more apparent in recent years. Literature has long sought to understand how financial systems influence the allocation of resources in a way that promotes economic growth. Work as early as Adam Smith hypothesized some of the benefits a financial sector has;

'It is not by augmenting the capital of the country, but by rendering a greater part of that capital active and productive than would otherwise be so, that the most judicious operations of banking can increase the industry of the country. That part of his capital which a dealer is obliged to keep by him unemployed, and in ready money, for answering occasional demands, is so much dead stock, which, so long as it remains in this situation, produces nothing either to him or to his country.'[1]

This fundamental proposition aligns with much of the work we see today. Within the last 30 years, the topic of financial development has gained significant attention as services linked to financial markets and institutions have dominated advanced economies. By incorporating modern econometric methods, growing work has looked into how financial institutions and markets improve the allocation of capital in an economy and, hence, economic growth. The findings provide evidence of financial developments' critical role in enabling technological change and productivity growth in various regions of the world. Another aspect of the research is the respective roles of financial institutions and financial markets and the question as to which has a more significant influence on long-term economic growth. The latter is our main focus in this paper.

The major interest of this paper lies in understanding the significance of the rate of financial development in economic growth. Indeed, the financial crisis of 2008 left many countries experiencing negative growth. The crisis left many questioning whether financial development is still worth it given the volatility that rapid integration of domestic financial sectors with the world economy engenders. To analyze these issues, we look at the ten countries that joined the European Union (EU) in 2004. Before their acceptance into the EU, they had to fulfill key membership criteria; *'That candidate countries have a working market economy, capable of competing effectively on EU markets.*'[2] For many of the 2004 joiners, this meant undergoing substantial structural changes to their financial systems. This study examines whether the increased international (European) integration they experienced, and the concomitant institutional rigour they had to establish, brought with it any significant growth in their domestic economy. By taking a long enough period, which includes initial structural transformation and high growth, the financial crisis era, as well as the recovery in the twenty-tens, we can evaluate the impact effects of various epochs of the long economic cycle encompassing the accession.

The main novelty of the paper are the following subjects, which we present ad seriatim. First, the country set for analysis is relatively unique, and little work has been done in aggregate for the A10, per se. Secondly, the very act of accession

initiated profound structural shifts and institutional transformations, which were paradigm changing. Such changes allow us to explore the effect of 'institutions' as different from the standard market expansion of economic development modeling. The fundamental question we ask is which is more important – institutions or markets. Our empirical analysis helps us to understand that issue. Thirdly, we utilize a new data set to look at a balanced panel of countries in the context of EU accession and integration. Fourthly, given the nature of our country panel, we assess for 'contagion' effects, which essentially creates a spatial correlation that validates standard estimation procedures. Our empirics correct for these discrepancies. Fifthly, we explicitly analyze the differential impact and relative importance of the two separate factors – financial institutions and financial markets to get a nuanced view of what financial development meant to these countries as they joined the EU. Finally, we draw conclusions regarding the relative role of institutional structures and simple market expansion in the developmental process of these countries.

The paper is conveniently divided into a number of sections. Section 2 discusses the broad channels by which financial development affects economic growth and development. Given the major importance of financial institutions in the accession process, and the validation of institutions' dominant role in economic development for the A10 countries in our empirical work later, we need to explain and emphasise what these institutional structures are and what motivates them. Section 3 gives a succinct summary of these institutional structures and mechanisms. Section 4 presents our main econometric results using a novel estimation method which emphasises spatial dependence and spatial correlation in our panel. Section 5 concludes. All the empirical results are conveniently grouped to together and presented in an Appendix.

2. Financial Development and Economic Growth

2.1. What Connects Financial Development and Growth

A country's financial system is considered integral to private sector development to stimulate economic growth. However, economists have differed in their explanations linking growth and financial development. Lucas (1988) described financial development as a product of high real growth, creating demand for finance, which is provided for by the market mechanism through financial development. This is an extension of the earlier seminal work by Joan Robinson (1952), as discussed in King and Levine (1993). However, many theories align with early work by Schumpeter (1912), who put financial development as a precondition as opposed to a result of economic growth. Entrepreneurs who

make up the endogenous engine driving growth through innovation and technological change are initially funded by risk-taking creditors.

Economic history supports this belief. Even before the start of the Industrial Revolution in England in the 18th century, massive rises in financial development created the precondition for industrialization. North and Weingast (1989) demonstrate the vital role of financial institution reforms – in the form of credible commitments for leveraged assets – enacted after the Glorious Revolution of 1688, which contributed in significant ways to financing industrialization and subsequent growth of the British and Dutch economies.

More generally, literature has stressed the financial sector's significant role in facilitating economic growth, rather than the core growth sector of aggregate investment per se. This is achieved through two avenues: catalyzing capital accumulation (the addition and *reallocation* of wealth) and financing technological change (the *innovation* process). A growing number of works (Jorgenson, 2005, 2008) emphasize that increased physical capital accumulation/aggregate savings does not by itself explain long-run growth. So, Levine (2005) instead states that theories should focus more on improving capital allocation, encouraging productivity growth, and innovation. This is done by both efficient financial markets (FM) and streamlined financial institutions (FI). However, the impact effects are not all the same as we show later in our own research. Which is more critical, FI or FM, is an essential area of research since it will influence policy.

A financial system can be narrowly defined as having the central role of enabling the allocation and deployment of economic resources, spatially and temporally, in an uncertain environment (Merton, 1995). Its existence can be traced down to the presence of market friction when allocating capital. If perfect competition is assumed, like in the Solow-Swan growth model (Solow (1956), financial intermediaries are not incorporated. As there is no private information and traders are treated as price takers, market friction will not occur. However, outside of these models, agents are imposed with costs that can ultimately lead to market failure. This includes transaction costs involved with bringing lenders and borrowers together or diversifying a portfolio. Market frictions also arise from the presence of asymmetric information between different parties in an exchange, causing incentive problems. Ex-ante, adverse selection creates issues with valuing a firm's creditworthiness, as interest rates could be set too low on companies who misrepresent their risk of default. Another cause of asymmetric information is moral hazard. Here, a borrower engages in additional risk once they have been financed, knowing that the lender will incur any additional costs. McKinnon (1973) explain these issues clearly and in detail.

2.2. The Five Channels of Impact from Financial Development to Economic Development

We consolidate vast amounts of literature on the financial development and growth nexus by exploring the five functions of financial markets and institutions; we can then see how they alleviate these market frictions (Levine, 1997, 2005). Theories have fundamentally expanded on these five functions to hypothesize their effects on financial savings and investment decisions in economic growth.

This gives financial development the following five critical functions in economic growth, which we examine ad seriatim.

1. **To allocate capital, providing information ex-ante about investment opportunities:** Having a financial intermediary behaving as a middleman in investment decisions means scarce capital can be channeled to where it is most productive. Ideally, this can identify the best production technologies and improve resource allocation (Goldsmith, 1969). These are achieved by reducing asymmetric information that would impose costs on savers if they were to provide finance themselves to the ultimate borrower directly. These enormous, fixed costs, and often sunk costs in the presence of Knightian uncertainty, can be associated with evaluating information on the firm/managers and economic/market conditions, to consolidate understanding of risks such as that of a default. Unlike financial intermediaries and markets, savers may need more expertise or technology to do this. The money and time spent in gathering information might be too much, disincentivizing savers from investing in a potentially productive and profitable firm.

2. **To monitor managers and exert corporate control ex-post after providing finance:** Investors can enhance corporate governance as they monitor and influence a firm's use of financial capital, with the incentive to maximize the firm's value. Companies must appease stakeholders to receive future financing and grow by showing they are committed to improving share prices. As these investors will be motivated by future profit, this will mean allocating financial capital efficiently to where it is most productive within the firm. The board of directors may ensure these interests are represented by allowing voting on issues such as mergers or business strategy. The effectiveness of corporate governance is a critical mechanism in a firm's performance and is central to improving growth. It can also help accumulate more capital, giving the savers some certainty that investments are being put to their best use. Financial institutions and regulatory structures can provide a framework for corporate governance.

3. **To enable trading, hedging, diversifying, and pooling of risk:** Agents dislike risk, and due to the scarcity of capital, they will choose to invest in safer projects that carry lower rates of return within a mean-variance framework. These safer investments may be less productive, but they do provide greater insurance to the creditor. Hence, in the absence of a developed financial system, the lack of diversification of risk may result in slower growth, as capital is not utilized for its most productive purpose (Greenwood & Jovanovic, 1990). Acemoglu and Zilibotti (1997) modeled micro-level uncertainty/risk with growth. Their research found that advanced financial markets offer better diversification opportunities in facilitating more endogenous productive capital allocation, linked to the development process.

   Furthermore, many risks are associated with entrepreneurs engaging in new ideas/products to break a market niche. These projects carry the burden of greater risk, so a financial system that eases risk diversification by financing entrepreneurs can facilitate technological advancement (King & Levine, 1993b). Other literature has focused on easing risk over a period rather than just cross-sectional risk/diversification at a single point in time. For example, Allen and Gale (1997) showed that financial intermediaries could help in risk sharing over generations, even more so than markets. They base their theory on intermediaries facilitating intergenerational risk caused by exogenous macroeconomic shocks by diversifying a portfolio with long-term investments. Therefore, low returns in a recession may be counteracted by high returns in a boom, thus smoothing risk over a long-term scale.

4. **To collect and mobilize savings:** Financial systems pooling and mobilizing savings can increase overall saving levels and improve resource allocation. It eases the problems of transaction costs of heterogeneous individuals and information asymmetry between parties. This may cause disincentives for savers to give up control of their finances. The process can include banks undertaking screening to combat adverse selection; or by enforcing bilateral contracts, where a party promises to perform an act in exchange for the other party's action. So, savers can feel more comfortable mobilizing their savings (Boyd & Smith, 1992). The pooling of savings and exploiting economies of scale in projects that require significant capital injections can also improve resource allocation and stimulate innovation. Many investments may not be divisible below the economies of scale threshold before they can offer any return. However, this threshold may be beyond what a single saver could finance alone. Pooling savings enables capital to

be channeled to larger projects that previously could not be funded, allowing more companies to be held in an investor's diversified portfolio (Levine, 2005).

5. **To facilitate the exchange of goods and services:** Greater specialization has long been understood as contributing to productivity improvements and economic growth (Adam Smith, 1776). However, there are transaction costs associated with increased specialization. Such costs can be reduced through financial innovation, which makes transactions in a market cheaper. The existence of money as a medium of exchange between parties is a typical example of reducing a transaction cost. In a complex monetary economy, neither party will have to engage in evaluating the value of goods, like in bartering. Greenwood and Smith (1997) constructed a model that shows endogenous market formation with economic development. As specialization incurs transaction costs, the formation of financial markets that value the firm's future expected profit or creditworthiness will ease these costs. Companies can now devote fewer resources to researching and producing this information themselves. Empirical work by Brown, Martinsson, and Petersen (2013) showed that improving the access firms have to stock markets increases investment, particularly in long-term research and development projects. This can essentially be thought of as easing the exchange of capital by liberating the market, which tends to be specific to a country's legal, institutional, and financial framework. This substantially benefits smaller and younger firms, the fountain of economic growth in emerging economies.

All of these channels between financial development and economic growth can be aggregated into three major factors: financial depth; financial access; and finalcial efficiency. All three factors, if utilized positively, enhance economic growth and development. The IMF data set that we use (see IMF (2016) clearly delineates each and every one of these factors and gives a suitable definition for indicators that define access, depth, and efficiency (see Appendix for the six categories). However, the fundamental difference is between institutions and markets, and it is their differential effects that are crucial for the final outcome and the effectiveness of the conduit between finance development and economic growth. Our paper explores the relative efficacy and relative impact effects of these two crucial pillars – institutions versus markets.

3. Financial Institutions and the Accession Countries (A10) of the EU

As the A10 countries were preparing to join the European Union during more than a decade of transition during the 1990s and early 2000s, their financial

development with respect to building quality institutions became key in ensuring their acceptance into the EU and strengthening their economies. The development of market-based financial institutions, where banks were the most important ones, was the first and main ingredient in ensuring a successful transition from plan to market and paving the way towards EU accession (Caporale *et al.,* 2015).

The international financial crises that exploded in the 1990s in Mexico (1994), Asia (1997), Russia and Brazil (1998) called for ways of strengthening the international financial system's architecture by the international community. The two broad categories of initiatives considered pertained to crisis prevention and crisis resolution (Nord, 2000).

During the same decade, the A10 countries witnessed macroeconomic instability, economic downturns, as well as banking crisis with spillover effects between financial and economic crisis. Their goal of acquiring EU membership and integrating themselves into the wider world economy meant, among other requirements, they had to build a strong financial system. The way this goal was going to be achieved was through increasing the quality and transparency of their financial institutions, adopting standards that are internationally accepted, and strengthening their financial systems, including their financial institutions.

Building on the three pillars of the new financial architecture

Pillar 1: Transparency: According to the Merriam Webster dictionary, transparency is "the quality of being capable of being seen through". In the context of business and governance, transparency means being honest and open and requires disclosure of all relevant information to make informed decisions.

Main lessons from the 1990s crises, in regard to transparency, are as follows. First, information is key in maintaining the stability of any economy, hence of the world economy. Second, providing accurate and timely economic data reduce uncertainty and support markets in improving risk assessment. Third, transparency increases the policy makers accountability and incentivizes policy makers to make timely policy adjustments. Fourth, transparency contributes to avoid contagion when policy makers possess pertinent information about markets in different countries.

Pillar 2: Standards: Possessing a yardstick against which information is judged is key in our time of information overload and, both the private and public sectors have registered significant progress in improving international standards in economic and financial areas.

Table 1: The New Financial Architecture

International standards have led to improvements in many areas, including Data dissemination.
Fiscal transparency
Monetary and financial policy transparency
Banking supervision
Securities regulation
Insurance regulation
Payment systems
Deposit insurance
Accounting
Auditing
Insolvency regimes
Corporate governance

Source: International Monetary Fund (2000), Central and Eastern Europe and the New Financial Architecture.

The IMF has been extremely active in creating initiatives aimed at early-stage identification of emerging financial crises throughout the 1990s and the 2000s. One such initiative is the Special Data Dissemination Standards (SDDS) introduced in 1996, which highlights best practices in preparing and disseminating economic data (https://dsbb.imf.org). Furthermore, in 1998, the IMF started to develop codes of good practice in both fiscal and monetary policies, as well as financial policies to serve as benchmarks. Nine of the A10 countries, namely the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, the Slovak Republic and Slovenia subscribe to the SDDS.

An additional area of progress includes, but is not limited to, the Basel Committee's Core Principles for Effective Banking Supervision and the Organization for Economic Cooperation Development's Principles of Corporate Governance. This is an international committee created to develop and oversee standards for baking regulations. Of the A10 countries, seven are members of the Basel Committee, namely Czechia, Cyprus, Hungary, Malta, Slovakia, Slovenia, and Poland.

As part of their effort to monitor the implementation of the internationally accepted standards, the IMF and the World Bank have developed a series of studies titled 'Reports on the Observance of Standards and Codes' (ROSC) that contain information on the extent to which countries abide by and enforce internationally recognized standards and codes. "The IMF has recognized 12 areas and associated standards as useful for the operational work of the Fund and the World Bank. These comprise accounting; auditing; anti-money laundering and countering the financing of terrorism (AML/CFT); banking supervision; corporate governance; data dissemination; fiscal transparency;

insolvency and creditor rights; insurance supervision; monetary and financial policy transparency; payments systems; and securities regulation; AML/CFT was added in November 2002. Reports summarizing countries' observance of these standards are prepared and published at the request of the member country" ((https://www.imf.org/en/Publications/rosc).

All of the A10 countries included in this study have requested and obtained the reports assessing their financial sector supervision and regulation, including observance of standards and codes, baking supervision and banking transparency.

Pillar 3: Sound financial systems: An important lesson to learn from the Asian financial crisis is that weak banking systems are a key ingredient into such crisis. Moreover, weak financial systems and banking crisis are certainly not foreign to our A10 economies, as many countries suffered severe banking crises during the 1990s given corporate distress and lack of an effective regulatory and legal environment (IMF, 2000). In response to the Asian financial turmoil and to provide countries with adequate information to prevent future crises and potential contagion, the IMF in collaboration with the World Bank created the Financial Sector Assessment Program (FSAP) launched in 1999. The program examines factors that could potentially make financial systems vulnerable to instability and analyzes both the soundness and the stability of countries' financial systems. This is important for at least two reasons. First, financial systems play a key role in the implementation of each nation's macroeconomic policies. Second, the increase in international capital flows over the past two decades, leads to increased risk that potential financial distress in one country will generate a regional or global financial crisis.

The table below summarizes the most recent FSAPs for each of the A10 countries under study.

Table 2: Financial Sector Assessment Program by Country

Country	Year of most recent FSAP
Cyprus	November 3, 2009
Czech Republic	July 17, 2012
Estonia	March 9, 2009
Hungary	June 29, 2005
Latvia	N/A
Lithuania	April 22, 2008
Malta	February 27, 2019
Poland	February 6, 2019
Slovak Republic	July 17, 2007
Slovenia	December 6, 2012

Source: IMF, Financial Sector Assessment Program https://www.imf.org/en/Publications/fssa?sortBy=CountryName&sortVal=S#PublicationSearchListByType

Overall progress in the A10 countries

The development of market oriented financial institutions, the adoption of internationally accepted standards and the restructuring of the banking system has been a huge task in all transition economies of the Central and East European region, including our A10 countries. The accomplishments are many and the newly created system highly resembles that of the EU (Thimann, 2022). The mono-bank system was abolished, the new banking legislation that was introduced allowed private banks to develop and permitted foreign financial institutions to enter the domestic banking sector. While the Central Bank remained responsible of monetary policy including the exchange rate policy and the newly-formed banking sector, banks were permitted to run as universal trade banks. As a result, significant decline in state owned banks (e.g. in Lithuania and Estonia no state banks exist since 2008) and rapid expansion of the banking sector followed, and new foreign banks entered the A10 financial markets. This has had beneficial impacts on the banking system as it increased its efficiency and stimulated competition, thereby incentivizing better financial regulation and increasing access to international capital.

Following EU accession in 2004, the A10 countries moved into a new era of financial stability, strengthening and development, both economic and financial. This has materialized in the adoption of EU-compatible financial regulation and legislation, strong financial integration with the EU and further harmonization of the central bank's monetary policies with those of the Eurosystem. Based on successfully meeting the convergence criteria for Eurozone acceptance, seven of the A10 countries joined the Eurozone, as follows: Cyprus, Estonia, Latvia, Lithuania, Malta, Slovak Republic and Slovenia.

Table 3: The four convergence criteria

What is measured	*Price stability*	*Sound and sustainable public finances*	*Durability of convergence*	*Exchange rate stability*
How it is measured:	Harmonised consumer price inflation	Government deficit and debt	Long-term interest rate	Exchange rate developments in ERM II
Convergence criteria:	A price performance that is sustainable and average inflation not more than 1.5 percentage points above the rate of the three best performing Member States	Not under excessive deficit procedure at the time of examination	Not more than 2 percentage points above the rate of the three best performing Member States in terms of price stability	Participation in ERM II for at least 2 years without severe tensions, in particular without devaluing against the euro.

Source: https://economy-finance.ec.europa.eu/euro/enlargement-euro-area/convergence-criteria-joining_en

This provides further proof of progress, maturity and strength of the A10 countries' financial systems, including financial institutions.

4. Economic Growth and Financial Development: Empirical Analysis

To empirically analyze the financial development -economic growth nexus, we utilize panel data from 10 countries: Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, and Slovenia. Annual data from 1997 to 2020 were collected, providing a 24-year unbalanced panel. Data on financial development was obtained from the IMF financial development database. These have been discussed inter alia in: Beck, T., Demirgüç-Kunt, and Levine, (2010); Èihák, M., Demirgüç-Kunt, A., Feyen, E., and Levine, R. (2012); International Monetary Fund (2016). The Appendix offers definitions of variables and more details on their sources.

4.1. Model Specification

In many empirical applications involving panel data, the residuals from different cross-sectional units are likely to be correlated with one another, especially if the cross-sectional units exhibit "contagion" or "neighbourhood" effects, which propagate across countries in complex ways. Spatial correlations may arise for several reasons. For example, in applications such as ours in which real GDP is the dependent variable, and all countries are drawn from a particular region, it is argued that various channels of interdependence common in such sample, such as regional trade, capital flows, policy coordination mechanisms, institutional features of the EU, et al., that exist between these accession economies will undoubtedly induce cross-country correlations in GDP growth rates. Furthermore, several studies have shown that ignoring such spatial dependence, when it exists, produces inefficient estimates of the regression coefficients as well as biased standard errors.

According to Driscoll and Kraay (1998), the presence of such spatial correlations in residuals negates the standard inference procedures that combine time-series and cross-sectional data since these techniques typically require the assumption that the cross-sectional units are independent. In fact, when this assumption is violated, it is contended that estimates of standard errors become inconsistent and, hence, irrelevant for inference. Generally, standard corrections for spatial correlations will be valid if and only if spatial correlations are of a particularly restrictive form.

Unfortunately, the standard fixed-effects models, the workhorse of econometrics, assume independence of stochastic errors. So, a likely deviation

from independent errors in the context of pooled cross-section time-series data (or panel data), or simply putting a contemporaneous correlation across cross-sectional units, will likely cause the parameters from the standard fixed-effects models to be invalid.

To ensure we use the most appropriate technique for our analysis, we first test for the presence of spatial correlation in our model (Eq. 1). We utilize the Breusch-Pagan statistic, following Greene (2000, p. 601), to test the hypothesis that the residual correlation matrix, computed over observations common to all cross-sectional units, is an identity matrix of order N_g, where N_g is the number of cross-sectional units. The resulting test statistic is a distributed Chi-squared(d), where d=N_g * (N_g – 1)/2, under the null hypothesis of cross-sectional independence.

$$RGDP_{i,t} = \alpha_i + \gamma_i C_{i,t} + \varepsilon_{i,t} \quad (1)$$

where; $i = 1, ..., N$ (country) and $t = 1, ..., T$ (year). $RGDP_{i,t}$ is real GDP, and $C_{i,t}$ is a set of conditioning variables that are viewed as determinants of growth. $\varepsilon_{i,t}$ is the error term, which is normally assumed to be iid - $(E(\varepsilon_{i,t}|f_{i,t}, C_{i,t}) = 0)$. The use of conditioning variables depends on the context. Some models would include human capital, which embodies the effects of education and training on workers' skills, and the effects of medical care, nutrition, and sanitation on workers' health, in addition to the quality and quantity of capital, as part of the conditioning variable; this is particularly true for developing countries. Others, possibly for highly developed OECD economies, often include proxies for the technological level, such as the level of research and development in the economy and patent rights, as key determinants in the model. The view is that a more technologically advanced economy achieves a higher level of overall productivity cum economic growth. In our case, see below, we use investment, trade, government expenditure, and inflation as conditioning variables.

For this study, we expand the canonical model (Eq. 1) by including financial development indicators as additional explanatory variables.

$$RGDP_{i,t} = \alpha_i + \beta_i fD_{i,t} + \gamma_i C_{i,t} + \varepsilon_{i,t} \quad (2)$$

Where $f D_{i,t}$ is the set of indicators for financial development. Eq. 2 follows similar methods that have been used in the finance-growth studies, by including fd (financial development), fi (financial institutions development), fm (financial markets development), fid (financial institutions depth), fia (financial institutions access), fie (financial institutions efficiency), fmd (financial markets depth), fma (financial markets access), fme (financial markets efficiency). Figure 1, culled from the seminal IMF study, shows the various indices forming a systemic

pyramid. At the apex is financial development, broadly defined as the ultimate aggregation of all financial variables. Financial development, in turn, can be subdivided into financial institutions and markets, which is the ultimate dividing and conceptual basis of our findings. Institutions and markets are judged, in seriatim, by financial depth and impact, financial access and reach, financial efficiency, and productivity, all contributing to the final impact effect on development and growth.

4.2. Conditioning Set and Financial Development Indicators

The conditioning set can be broken down as follows;

$$Conditioning\ Set = Ci,t\ (INF, INV, GOV, TRADE)$$

where; INF = inflation, INV = gross capital formation (% of GDP), GOV = general government final consumption expenditure (% of GDP), TRADE = sum of import and export (% of GDP). In many endogenous growth models (Barro, 1991, for example), investment is seen as key to improving productivity and economic growth. Hence, we incorporate this as a measure relative to GDP; this value will often be large in high-income countries. A fiscal policy proxy in the form of general government expenditure relative to GDP is used to examine the overall government activity in domestic economies, where high values would indicate an expansionary fiscal stance, larger taxation, deficit spending, government borrowing, or a more nationalized economy. Similarly, we also use the monetary proxy, inflation, which indicates the policy central banks might be pursuing and captures increases in living costs or market distortions. TRADE is measured as the sum of real exports and real imports to GDP. Large values display a high degree of trade liberalization and international activity in domestic economies.

The financial development indicator set can be broken down as follows:

$$Financial\ Dev.Indicators\ (FDI) = f_{i,t}\ (f\,d, fi, fm, fid, fia, fie, fmd, fma, fme)$$

The two main financial development variables – financial institutions (fi) and financial markets (fm) – have established themselves throughout the literature as the main indicators for financial development, particularly for measuring the size of the financial system. Our primary interest in this study is to differentiate the impact effect of institutions and markets and judge the efficacy of each in turn for the accession economies. Through this method, we wish to answer the following question: Has accession to the EU accelerated both institutional transformation as well as market expansion? Which of these had the more significant impact?

4.3. Methodology

As discussed earlier, several studies have shown that ignoring spatial dependence, when it exists, produces inefficient estimates of the regression coefficients as well as biased standard errors. Driscoll and Kraay (1998) observe that the presence of such spatial correlations in residuals complicates standard inference procedures that combine time-series and cross-sectional data since these techniques typically require the assumption that the cross-sectional units are independent. When the independence assumption is violated, estimates of standard errors are inconsistent and, hence, are not useful for inference. In our paper, testing for the presence of spatial correlations shows the presence of spatial correlations in our sample dataset.

Indeed, numerous standard methodologies exist for addressing spatial correlations; however, these approaches typically impose stringent assumptions regarding the nature of the spatial dependencies. For instance, a common technique involves incorporating time dummy variables in pooled time-series cross-sectional regressions to account for common shocks. This method is valid for correcting spatial correlation only under the assumption that the contemporaneous correlations between any pair of cross-sectional units are uniform, and that lagged cross-sectional correlations are non-existent. However, for studies such as ours that examine economic growth across different countries over several decades, the inclusion of time dummy variables might assume that an economic crisis in one country impacts all other countries equally and instantaneously, even though the extent and timing of such impacts can vary significantly. For example, during the 2008 financial crisis, while the immediate shock affected all global markets, central and eastern European countries like Poland and the Czech Republic demonstrated a more robust resilience compared to others like Romania and Bulgaria. (*mb201012_focus01.en*)

These examples underscore that the strict assumptions of uniform and instantaneous effects are rarely met in practice. Consequently, when such unrealistic assumptions about spatial correlations are imposed, the validity of the resulting estimators becomes questionable. The heterogeneity in responses and the presence of lagged effects complicate the spatial correlation structure, leading to potential misspecifications. As a result, the properties of the estimators derived under these flawed assumptions are generally unknown and can undermine the reliability of the empirical findings. This calls for more sophisticated approaches to accommodate the complexity and diversity inherent in real-world spatial correlations.

Fortunately, Driscoll and Kraay (1998) proposed a correction for spatial correlations that does not require strong assumptions concerning their form -

and show that it is superior to a number of commonly used alternatives. Driscoll and Kraay's technique is built on the non-parametric heteroskedasticity and autocorrelation consistent (HAC) covariance matrix estimation technique of Newey and West (1987) and Andrews (1991). Their method extends Newey-West and Andrews's techniques to a panel setting with cross-sectional dependence, in addition to serial correlation and heteroskedasticity being present in the panel. We employ Driscoll and Kraay's method in this paper to examine the effect of financial development on real GDP per capita, as we suspect the presence of spatial correlation given the geographical locations and relationship between the countries in our analysis.

From a Monte Carlo simulation, Driscoll and Kray obtain consistent estimates of standard errors in the presence of arbitrary contemporaneous cross-sectional correlations, as well as lagged cross-sectional correlations, which are restricted to become small only as the time interval separating the two observations becomes large. Their results on consistency are based on asymptotic theory, which requires the time dimension, T, to tend to infinity. Thus, the Driscoll-Kraay method will only be relevant for panel data sets in which the time dimension is reasonably large (their Monte Carlo simulations suggest that a value of T=20 or T=25 is the minimum). Their method does not place any restrictions on the size of the cross-sectional dimension, N. This method fits well with our data, which has a reasonably large T (24).

To summarise, addressing the problems associated with spatial correlations, Driscoll and Kraay (1998) propose a non-parametric mixing random fields technique that corrects for spatial correlations, which does not require strong assumptions concerning their form. The result of our analysis based on the Driscoll-Kraay technique is presented in Appendix A, Table 1. The discussion below summarizes the empirical estimates from Table 1 (see Appendix).

5. Discussion

The six columns of Tables 1 and 2 represent the impact effect of the conditioning variables, as well as estimating the importance and significance of the financial development variables – both in aggregate form, fd, fi, and fm (see Appendix C for diagrammatic representation) and in terms of the disaggregated impact of depth (fd), access (fa), and efficiency (fe), for both institutions and markets. Table 1 is the standard fixed effect panel data model, which as we emphasise is inapplicable due to spatial dependence and correlation. Table 2 is the main focus of our analysis, incorporation the Driscoll-Kraay applications, and we concentrate on these. The coefficients are similar in both cases. However, the standard errors

are different but reflect the role of accounting for cross sectional dependence among countries - which is central to the fact that we are dealing with accession economies all joining the mega institutional structures of the European Union.

The results from the estimated regressions (Appendix A) show that the standard conditioning variables, capital formation, government expenditure, trade, and inflation, do affect real GDP per capita. The results show that these conditioning variables explain around 85% plus of the variation of the real GDP per capita variable. Investment adds to capital formation and growth, mainly because of the eastward orientation of European economies; total trade has a positive and beneficial effect on economic development, as we would expect given these countries being the major beneficiaries of extended openness; government expenditure seems to have an inverse Keynesian multiplier effect and has a negative and significant impact in all the regressions; given the all-pervasive role of the state in east European economies under socialism, it is possible that liberalization and the retreat from interventionism negated the expansionary impact of fiscal policy and budget deficits that we see elsewhere; there is definitely a 'crowding out' effect here; inflation also has a positive impact since it allows underutilized resources to be absorbed into the formal economy so that the economy moves towards its efficient production possibility frontier after accession.

Adding the financial development variable to the regression (column 2) improved the R-squared from 0.849 to 0.858, a 0.9% change. The result also shows that financial development significantly affects real GDP per capita. A unit increase in the financial development variable index (fd) causes a 0.55% increase in real GDP per capita.

To understand which aspect of financial development, whether it is the financial 'institutions' or financial 'markets' development that spurs growth, we then split the financial development measure further down into these two categories (column 3). The result shows that the financial institutions' development variable (fi) affects real GDP per capita more than its financial market (fm) counterpart. Both are statistically significant, although at a 90% confidence level. While a unit change in the financial institution development variable induces a 0.4% change in real GDP per capita, the financial markets development measure only contributes around 0.2% - half of that of financial institutions development. Financial markets have a *far lower impact effect* (about 50% less in proportional terms) than financial institutions.

We further investigate the aspects of financial institutions' and financial markets' development that are key to economic growth. The three areas tested were access, depth, and efficiency. Column 4 shows the results for financial

institutions' development in these three categories, while column 5 shows that for financial markets.

Firstly, when only the dimensions of financial institutions' development are analyzed, the model improves significantly. The model explained circa 88% variation in the real GDP per capita – a 3.3% improvement compared to the base model in column 1. Whereas when only the dimensions of financial market development are included (column 5), the R-squared increased by only 0.003% above the benchmark. Further analysis showed that the development of financial institutions with regard to depth and efficiency are the core determinants of economic growth, with financial institutions' efficiency being the primary link. Access seems to play an insignificant role, principally because the access index as defined appears to be independent of institutional and regulatory structures. Access allows more bank branches and ATMs, which have little to do with EU accession. In the case of financial *markets*, only access seems to be the main driver, possibly because it allows a much larger sector of the economy, including SMEs (outside the top 10), to utilize and leverage financial assets enabling it to grow faster. Access was also facilitated by the entry of foreign banks which allowed increased impact effect on real GDP per capita. However, depth and efficiency are insignificant, even having a negative coefficient. The theoretical literature has always prioritized depth and efficiency as the sine qua non of financial development and its low significance in the empirical model demonstrates that financial markets are less important in inspiring economic development.

Overall, we find that financial institutions (and the index that represents their impact) have a more substantial impact in terms of their development-enhancing powers relative to financial markets. The accession with the EU helped these economies in so many ways. However, the most crucial role was played by the new institutional structures, rules, norms, and regulations, inherited from the European Union, which helped streamline the financial system and make it a force for good. By aligning their financial systems with the well-ordered and capable European structures, the accession countries benefited from financial depth and efficiency without being subject to the unpredictable vagaries and fluctuations of international finance. Our time period of analysis also includes that of the Great Recession, which demonstrates the stability of these accession economies in the face of the whirlwind of the financial world during one of its most difficult epochs of the century.

6. Conclusion

In this paper we investigate empirically the impact of financial development on economic growth in the ten EU accession countries of a region which was

characterised at the turn of the century by three features: catch-up growth starting from developing or emerging economies to a transition to high income countries within a brief span of a decade or less; opening up of the economy to trade and finance to one of the largest regional markets in the world allowing both goods, services, and finance, to enter and exit with low transaction costs; fundamental structural and institutional change to bring these countries to achieve an extremely high bar of European Union rules and regulations which transformed their institutions.

By utilizing panel data with the Driscoll and Kraay robust technique, we discovered significant, positive links between economic growth and the rate of financial development, - vis-à-vis financial institutions' depth, access, and efficiency as well as financial markets access - within the new member states. This aligns with many theories in the literature, where financial development is critical in enabling innovation and productivity growth, thus improving resource allocation. Hence, it could only be assumed that achieving resource allocation and innovation at a faster rate would be significant in financial development and the overall link with economic growth. We subdivided the impact effect of the broadly defined financial development, into financial institutions and financial markets. The most important result we obtained was that financial institutions were more important than financial markets in creating economic development and growth for these accession economies. The very act of integration with the EU's institutional structure created the catalyst for development, by far more important than market forces, and it is these financial institutional structures that ultimately catalysed growth and development.

Notes

1. Adam Smith, Wealth of Nations, Book 2, chp.2, 1776. (https://www.marxists.org/reference/archive/smith-adam/works/wealth-of-nations/book02/ch02-2.htm)
2. Copenhagen criteria from the June 1993 European Council.

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Appendix A

Table 1: Standard Panel FE regression

Variables	*(Model 1) lnrgdppc*	*(Model 2) lnrgdp_pc*	*(Model 3) lnrgdppc*	*(Model 4) lnrgdp_pc*	*(Model 5) Lnrgdpc*	*(Model 6) lnrgdppc*
Lninv	0.202***	0.128***	0.123**	0.092**	0.176***	0.046
	(0.045)	(0.048)	(0.048)	(0.044)	(0.048)	(0.046)
Lngov	-0.549***	-0.563***	-0.558***	-0.504***	-0.532***	-0.468***
	(0.096)	(0.093)	(0.093)	(0.086)	(0.099)	(0.089)
Lntrade	0.187***	0.169***	0.142**	0.056	0.217***	0.105*
	(0.059)	(0.058)	(0.060)	(0.056)	(0.062)	(0.057)
Lncpi	0.849***	0.774***	0.761***	0.770***	0.830***	0.723***
	(0.046)	(0.049)	(0.050)	(0.045)	(0.051)	(0.048)
Fi			0.424***			
			(0.115)			
Fm			0.175*			
			(0.100)			
Fd		0.554***				
		(0.147)				
Fia				-0.084		-0.061
				(0.070)		(0.072)
Fid				0.434***		0.423***
				(0.109)		(0.110)
Fie				0.686***		0.731***
				(0.093)		(0.093)
Fma					0.118*	0.175***
					(0.064)	(0.058)
Fmd					-0.025	-0.006
					(0.136)	(0.125)
Fme					0.042	-0.039
					(0.059)	(0.053)
Constant	5.805***	6.297***	6.447***	6.547***	5.731***	6.477***
	(0.515)	(0.517)	(0.524)	(0.482)	(0.538)	(0.494)
Observations	240	240	240	240	240	240
R-squared	0.849	0.858	0.859	0.882	0.852	0.887
Cross-sectional independence test (Pesaran)	0.000	0.000	0.000	0.005	0.000	0.002
Number of ccid	10	10	10	10	10	10

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2: Regression with Driscoll-Kraay standard errors

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
	lnrgdp_pc	*lnrgdp_pc*	*lnrgdp_pc*	*lnrgdp_pc*	*lnrgdp_pc*	*lnrgdp_pc*
Lninv	0.202***	0.128**	0.123**	0.092***	0.176***	0.046
	(0.051)	(0.052)	(0.055)	(0.033)	(0.054)	(0.045)
Lngov	-0.549***	-0.563***	-0.558***	-0.504***	-0.532***	-0.468***
	(0.155)	(0.153)	(0.149)	(0.103)	(0.151)	(0.094)
Lntrade	0.187**	0.169**	0.142*	0.056	0.217***	0.105*
	(0.075)	(0.064)	(0.081)	(0.062)	(0.075)	(0.060)
Lncpi	0.849***	0.774***	0.761***	0.770***	0.830***	0.723***
	(0.043)	(0.067)	(0.080)	(0.053)	(0.045)	(0.061)
Fi			0.424*			
			(0.236)			
Fm			0.175*			
			(0.097)			
Fd		0.554**				
		(0.199)				
Fia				-0.084		-0.061
				(0.137)		(0.141)
Fid				0.434**		0.423**
				(0.155)		(0.154)
Fie				0.686***		0.731***
				(0.089)		(0.113)
Fma					0.118**	0.175***
					(0.054)	(0.052)
Fmd					-0.025	-0.006
					(0.087)	(0.088)
Fme					0.042	-0.039
					(0.073)	(0.070)
Constant	5.805***	6.297***	6.447***	6.547***	5.731***	6.477***
	(0.802)	(0.896)	(1.030)	(0.626)	(0.783)	(0.606)
R-squared	0.849	0.858	0.859	0.882	0.852	0.887
Observations	240	240	240	240	240	240
Number of groups	10	10	10	10	10	10

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix B: Cross sectional independence in panel data

The Pesaran test, developed by M. Hashem Pesaran in 2004, is a statistical test used to examine the hypothesis of cross-sectional independence in panel data.

- Null Hypothesis (H0): The null hypothesis of the Pesaran test assumes cross-sectional independence. In other words, it assumes that there is no correlation or dependence between the individuals or entities in the cross-section at any given point in time.
- Alternative Hypothesis (H1): The alternative hypothesis suggests the presence of cross-sectional dependence. This means that there are correlations or interdependencies between the entities or individuals in the cross-section at a particular point in time.

The Pesaran test indicates that the null hypothesis of cross-sectional independence should be rejected. This implies that there is evidence of cross-sectional dependence in the panel data. Rejecting the null hypothesis means that the data exhibits patterns or relationships among the cross-sectional units that are not simply due to random variation. In other words, there are interdependencies or correlations between the entities or individuals in the cross-section at a given point in time. The presence of cross-sectional dependence implies that observations within the same cross-section are not independent of each other. This could be due to various factors such as spatial dependencies, network effects, common unobserved factors, or other structural relationships among the entities.

The correlation matrix of the residuals of the standard FE regressions (see tables below) highlights the individual presence of cross-sectional independence in the panel dataset. In summary, rejecting the null hypothesis in a Pesaran test indicates that the panel data analysis should account for cross-sectional dependence, leading to more accurate and reliable results. The Driscoll-Kraay FE model incorporates this dependence, ensuring a more accurate and reliable empirical result.

	c1	c2	c3	c4	c5	c6	c7	c8	c9	c10
r1	1.0000									
r2	0.2826	1.0000								
r3	-0.0081	0.6009	1.0000							
r4	0.2518	0.2418	-0.3622	1.0000						
r5	0.0442	0.4301	0.9126	-0.6053	1.0000					
r6	0.1300	0.5212	0.7995	-0.0135	0.6849	1.0000				
r7	0.0083	0.0071	0.4960	-0.6973	0.6752	0.4762	1.0000			
r8	-0.4017	0.3596	0.7170	-0.6076	0.7867	0.4217	0.5652	1.0000		
r9	-0.5006	0.0895	0.1146	-0.0349	0.1251	-0.0400	-0.1635	0.5539	1.0000	
r10	0.0864	0.1065	-0.3851	0.7190	-0.5152	-0.2806	-0.6642	-0.2664	0.4812	1.0000

Pesaran's test of cross sectional independence = 4.486, Pr = 0.0000

Table 2: Correlation matrix of residuals from the Pesaran Test for cross-sectional independence (Model 1)

	c1	c2	c3	c4	c5	c6	c7	c8	c9	c10
r1	1.0000									
r2	0.4668	1.0000								
r3	-0.0385	0.2923	1.0000							
r4	0.1135	0.5079	-0.3257	1.0000						
r5	0.0165	0.0839	0.9207	-0.5751	1.0000					
r6	0.1629	0.4389	0.8094	0.0793	0.6786	1.0000				
r7	0.1807	-0.0809	0.5824	-0.5945	0.7258	0.5234	1.0000			
r8	-0.2045	0.1044	0.7685	-0.4035	0.8342	0.5370	0.6115	1.0000		
r9	-0.4007	0.0536	0.1853	0.1426	0.1924	0.0616	-0.1753	0.5495	1.0000	
r10	-0.1375	0.2336	0.0185	0.5476	-0.0733	0.1360	-0.2510	0.2791	0.7839	1.0000

Pesaran's test of cross sectional independence = 6.837, Pr = 0.0000

Table 3: Correlation matrix of residuals from the Pesaran Test for cross-sectional independence (Model 2)

Correlation matrix of residuals:

	c1	c2	c3	c4	c5	c6	c7	c8	c9	c10
r1	1.0000									
r2	0.5298	1.0000								
r3	0.0979	0.3436	1.0000							
r4	0.0118	0.4141	-0.3494	1.0000						
r5	0.1562	0.1525	0.9235	-0.5918	1.0000					
r6	0.2312	0.4446	0.8110	0.0600	0.6887	1.0000				
r7	0.3383	0.0623	0.6039	-0.5469	0.7393	0.5699	1.0000			
r8	-0.0467	0.1859	0.8034	-0.3865	0.8544	0.6013	0.6246	1.0000		
r9	-0.3889	-0.0102	0.2223	0.1125	0.2248	0.1156	-0.1220	0.5775	1.0000	
r10	-0.1303	0.1778	-0.0718	0.6429	-0.1776	0.1455	-0.2388	0.2014	0.7051	1.0000

Pesaran's test of cross sectional independence = 7.531, Pr = 0.0000

Table 4: Correlation matrix of residuals from the Pesaran Test for cross-sectional independence (Model 3)

	c1	c2	c3	c4	c5	c6	c7	c8	c9	c10
r1	1.0000									
r2	0.1506	1.0000								
r3	0.1327	0.0086	1.0000							
r4	-0.2283	0.7092	-0.2975	1.0000						
r5	0.2567	-0.3058	0.7229	-0.6981	1.0000					
r6	0.3631	0.2404	0.6540	-0.0472	0.5954	1.0000				
r7	0.5689	-0.0868	0.1378	-0.4315	0.5829	0.4655	1.0000			
r8	0.2553	-0.1687	0.5331	-0.6132	0.9031	0.5544	0.6495	1.0000		
r9	-0.3852	-0.0726	0.0543	0.0623	0.0974	-0.0419	-0.1656	0.2797	1.0000	
r10	-0.3124	0.3800	-0.6134	0.6594	-0.7217	-0.4552	-0.4509	-0.4936	0.4482	1.0000

Pesaran's test of cross sectional independence = 2.831, Pr = 0.0046

Table 5: Correlation matrix of residuals from the Pesaran Test for cross-sectional independence (Model 4)

	c1	c2	c3	c4	c5	c6	c7	c8	c9	c10
r1	1.0000									
r2	0.1506	1.0000								
r3	0.1327	0.0086	1.0000							
r4	-0.2283	0.7092	-0.2975	1.0000						
r5	0.2567	-0.3058	0.7229	-0.6981	1.0000					
r6	0.3631	0.2404	0.6540	-0.0472	0.5954	1.0000				
r7	0.5689	-0.0868	0.1378	-0.4315	0.5829	0.4655	1.0000			
r8	0.2553	-0.1687	0.5331	-0.6132	0.9031	0.5544	0.6495	1.0000		
r9	-0.3852	-0.0726	0.0543	0.0623	0.0974	-0.0419	-0.1656	0.2797	1.0000	
r10	-0.3124	0.3800	-0.6134	0.6594	-0.7217	-0.4552	-0.4509	-0.4936	0.4482	1.0000

Pesaran's test of cross sectional independence = 2.831, Pr = 0.0046

Table 6: Correlation matrix of residuals from the Pesaran Test for cross-sectional independence (Model 5)

	c1	c2	c3	c4	c5	c6	c7	c8	c9	c10
r1	1.0000									
r2	0.2532	1.0000								
r3	-0.1774	0.0051	1.0000							
r4	-0.0449	0.6985	-0.2704	1.0000						
r5	-0.0537	-0.3263	0.7241	-0.6773	1.0000					
r6	0.1324	0.2556	0.6604	-0.0069	0.5873	1.0000				
r7	0.4362	0.0166	0.1432	-0.3532	0.5346	0.4782	1.0000			
r8	-0.0079	-0.2166	0.5179	-0.6275	0.9005	0.4866	0.5594	1.0000		
r9	-0.3683	-0.0385	-0.0270	0.0947	0.0567	-0.0750	-0.2175	0.2817	1.0000	
r10	-0.2521	0.1163	-0.4049	0.3242	-0.2349	-0.1965	-0.2134	0.0683	0.7874	1.0000

Pesaran's test of cross sectional independence = 3.161, Pr = 0.0016

Table 7: Correlation matrix of residuals from the Pesaran Test for cross-sectional independence (Model 6)

Appendix C: Data Appendix

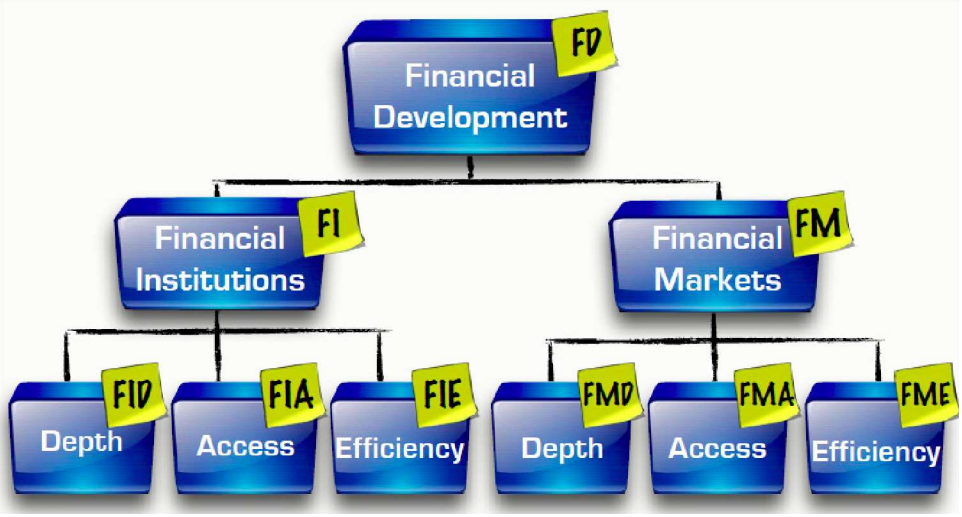

Figure 1: Financial Development Index Pyramid

Source: Introducing a New Broad-based Index of Financial Development
Katsiaryna Svirydzenka, IMF, Working Paper Series, WP/16/5, 2016.

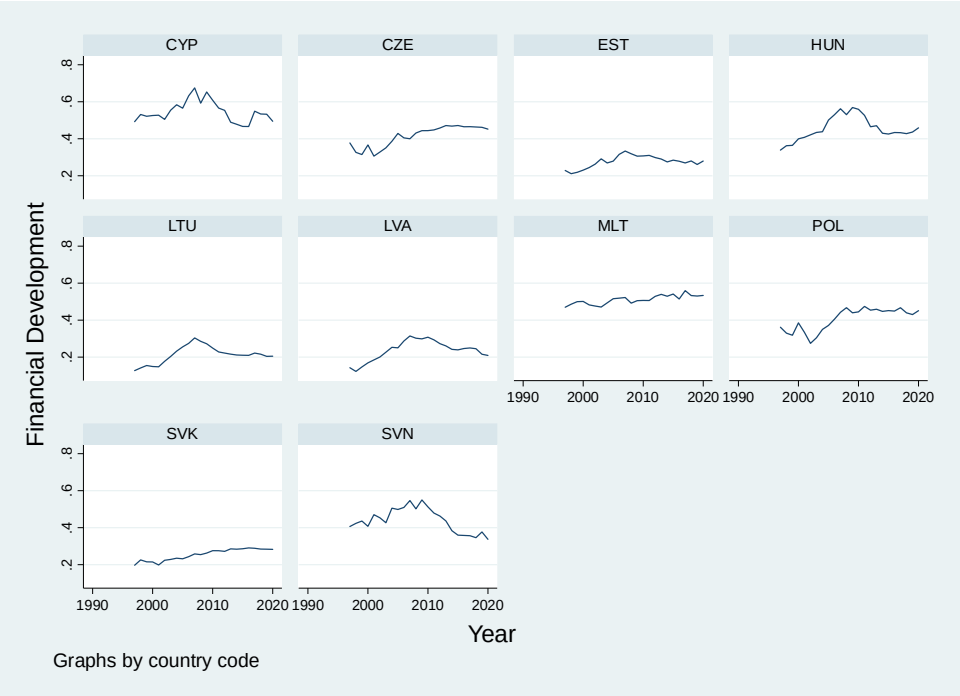

Figure 1: Financial development (FD) index across countries

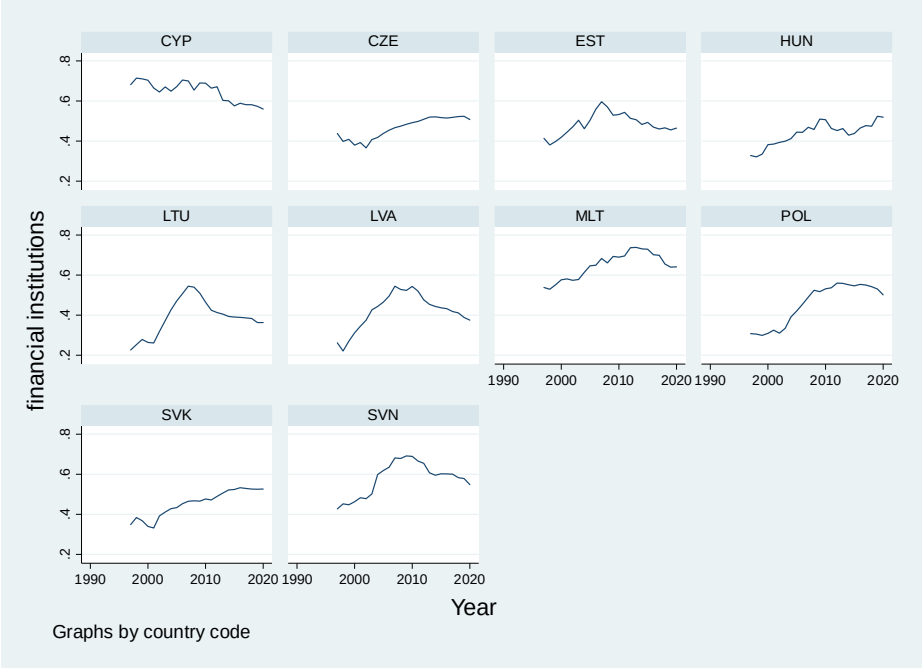

Figure 2: Financial Institutions (FI) development

Figure 3: Financial Markets (FM) development

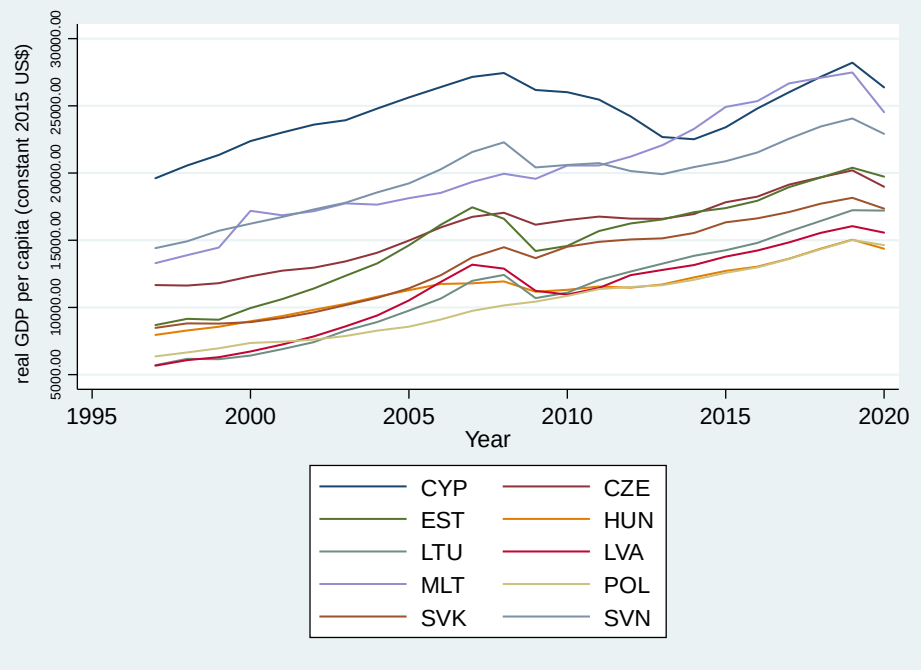

Figure 4: GDP per capita (constant 2015 US dollars)

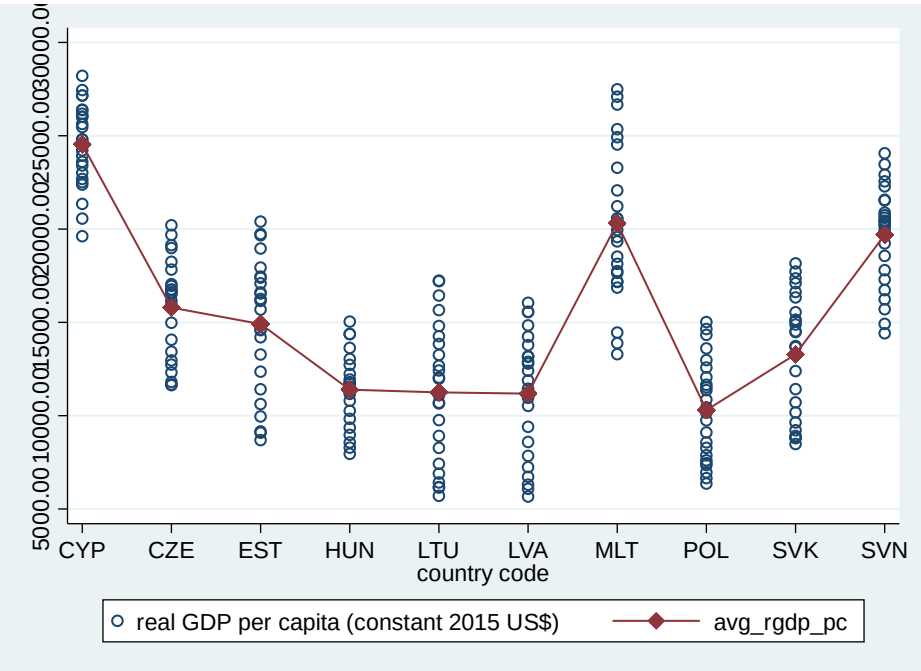

Figure 5: Fixed Effects: Heterogeneity across countries

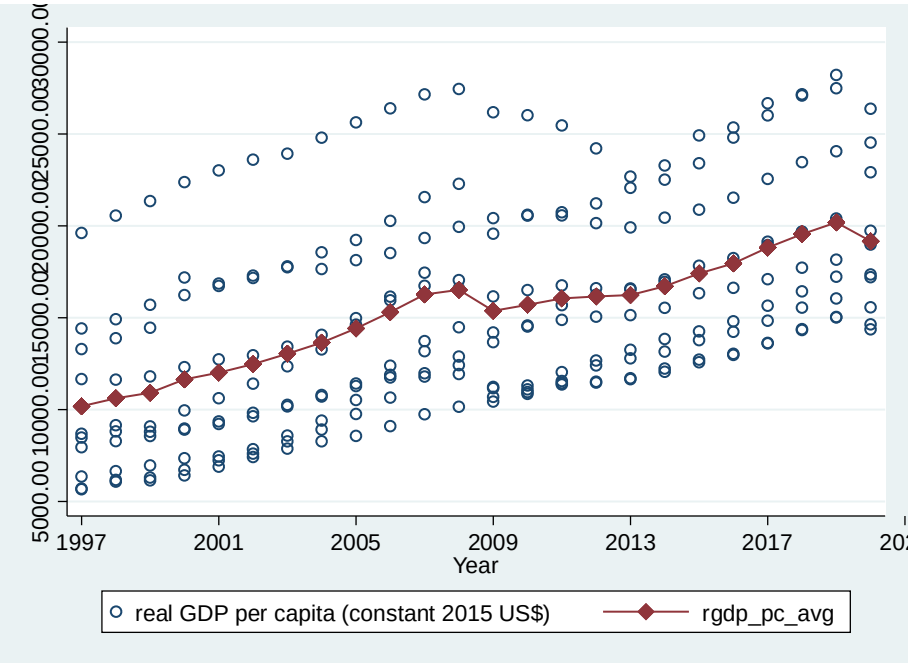

Figure 6: Fixed Effects: Heterogeneity across years