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# How Do Financial Globalization, Institutions and Economic Growth Impact Financial Sector Development in European Countries?

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**Abstract:** This paper examines the role of financial globalization, institutions and economic growth on the development of financial sector in European countries. We use panel data covering the period of 1989-2016. Using the composite index of financial development covers various dimensions of financial market, that is, depth, access and efficiency and four-way classification of institutions as suggested by Rodrick (2005) and Law et al. (2018), the empirical results indicate that economic growth and institutional quality are positively associated with financial development. Contrarily, financial globalization hinders the process of financial sector development. The results are robust to using alternative proxies of economic growth, institutional indicators and capturing the period of financial crisis. These empirical findings suggest policy guidelines to develop financial sector by using globalization, institutional quality and economic growth as economic tools.

**Keywords:** Economic Growth, Financial Development, Financial Globalization, Institutions
JEL Codes: D90, F13, G10, O16

## I. Introduction

Recently, the driving force of economic growth has become one of the dynamic areas of empirical work in applied economics. In association with existing empirical literature, it is suggested that financial development, economic globalization and institutional quality are key determinants in influencing economic development in developing and developed countries of the globe. Indeed, the degree of globalization, depth of financial sector development, and differences in institutional quality also assume prominent role in differentiating developing and developed countries (Stiglitz 2004, Dreher 2006, Rao et al. 2011, Law et al. 2013, Naceur et al. 2014, Kandil et al. 2015).

Few studies analyze the role of globalization as one of the powerful tools in boosting economic growth through increasing migration between countries, enhancing social and human capitals, developing financial and technological infrastructures, and helping inflows of foreign direct investment (O'Rourke 2001, Agenor 2003). Moreover, Stiglitz (2004) pointed out the effective role of globalization for economies by taking the comparative advantage of openness with minimizing downsize risk. With advancing globalization, the effects of financial sector development and institutional quality on economic growth in developing and developed countries have increased in the recent years. Mishkin (2009) in his recent paper further theoretically argued that globalization helps in stimulating economic growth due to the existence of mutual exclusiveness between globalization, financial development and institutional efficiency. More specifically, he argued that globalization improves the performance of financial institutions by opening domestic banking sectors to foreign financial markets and as a result the quality of bureaucracy, property rights, governance and political stability of a country will increase. As a consequence, due to the improvement of these institutional conditions, the cost of domestic financial capital will match with foreign competitive cost of investment suggesting the law of single price that will enable domestic consumers and business firms to access capital from banking and stock markets for their consumption and investment purposes. Increasing consumption and business investment activities in an economy will increase employment opportunities that will augment the further demand for goods and services and thereby it will stimulate economic growth and hence economic development. From these perspectives, it seems that globalization is gaining popularity not only in emerging economies but also in developed

countries in the world. Garcia, (2012) agrees with the idea of Mishkin, (2009) and argues that globalization leads financial globalization that increases the growth of financial sector and thereby positively contributes to economic growth.

With the growing importance of banking sector and stock market developments (i.e. financial sector depth) in the context of financial liberalization and global integration, it is important to define financial system as it has major impacts on economic development in both developed and developing economies. Financial system is conceptualized by a sophisticated network of intermediaries that play a vital role in transmitting resources between lenders and borrowers and enabling the efficient allocation of resources in an economy. In a similar vein, Levin (2003) argues that the development of financial sector is essential to an economy because it helps in effective manner of resource allocation between borrowers and buyers. Eventually, it is strongly suggested in the large body of empirical literature that financial development can explain differences or matter in economic growth across countries (Fase and Abma 2003, Levin 2003, Levine 2005, Ang 2008, Hsueh et al. 2013). Given that Law and Singh (2014) and Naceur et al. (2014) also argue that a well-developed financial market is a fundamental requirement to economic growth. It is again suggested in their findings that a well-functioning financial market helps to match borrowers and lenders, channeling resources to the most investment avenues. A vibrant level of investment creates ample employment opportunities, improves public finances and helps to reduce poverty due to the growing nature of economic activities. Keeping this positive note, it is of high importance to look at the impact of financial development driven domestic financial reform policies, legal system, cultural norms and political institutions on economic development. This is primarily due to the fact that the lack of prudent measures and institutional quality may increase the risk of financial intermediation following a collapse in the value of financial assets. These circumstances are the latest episode of the recent US sub-prime crisis and global economic recessions which rationally provided a motivation for empirically understanding the impact of financial development on economic growth in developed economies (Sun et al. 2011, Naceur et al. 2014, Law et al. 2015).

Despite the historical literature favoring the role of financial development in driving economic growth (Schumpeter 1911, Gurley and Shaw 1967, Goldsmith 1969, Mackinnon 1973), Rajan

and Zingales, (1998) found the positive impact of economic growth on financial system development. It is suggested in their analysis that economic growth leads to further development of financial system and also provides incentives for deepening and widening the sound system for financial intermediation. Hence, economic growth increases employment opportunities and thereby enhances the pool of household's savings that will be deposited in the banking sector for asking higher investment returns. Eventually, the invested money in the banking sector as part of the credit creation policy will enhance credit supply for business activities provided the sophisticated financial system is in the right place to match both borrowers and lenders in an economy. In this way, the improved financial system also leads economic growth.

Do institutions cause economic growth or does economic growth cause institutions? It is evident that the role of institutions in influencing economic growth has become one of empirical research in the field of empirical finance (Knack and Keefer 1995, Mauro 1995, Olson 1996, Keefer and Knack 1997, Hall and Jones 1999, Grogan and Moers 2001, Acemoglu et al. 2001, Law et al. 2013, Law et al. 2014). These empirical studies have provided convincing evidence to support the view that differences in institutional quality can have a major effect on economic performance. More specifically, Knack and Keefer (1995) and Mishkin (2009) also argued that the quality of bureaucracy, property rights, governance and political stability of a country all contribute to positive economic growth. On account of seeing the importance of institutions on economic growth, it is again important to remind the seminal view of North, (1981) in conceptualizing institutions as 'set of rules, compliance procedures, moral and ethical norms designed to constrain the behavior of individuals in the interests of maximizing the wealth or utility of principals'. Chong and Calderon, (2000) argued that the direction of causality between institutions and economic growth also go the other way. It is very likely that in some countries, institutions cause economic growth, while in others economic growth leads institutions. Mishkin, (2009) argued that the quality of institutions will enable an economy to grow and prosper by developing financial sector. Lipset, (1960) and Glaeser et al. (2004), on other hand, also point out that economic growth leads to better institutions due to the accumulation and social capital. It is in the sense that as people becomes richer; their demand for better institutional quality will rise in the form of asking better bureaucratic condition, more regulations and law and order. In a

similar fashion, Barro (1996) supported the positive impact of economic growth on institutional quality and thereby granting more political freedom to their citizens.

Financial system of European countries is a bank-based system. The main exception among European countries is the United Kingdom where capital market is fully developed and plays a central role in the economy. Thus, financial system of United Kingdom is called a market based system. Rajan and Zingales, (2003) compared the characteristics of European financial system over the last two decades. They described that European countries' financial system moved away from a bank-based towards a market-based system. The ongoing process will likely result in the evolution of market-based system over time, but still the bank-based system predominates in most part of Europe. The volume of intermediated credit measured by the amount of credit issued by banks and other financial intermediations to private sector has risen sharply in nearly all European countries since 1980, on average double relative to GDP (see Figure-1, Panel A, presented in Appendix 1). 1990s financial crisis interrupted the upward trend in credit to GDP ratio in European countries. This ratio has also come down since the onset of global financial crisis of 2008 as lending activities decreased and write-down have been taken on past loans (Bouis et al. 2013). In many European countries, the growth in financial intermediations outpaced the growth in financial sector value added due to lower interest margin.

European stock exchanges were not attractive to many local firms in the last two decades. Despite the cost of listing many European companies decided to cross-list on the US stock exchanges. The reason for this shift is that accounting standards and shareholders' rights protection were lower in many European countries and transaction costs were usually high. The 21$^{st}$ century has started with another revolution for European stock exchange markets: deregulation, globalization and technological developments have helped equity market integration, through the creation of stock exchange market networks. European stock exchanges have largely exploited this opportunity. They are particularly active, taking the leading forming and joining in active network cooperation (Hasan and Schmiedel, 2003). The share market size is usually represented by the ratio between the market capitalization of listed companies in the national stock exchange market and GDP. The ratio of stock market of listed companies to GDP has expanded considerably over the past two decades. This expansion has been disturbed by global financial crisis and European financial crisis during the first decade of 20$^{th}$ century. Size

alone is not sufficient for understanding the relevance of the stock exchange in a country. It is very important to analyze its activity, usually measured as the ratio between the value of shares traded and GDP. The most active markets are the London and the Amsterdam stock exchanges. Transactions volumes are high in Spain and Sweden too. Overall in Europe, Value Traded (% of GDP) increased from 2.13% in 1980 to 100.53% in 2000 and comes down to 63.48% in 2016 due to global financial crisis. As far as shares' trading is concerned, the most liquid markets are the Spanish exchanges, the London stock exchange and Deutsche Börse. The high turnovers in Sweden, Italy and the Netherlands are worth mentioning, also because of their huge increase. In overall European countries the high turnover ratio (% of GDP) is observed in 2007-2009 (see Figure-1, Panel B presented in Appendix 1). European countries made a tremendous improvement in their GDP per capita growth. The real GDP per capita was recorded as 19930 (US$) in 1980, 30283 (US$) in 2000 and 35810 (US$) in 2016 (see Figure-1, Panel C presented in Appendix 1). All most all European countries have good democratic system and quality of institutions that help to attract financial flows in a country.

The foundations of free capital movement in Europe were laid down with the 1957 Treaty of Rome that established the common market. The Maastricht Treaty of 1993 stipulated the goal of achieving fully free movement of goods, services, people, and capital in the SM. Since then, further steps such as the Financial Services Action Plan and the establishment of the EMU have led to an ever more integrated financial single market. In response to the financial crisis and the subsequent euro crisis, a single regulatory financial framework containing a whole range of common rules governing the financial sector was put in place to ensure a level playing field and develop a more resilient financial system. These include – but are not confined to – micro prudential and macro prudential bodies (e.g., the European Banking Authority and the European Systemic Risk Board) as well as the (incomplete) banking union (see e.g. ECB 2018).

The two most far-reaching recent initiatives to integrate financial markets in Europe are the banking union and capital market union (see e.g., ECB 2017). The banking union was designed to relax the vicious circle of bank and sovereign (in) solvency within the euro area and stabilize financial markets in at least two more important dimensions. First, the Single Supervisory Mechanism (SSM) was set up to centralize monitoring and supervision of large European banks

under the auspices of the ECB. Second, the Single Resolution Mechanism (and Fund) (SRM/SRF) came into force so as to restructure or even liquidate troubled banks in an orderly fashion that would reduce market disruption and contagion. In addition to the harmonization of national rules, the European Commission proposed a third pillar of the banking union in 2015: a European deposit insurance scheme (EDIS). It intends to create uniform legislation that insures private deposits against bank default, independently of the location and jurisdiction in which a bank operates (see e.g., ECB 2016). Finally, the most recent proposal to advance stock market, to deepen capital market integration and facilitate credit access by creating a pan-European market-based loans system. It would therefore constitute more of a negative integration process: unlike the banking union, not necessarily creating new and urgently needed institutions and mechanisms, but primarily seeking to strengthen the current institutional framework and remove obstacles in the common financial market (Valiante, 2016).

The aim of current paper is to investigate the impact of financial globalization, institutional quality and economic growth on financial development using the panel data for 23 European countries. This paper contributes to existing literature in following ways: (i), This empirical work investigates the impact of financial globalization, institutional quality and economic growth on financial development in European countries remains extremely sparse. This lack can possibly be attributed to the scarcity of sufficiently long time series institutional quality data for panel analysis. Since global standards of institutions (International Country Risk Guide, Global Governance Indicators, Freedom House and Fraser Institute) are emerging, it is high to see not only emerging economies but also developed countries are aware of the significant role of institutional quality on economic growth and hence the long time series data now-a-days are available for panel studies across various European countries. (ii), We apply system GMM dynamic panel data approach to deal with simultaneity and endogeneity bias that appear due to likely correlation of institutions and economic growth with financial development. The use of composite index of financial development, four-way classification of institutions as suggested by Rodrick (2005) and the use of recently developed measures of financial globalization is a major contribution to the field of finance literature. Our empirical evidence indicates that economic growth adds to financial development. Institutional quality is positively linked with financial development. On contrary, financial globalization declines financial development.

The remainder of the paper is structured as follows: Section-II reviews a brief related empirical literature. The descriptions of variables and data sources are analyzed in Section-III. Section-IV discusses empirical techniques used in the analysis. Section-V discusses empirical results and its interpretation. Section-VI presents concluding remarks and policy implications along with future directions.

## II. Review of Literature

The study of Schumpeter (1911) has produced voluminous literature on the nexus between finance and economic growth for the case of developed and developing economies. Subsequently, many studies have come up in stating that the development of both baking sector and stock market (financial development) plays a vital role in enhancing the long-run growth of an economy (Rajan and Zingales 1998, Beck et al. 2000, Levin 2003, Liu and Hsu 2006, Ang 2008, Fung 2009, Sun et al. 2011, Hsueh et al. 2013). Moreover, Chinn and Ito (2006) argue that better institutional quality will enable countries to harvest the long-run growth effect of financial development. In a similar vein, Mishkin (2009) also argues that globalization will bring necessary promotion of greater financial development for an economy with the help of strong institutional quality. In contrast, the recent global financial crisis (2007-2009) has also acknowledged the consequence of greater financial development originated in developed countries on economic development of other countries (Sun et al. 2011, Law and Singh 2014, Law et al. 2015). In this context, an important question needs to be asked here: why few countries are remaining financially underdeveloped or are prone to the consequences of financial crisis despite having their better financial system? In answering this research question, several studies made their effort towards empirical understanding between trade openness and financial development and also found inconclusive findings (Rajan and Zingales 2003, Baltagi et al. 2009, Kim et al. 2010). In such circumstances, we review below various studies looking at the determinants of financial development for both developed and developing countries, such as economic growth, globalization, and institutional quality within the time series and panel frameworks.

Levin et al. (2000) by using the panel data of 71 countries for the period ranging from 1960-1995 examined the growth-finance nexus and found a positive relationship between economic growth and financial development. In this line, Odhiambo (2009) examined the dynamic relationship between financial development and economic growth in South Africa and found a causal relationship between financial depth and economic growth. Wolde-Rufael (2009) re-examined the causal relationship between financial development and economic growth in Kenya. By using the multivariate VAR framework and modified Granger causality tests, they found evidence of the bidirectional causality between financial development and economic growth, indicating that financial development and economic growth are mutually determined for Kenya. In a similar fashion, Demetriades and Hussein (1996) examined the various causality tests for financial development and economic growth nexus for 16 developing countries and found the evidence of bidirectional causal relationship between them. Abu-Badar and Abu-Qarn (2008) examined the causal relationship between financial development and economic growth in Egypt during the period 1960-2001. By employing the Granger causality tests within the framework of cointegration and vector error correction methodology, they found the presence of feedback effect between financial development and economic growth. Similarly, Kemal et al. (2007) surveyed panel data from 19 highly developed countries and found no causality between financial development and economic growth. In a similar vein, Samargandi et al. (2015) made their recent empirical revisiting attempt on the linkage between financial development and economic growth in a panel of 52 middle-income countries over the 1980-2008 period. By using pooled mean group estimations in a dynamic heterogeneous setting, they found the significance interaction between finance and growth, suggesting an existence of inverted U-shaped relationship between them in long-run.

The seminal argument proposed by Mishkin (2009) is a theoretical in nature but it lacks empirical scrutiny. In connection to the Mishkin's (2009) hypothesis linking the relationship between globalization and financial development through the channel of institutional quality, few empirical studies have been emerged to understand the nexus between two (La Porta et al. 1997, Huang and Temple 2005, García 2011, Falahaty and Law 2012, Chen and Emile 2013, Law et al. 2015, Kandil et al. 2015, Luo et al. 2016, Muye and Muye 2017, Shahbaz et al. 2018a, b). La Porta et al. (1997) in their empirical study found that trade openness (proxy for globalization)

promotes financial development for richer economies, but not for poorer economies. In a similar line, Huang and Temple (2005) view that trade openness enhances bank-based financial development in higher income countries, but not in case of lower income countries. García (2011) used panel data of 1995-2008 for 26 transition countries in order to explore the linkage between globalization and financial development and found that globalization positively affects financial development in the transition countries. Falahaty and Law (2012) using the panel data of 1991-2007, explored the relationship between globalization and financial development for the Middle-East and North American (MENA) countries. Their empirical findings reveal that globalization promotes financial development in the MENA region. Subsequently, Chen and Emile (2013) found that trade openness is highly beneficial for the financial development in case of 17 Latin American countries. Their results are robust when they consider the level of economic development and trade relations with the Chinese economy.

Moreover, Law et al. (2015) empirically examined the causal linkages between globalization, institutional reforms and financial development in East Asian economies covering the data from 1984 to 2008. Using Westerlund panel cointegration test, they found the strong long-run relationship among globalization, institutional quality, financial development and economic development. In the long run, it suggested in their findings that globalization plays a greater role in directly promoting stock market development and indirectly influencing banking sector development via institutional reforms. In the short run, it is also found that there exists Granger causality effect running from globalization to institutions and in turn institutions lead development of financial sector. After all, the empirical results support the seminal argument of Mishkin, (2009) in which he has theoretically argued that globalization is a key factor in enhancing institutional quality which also encourages development of financial system activity (e.g. banking sector and stock market). From a policy perspective, they suggest that it is important for Asian economies to enjoy high economic growth and low volatility if they largely participate in liberalizing their capital markets and banking sector development. This thought process is also merged with the very novel idea of Gu and Dong, (2011). Moreover, Kandil et al. (2015) examined the interaction between globalization and financial development in 32 developed and developing countries over the period of 1989-2012 and with help of using panel cointegration and Granger causal analysis, they found that economic growth leads financial

development. Globalization impedes financial development. They also found that institutions do not impact financial development in these economies. From a policy scenario, their findings suggest that policies should aim at strengthening the development of financial sector through the institutional reforms and therefore it will help in the efficiency of resource allocation which is essential for long term economic growth of both developed and developing economies.

Recently, Luo et al. (2016) using their time series analysis, found that trade and financial openness have beneficial effects on financial efficiency but also found its adverse effects on the size of financial development in China. Muye and Muye (2017) using the time series framework, also found the positive long-run relationship between globalization and financial development for the BRICS region. In addition, Shahbaz et al. (2018a) using time series data of 1971-2013 for the Indian economy, explored the long-run relationship between globalization, institutional quality, economic growth and financial development. They found that though economic growth promotes financial development in India, but globalization, and institutional quality are not conducive to the growth of banking sector as they have detrimental effects on financial development in the long-run. In a similar vein, Shahbaz et al. (2018b) made a comparative time series attempt of exploring the long-run relationship between trade openness, institutional quality and service sector growth for both the Chinese and Indian economies. They found that though institutional quality hinders financial development of both economies, but service sector growth also promotes financial development. Interestingly, they also found that trade openness enhances Indian financial development but hinders Chinese financial development.

After reviewing the above literature, we observe that although existing studies on the determinants of financial development at the country level are large, but the less studies are found at the panel level. European countries are one of them which has not been yet studied by anyone in the field of applied economic literature. This is the gap that will enrich policymakers about the knowledge of macroeconomic determinants affecting financial development in case of European countries. In this connection, our study is motivated to analyze the effects of globalization, financial globalization, institutional quality and economic growth on financial development for 23 European countries within a panel framework.

## III. Descriptions of Variables and Data Sources

This section provides detail on individual measures of financial globalization, financial development and institutional quality and then build an econometric model based on annual data set covering 23 European countries over the period of 1989-2016. The list of sample countries is displayed in Appendix 1 (Table A1).

### Financial Globalization

Two measures of financial globalization, which are distinguished by the name 'de-*facto'* and 'de-*jure'* are commonly used in empirical literature. The de-facto measure of financial globalization constructed by Lane and Milesi-Ferreti (2007). The volume of country's foreign assets and liabilities (% of GDP) are used to measure financial globalization. This measure provides a useful summary of a country's history of financial liberalization at any given point in time. This indicator has an advantage over flow based measure of *gross private capital flows* by World Bank (CD-ROM, 2017), which places more emphasis on current observations. The second measure of financial globalization-*the de-jure measure*- is Chin and Ito (2006) index of capital account openness. This measure is based on four binary variables[1] that categorize restrictions on cross border financial transactions reported in IMF's Annual Reports on Exchange Arrangements and Exchange Restrictions (AREAER). The summary measure of liberalization varies from 0 (restricted capital account) to 1 (liberalized capital account) and derived from the first principal component analysis. The disadvantage of this index is that it does not provide information on the direction or residency and the prevalence of capital control for the specific types of flows. Besides Chin and Ito index, there is another measure of financial liberalization introduced by Abiad and Mody (2005) and based on annual data for the period 1980-1996 for a 34 developed and developing countries. This measure captures six different aspects of globalization comprises credit controls, interest rate controls, entry barriers, regulation, privatization and international transactions. The disadvantage of this index is that it is too broad for a specific purpose because its range lies from 0 to 18.

Recently, Gygli et al. (2018) revised the KOF globalization index and breakdown it into de-facto and de-jure measures. Quinn et al. (2011) pointed out that de facto and de jure measures yield

[1]Foreign exchange regime, export proceeds, capital account and current account

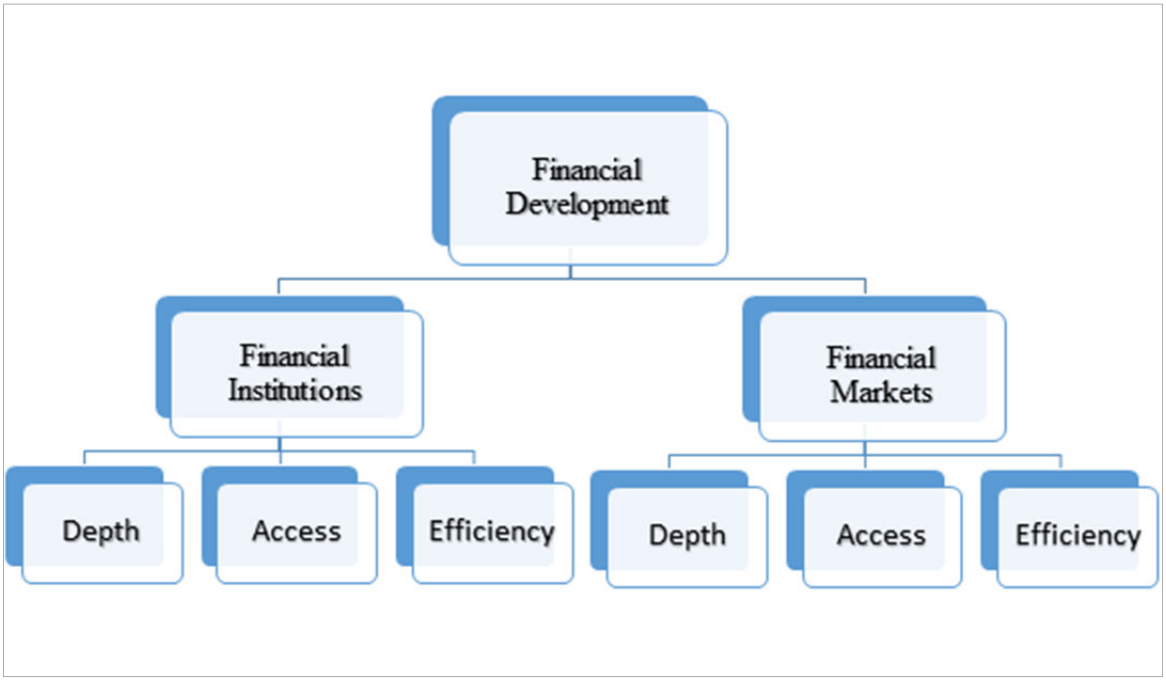
different results when the effect of financial globalization on economic growth is analyzed. This is because they proposed a new structure for the revised KOF globalization index which Cleary distinguish between de-facto and de-jure globalization at every dimension and at every level of index. The *KOF de-facto* measure of financial globalization is the extension of Lane and Milesi-Ferreti (2007) dataset and include the following variables: the sum of stock of foreign assets and liabilities (% of GDP), sum of stock of international equity portfolio investment assets and liabilities (% of GDP), sum of stock of international portfolio debt securities and international bank loans and deposits (% of GDP), international reserve excluding gold (% of GDP) and sum of primary income and receipts (% of GDP). The *KOF de-jure* measure of financial globalization comprises investment restrictions that include measures of the prevalence of foreign ownership and regulations to international capital flows and are taken from Gwartney et al. (2016), capital account openness index by Chin and Ito (2006) and capital account openness index by Jahan and Wang (2016). These recent indices of KOF financial globalization overcome most of the disadvantages of previously used financial globalization indices. Further, as Rajan and Zingales (2003) argued that it is difficult to arrive at a conclusion regarding the theoretical pros and cons of de-facto and de-jure measures because of the absence of theoretical model in which both indices are based. As a result, we utilize both de-facto and de-jure measures of KOF financial globalization proposed by Gygli et al. (2018) and sample period for this index is 1970-2016.

**Financial Development**

The selection of key variables to measure financial development is a difficult task due to diversity of financial services provided by financial system. Moreover, diverse array of institutions and agents are involved in financial intermediation activities. The level of financial development can be best measured by the level of transaction costs, financial intermediaries' ability to mobilize domestic savings, manage risks and facilitates transactions. Unfortunately, there is no reliable availability of data to support this idea. Researchers have used different proxies to measure the level of financial development in a country. Furthermore, the diversity of financial system across countries implies that one need to use multiple indicators to measure financial development. To overcome the shortcoming of using single indicator to measure financial development, we create a number of indices that summarize how developed financial

institutions and financial markets are in terms of their depth, access, and efficiency, culminating in the final index of financial development (Figure 1).

Figure 1. Financial Development Index




Source: Čihák et al. (2012 and 2013).

The financial development index is constructed using a Principle Component Analysis (PCA). PCA involves the transformation of a number of correlated set of variables into a smaller number of uncorrelated variables. This approach reduces a set of observed variables into principal components which as much as possible retain information from the original set of variables. Further, this procedure helps to overcome measurement errors and outlier problems that might be associated with the use of single indicator. Table A2 in Appendix 1 reports the proportion

explained and the eigenvector of each first principal component that are used to develop the new indices of financial development.

Following Svirydzenka (2016), we have constructed a total of nine indices that measure various dimensions of financial sector. Starting from the bottom of the pyramid in Figure 1, six lower level sub-indices are constructed using a list of indicators to measure how deep, accessible, and efficient financial institutions and financial markets are. These sub-indices are called $FIDpth$, $FIAccs$, $FIEfcy$, $FMDpth$, $FMAccs$, $FMEfcy$, where the letters I and M denote institutions and markets, and the letters D, A, and E denote depth, access, and efficiency. These sub-indices are aggregated into two higher level sub-indices, $FDIns$ and $FDMar$ which measure how developed financial institutions and financial markets are overall. Finally, $FDIns$ and $FDMar$ sub-indices are aggregated into the overall measure of financial development – $FDev$.

Financial institutions depth sub-index comprises private credit by deposit money banks to GDP, liquid liabilities to GDP, mutual fund assets to GDP, insurance premiums life and non-life to GDP. Financial institution access and efficiency measures are more bank specific, given the lack of this information for other financial institutions. Financial institutions access is proxied by the number of bank branches and ATMs per 100,000 adults. Additional indicators such as the number of bank accounts per 1,000 adults, percent of firms with line of credit, and usage of mobile phones to send and receive money are not included in the sub-index because they lack sufficiently large European countries and time coverage. Financial institutions efficiency sub-index relies on three aspects of bank efficiency: (i) efficiency in intermediating savings to investment, as measured by the net interest margin and lending-deposit spread; (ii) operational efficiency measures, such as non-interest income to total income and overhead costs to total assets.; and (iii) profitability measures, such as return on assets and return on equity. A lower value of net interest margin and a narrow spread between loan rates and deposit rates indicate greater competition and efficiency (Bikkar 1999; Huang, 2005; Caporale et al. 2009). A reduction in cost due to improved operational efficiency is expected to increase profitability (Beck et al. 2009; Ghosh, 2016). Profitability measures indicate how effectively the banks assets are managed to generate profits from bank assets (Ghosh, 2016). As with the other dimensions,

these are relatively crude measures of efficiency. For example, efficient financial institutions tend to be more profitable, but this relationship is not necessarily one for one, e.g. inefficient institutions can report profits when they operate in an economic upswing, while otherwise efficient institutions when hit by an adverse shock may generate losses (Svirydzenka, 2016). We do not include in the efficiency sub-index indicators of microstructure, such as banking system concentration ratios or the share of top three banks in total banking system assets. They are important to assess the financial stability features as they provide a rough approximation for the potential impact in the case of a major financial disruption (Čihák and Schaeck, 2010). But there is no clear bottom line in the literature on whether more concentrated banking systems are more or less efficient. As surveyed in Berger et al. (2004), the findings for a range of efficiency indicators – loan pricing, interest margins, profitability, and firm access to credit, among others – are mixed and are not robust to controlling for institutional development, legal impediments to competition, and the different competitive effects of foreign-owned and state owned banks. However, for comparison purpose, we also calculated banks efficiency using micro dataset. The detail is presented in Appendix 2. Financial market indicators focus on stock market and debt market development. The depth sub-index includes the size of the stock market (capitalization, or the value of listed shares) and how active it is (stocks traded), the outstanding volume of international debt securities of sovereigns and international and domestic debt securities of financial and nonfinancial corporations. For the financial market access, we use the percentage of market capitalization outside of top 10 largest companies to proxy access to stock markets. A higher degree of stock market concentration should reflect greater difficulties in accessing the stock market for newer or smaller issuers. For bond market access, we use the number of financial and nonfinancial corporate issuers on the domestic and external debt market in a given year per 100,000 adults. This variable reflects the number of distinct issuers, such that repeat issuance by the same company in a given year is only counted once. Financial market efficiency sub-index relies on the stock market turnover ratio – the ratio of the value of stocks traded to stock market capitalization. A higher turnover should indicate higher liquidity and greater efficiency in the market. In the bond market, the most commonly used variable is the tightness of the bid-ask spread. Bloomberg data on the bid-ask spread in the sovereign bond market covers on average 7 European countries starting only in 2000. Given poor coverage, it is not used in the sub-index. The data for financial development indicators is taken from Global Financial

Development Database (GFDD) developed by World Bank, BIS debt securities database and Dealogic corporate debt database. These key indicators and their data sources are presented in Table 1.

**Table 1**: Financial Development Indicators and Data Sources

| Category | Indicators | Data source |
|---|---|---|
| **Financial Institutions** ( *FDIns* ) | | |
| Depth ( *FIDpth* ) | Private-sector credit to GDP ( $P_{riv}C$ ) | GFDD |
| | Liquid Liability to GDP ( $LL_{iab}$ ) | GFDD |
| | Mutual fund assets to GDP ( $M_{fnd}A$ ) | GFDD |
| | Insurance premiums, life and non-life to GDP ( $I_{prim}$ ) | GFDD |
| Access ( *FIAccs* ) | Bank branches per 100,000 adults ( $B_{ank}B$ ) | GFDD |
| | ATMs per 100,000 adults ( $A_{tm}$ ) | GFDD |
| Efficiency ( *FIEfcy* ) | Net- interest margin ( $N_{et}IM$ ) | GFDD |
| | Lending-deposits spread ( $LD_{rate}$ ) | GFDD |
| | Non-interest income to total income ( $N_{int}T_{inc}$ ) | GFDD |
| | Overhead cost to total assets ( $OC_{ost}$ ) | GFDD |
| | Return on assets ( $RO_{ast}$ ) | GFDD |
| | Return on equity ( $RO_{eqt}$ ) | GFDD |
| Financial Markets ( *FDMar* ) | | |
| Depth ( *FMDpth* ) | Stock market capitalization to GDP ( $S_{tk}MC$ ) | GFDD |
| | Stock traded to GDP ( $S_{tk}T$ ) | GFDD |
| | International debt securities of government to GDP ( $I_{nt}DS$ ) | BIS debt securities database |
| | Total debt securities of financial corporations to GDP ( $TDS_{FC}$ ) | Dealogic corporate debt database |
| | Total debt securities of non-financial corporations to GDP ( $TDS_{NFC}$ ) | Dealogic corporate debt database |
| Access ( *FMAccs* ) | Percent of market capitalization outside of top 10 largest companies ( $MC_{l\,arg}C$ ) | GFDD |

| | | |
|---|---|---|
| | Total number of issuers of debt ($T_{issuer}D$) | GFDD |
| Efficiency ($FMEfcy$) | Stock market turnover ratio ($T_{OR}$) | GFDD |

**Institutional Quality**

Following Rodrick (2005) and Law et al., (2018), four types of institutions are used to analyze the effect of financial development on economic growth, namely, market creating $(MAR_{cr})$, market regulating $(MAR_{reg})$, market stabilizing $(MAR_{stab})$ and market legitimizing $(MAR_{lig})$. Market creating institutions ensure contract enforcement, protect property rights and prevent market failure. International Country Risk Guide (ICRG) data on law and order index is used to measure market creating institutions. Composite index of regulation in credit market, labor market and business in general is used to measure market regulating institutions and data is obtained from Fraser Institute (FI) economic freedom of the world index. Market regulating institutions minimize the risk of financial crisis, reduce macroeconomic uncertainty and prevent inflationary pressure. Fraser Institute data on sound money index is used as a measure of market stabilizing institutions. This type of institutions provides social protection in the event of shocks, manage social conflict and handle redistribution. Democracy is used a proxy for market legitimizing institutions as suggested by Rodrik (2005). Polity IV democracy index is used to measure $MAR_{lig}$. These sub-institutions ranges from 0 to 10, higher value indicates better institutional quality. The summation of all these sub-institutions is used to construct single measure of institutional quality $(INS)$. So, the theoretical range of final measure of institutional quality is 0 to 40.

**Economic Growth**

Annual data on log of GDP per capita (at constant 2010 $US) is used to measure economic growth (EGrowth). This variable captures the demand for finance in an economy. It is a well-known fact that countries with higher economic growth demand for more finance.

**Control Variables**

The list of control variables that are used with dependent variables is as follows:

Trade to GDP ratio ($TR_{ade}$)

The ratio of the sum of exports and imports to GDP is used to measure trade to GDP ratio. This variable explains the degree of economic integration between countries.

Inflation ($IN_f$)

It is the rate at which general price level of goods and services change in an economy. Inflation, consumer prices (annual percentage change) is used to measure this variable.

Population ($PO_p$)

Financial development is also closely related to total size of population. Countries with lower population tend to have higher ratio of liquid liabilities and private credit.

The data on economic growth and all control variables are retrieved from World Development Indicators (WDI, World-Bank CD-ROM, 2018). Description of variables is presented in Table1. The descriptive statistics for all variables are displayed in Appendix 1, Tables-A3. The scatter plot of financial development and economic growth is portrayed in Figure-1A (Panel-A, Panel-B & Panel-C) of the Appendix 1. Economic growth is measured in natural logarithms, which help to reduce outlier problem in this case. It is clear from figure that economic growth and financial development are positively related. Again, there are evidence of positive relationship between financial development and financial globalization, financial development and institutions, although the presence of outlier such as Switzerland may obscure the relationship to some extent (see Figures 2A-5A of the Appendix 1).

## IV. Estimation Approach

The aim of estimating strategy is to explain the relationship between financial development, financial liberalization (financial globalization), institutional quality and economic growth by utilizing an empirical model that allows the testing of main hypothesis of this study. Following this aim, we make maximum use of time and cross-country dimensions of available dataset. The underlying data are averaged over four years intervals through 1989-2016 with at most 7 overlapping four-year periods (1989-1992, 1993-1996, 1997-2000, 2001-2004, 2005-2008,

2009-2012, 2013-2016). As it is mentioned in empirical literature, averaging annual data reduces the impact of measurement error, simplifies the model specification and results are less likely to be driven by co-movement at very short horizon (Huang and Temple, 2005). For empirical estimation, we use the following dynamic model for financial development which include a lagged dependent variable.

$$FDev_{it} = \beta FDev_{it-1} + \gamma'[z]_{it} + \omega_i + \mu_{it} \quad (1)$$

Where $FDev_{it}$ represent financial development, $FDev_{it-1}$ is the lagged value of financial development, $z_{it}$ is the set of explanatory variables including financial liberalization ($FGlob$), institutional quality ($Inst$), economic growth ($EGrowth$) and set of control variables. The term $\omega_i$ is a time-invariant country specific effect, $\mu_{it}$ represents independently and identically distributed error term.

The appearance of lagged value of financial development in empirical model indicates the presence of correlation between regressor and error term since lagged value of financial development depends on $\mu_{it-1}$ which is a function of $\omega_i$, the country specific effect. Because of this correlation, dynamic model presented in equation-1 suffers from specification bias. The preferred estimation technique in this case is generalized method of moment (GMM) by Arellano and Bond (1991). This method is able to correct time-invariant country specific effect, omitted variable bias, measurement error and endogeneity problem. Time-invariant country-specific characteristics can be eliminated by formulating equation-1 in difference form and then lagged values of regressors dated t-2 as instruments. Thus, more efficient dynamic panel GMM estimator employs the following moment conditions:

$$E\left[\Delta FDev_{it-r}\Delta\mu_{it}\right] = 0 \quad \text{for all} \quad r \geq 2, t = 3.....T \quad (2)$$

$$E\left[\Delta z_{it-r}\Delta\mu_{it}\right] = 0 \quad \text{for all} \quad r \geq 2, t = 3.....T \quad (3)$$

GMM estimators based on these moment conditions is known as difference GMM. The efficiency of difference GMM, however, is criticized in terms of bias and imprecision. A well-known property of difference GMM is that standard errors may be severely biased downwards in small samples. A more fundamental weakness of difference GMM is that lagged values of variables may be weak instruments for first difference, especially when the series are highly persistent. In this case, additional assumptions on the initial conditions of the process are required to improve the identification of the model. The System GMM developed by Arellano and Bover (1995) and Blundell and Bond (1998) is based on such assumptions that can alleviate the weak instrument problem. The System GMM estimator combines regression in differences with regression in levels. First difference control unobserved country heterogeneity, omitted variable bias and endogeneity problem. To achieve identification, level equation uses the lagged first differences of explanatory variables as instruments. Therefore, the additional moments conditions are as follows:

$$E\left[\Delta FDev_{it-r}\left(\omega_i + \mu_{it}\right)\right] = 0 \quad \text{for} \quad r = 1 \tag{4}$$

$$E\left[\Delta z_{it-r}\left(\omega_i + \mu_{it}\right)\right] = 0 \quad \text{for} \quad r = 1 \tag{5}$$

With the use of these moment conditions, system GMM method produce consistent and efficient estimates as compared to difference GMM and become most popular in empirical literature. There are two variants of system GMM estimators- the one step and two step estimators. Theoretically, two-step system GMM estimator is consider to be more efficient than one-step system GMM estimator because it uses optimal weighting matrix. However, it is noted that its application to sample with small cross-section dimension lead to biased standard error and a weekend over-identification test (Windmeijer, 2005). These problems lead to instrument proliferation or too many instruments (Roodman, 2009). To overcome these problems, Roodman (2009) introduces an innovative solution that reduces the dimensionality of the instrumental variable matrix. For example, in this study, we restrict the moment condition to a maximum of

two lags of the dependent variable. Following Roodman (2009); Vieira et al. (2012), the dimensionality of the instrumental variable matrix is reduced, because the regressors are endogenous, they should all be instrumented with two lags of themselves in the first difference equation and one lag of the first difference in the level equation. In this study we apply the two-step system GMM estimator to examine the effect of economic growth, financial globalization, institutional quality on financial development. The consistency of GMM estimator depends three specification tests suggested by Arellano and Bond (1991) and Blundell and Bond (1998) are used. The first is a Sargen test of over identifying restriction which test the overall validity of instruments by analyzing the sample analog of moment conditions used in the estimation process. The second is difference-in-Hansen test of too many instruments and the third is an autocorrelation test in disturbances. Failure to reject the null hypothesis of Sargen test implies that instruments are valid and model is correctly specified while failure to reject the null hypothesis of difference-in-Hansen test indicates instrument proliferation or too many instruments. With respect to autocorrelation test, one should not reject the absence of second order autocorrelation.

## V. Empirical Results and Discussions

This study regressed the economic growth, financial globalization and institutional quality along with control variables on composite index of financial development. The model is estimated by using two step system GMM estimator. Separate regressions are estimated for each of the two alternative measures of financial globalization. The results reported in Table-2 shows that lagged dependent variable is positive and significant which justifies the use of dynamic panel estimator. The coefficient of economic growth is found to be positive and significant in both regressions, suggesting that economic growth boosts investors' confidence, thus increasing both the demand for credit and the supply of credit from the private sector. Our results support 'growth lead finance' as documented by Baltagi et al. (2009), Filippidis and Katrakilidis (2014), Le et al. (2016). Both measures of financial globalization are found to be detrimental for financial development in European countries. The negative result implies that financial globalization may reduce restrictions on external financing, thus allows risk sharing activities at international level (Kose et al. 2009) and induce volatility in macroeconomic environment (Kalemli-Ozcan et al. 2003). Financial sector is less likely to channel resources in productive activities in a volatile

macroeconomic environment which in turn reduce the incentives for the development of domestic financial sector. The positive coefficient of institution implies that a well-developed institutional structure increase efficiency in financial market because it reduces transaction costs faced by economic agents (Filippidis and Katrakilidis, 2014). The coefficients of control variables (trade openness, inflation and size of population) are also reported in Table-2. The negative sign of trade openness variable reveals that more open economies suffer from macroeconomic instability (Rodrik, 1992) and increase vulnerability to international shocks (Yilmazkuday, 2011). Inflation and population size are negatively related with financial development because both these variables reduce efficiency of the finance sector (Ahmad 2013, Allen et al. 2014, Mahawiya 2015, Elkhuizen et al. 2017). The results of diagnostic tests indicate that both models are well specified. The null hypothesis of first order serial correlation is rejected at 1% significance level while the null hypothesis of second order serial correlation is failed to reject. The number of instruments is less than the number of cross-sectional units and therefore suggest that the models do not suffer from too many instruments problem. The Sargen test fail to reject the null hypothesis of over identification restriction, and the null of difference-in-Hansen test is also not rejected, thus, confirm that the instruments are valid.

**Table-2: System GMM Regression Analysis**

| Dependent variable: $FDev_{it}$ | | | | |
|---|---|---|---|---|
| Variables | I | | II | |
| | Coefficient | Standard error | Coefficient | Standard error |
| $FDev_{it}$ (lagged) | 0.564* | 0.045 | 0.652* | 0.053 |
| $EGrowth_{it}$ | 0.038** | 0.019 | 0.039** | 0.002 |
| $FGlob(de-facto)_{it}$ | -0.143*** | 0.079 | | |
| $FGlob(de-jure)_{it}$ | | | -0.692* | 0.232 |
| $Inst_{it}$ | 0.229*** | 0.130 | 0.876** | 0.412 |
| $TRade_{it}$ | -0.041*** | 0.022 | -0.025** | 0.007 |
| $INf_{it}$ | -0.004** | 0.002 | -0.005** | 0.002 |
| $POp_{it}$ | -0.044 | 0.030 | -0.026 | 0.015 |
| Number of Countries | 23 | | 23 | |
| Number of Instruments | 18 | | 18 | |
| Sample Period | 1989-2016 | | 1989-2016 | |
| Sargen Test (P-value) | 40.22 [0.97] | | 51.00[0.74] | |
| Difference-in-Hansen Test (P-value) | 61.06[0.52] | | 69.32[0.49] | |

| | | |
|---|---|---|
| $AR_{(1)}$ (P-value) | -1.52[0.00] | -1.82[0.00] |
| $AR_{(2)}$ (P-value) | 0.73[0.45] | 0.79[0.41] |
| Notes: 1. All regressions are estimated by using dynamic system-GMM estimator developed by Blundell and Bond (1998). 2. $AR_{(1)}$ and $AR_{(2)}$ are first order and second order serial correlation test. 3. The significance at 1%, 5 and 10% level is represented by * , ** and *** respectively. 4.Time-dummies are included in all regressions. 5. Values in brakets are P-values. | | |

In Table-3, $FDIns_{it}$ is taken as dependent variable and results show the negative impact of both measures of financial globalization (de-facto and de-jure) on the development of financial institutions. Boot (2000) pointed out that the process of financial globalization may aggravate information asymmetries. As financial globalization increased bank competition and decreased interest rate, borrowers may have incentive to end-up their long-lasting relationships with banks. The switching of borrowers to other banks increases information asymmetries because the information collected by previous banks with respect to their borrowers is no longer of value. Further, the competition between banks increased the probability of risk taking. The less efficient financial institutions that fail due to reducing their overhead costs may adopt a gambling strategy in order to remain profitable i.e. they reduce collection of efforts and monitoring strategy (Hellmann et al. 2000, Andersen and Tarp, 2003). Thus, financial globalization may result in instability rather efficiency in banking sector. Finally, Stiglitz (2000) argued that capital inflows following financial globalization is of speculative nature and may not be a mode of long-term investment. The sudden outflow of capital may lead to bank runs and banking crises (Elkhuizen et al. 2017).

The positive and significant coefficient of economic growth validates that financial institutions development can be driven by economic growth (Falahatyand Law 2013, Le et al. 2016, Aluko and Ajayi 2017). The results of institution variable demonstrate that developed institutional structure offers strong legal protection to investor, emphasize creditor rights and enforce contract effectively that tend to have better developed banking sector (Levine et al. 2000, Ayadi et al. 2013, Filippidis and Katrakilidis, 2014). The negative coefficient of inflation implies that in the presence of high inflation, banks are reluctant to provide finance on long-term basis and it adversely impact banks' ability to increase allocation of resources (Rousseau and Wachtel, 2005). The trade openness policies and the size of population may hinder the process of banking

sector development in European countries. The results of diagnostic tests imply that both models are correctly specified. The p-values of Sargen test and difference-in-Hansen test suggest that instruments are valid and there is no problem of serial correlation at second order.

**Table-3: System GMM Regression Analysis**

| Dependent variable: $FDIns_{it}$ | | | | |
|---|---|---|---|---|
| Variables | I | | II | |
| | Coefficient | Standard error | Coefficient | Standard error |
| $FDIns_{it}$ (lagged) | 0.478* | 0.061 | 0.601* | 0.051 |
| $EGrowth_{it}$ | 0.001** | 0.0005 | 0.009* | 0.0003 |
| $FGlob(de-facto)_{it}$ | -1.051** | 0.420 | | |
| $FGlob(de-jure)_{it}$ | | | -0.764 | 0.557 |
| $Inst_{it}$ | 1.224** | 0.598 | 1.261*** | 0.647 |
| $TRade_{it}$ | -0.007 | 0.054 | -0.004 | 0.030 |
| $INf_{it}$ | -0.002** | 0.001 | -0.001** | 0.0005 |
| $POp_{it}$ | -0.216*** | 0.115 | -0.195 | 0.118 |
| Number of Countries | 23 | | 23 | |
| Number of Instruments | 16 | | 16 | |
| Sample Period | 1989-2016 | | 1989-2016 | |
| Sargen Test (P-value) | 51.63[0.63] | | 59.41[0.72] | |
| Difference-in-Hansen Test (P-value) | 72.83[0.39] | | 67.50[0.45] | |
| $AR_{(1)}$ (P-value) | -1.71[0.01] | | -1.63[0.05] | |
| $AR_{(2)}$ (P-value) | 0.56[0.44] | | 0.52[0.39] | |

Notes: 1. All regressions are estimated by using dynamic system-GMM estimator developed by Blundell and Bond (1998). 2. $AR_{(1)}$ and $AR_{(2)}$ are first order and second order serial correlation test. 3. Robust standard error are used. 4. The significance at 1%, 5 and 10% level is represented by *, ** and *** respectively. 5. Time-dummies are included in all regressions. 6. Values in brakets are P-values.

In Table-4, the results are estimated by using $FDMar_{it}$ that capture the development in financial markets as dependent variable. The effect of financial globalization on financial markets is found to be negative and significant when de-facto measure of financial globalization is used while positive and insignificant when de-jure measure of financial globalization is used. However, the coefficient of financial globalization is significant marginally when de-facto measure of financial globalization is used. The positive value of coefficient explains that financial globalization leads

to the development of financial markets only if a country is equipped with certain level of legal and institutional development (Chin and Ito, 2006). European countries have developed institutional structure, so that they can benefit from financial globalization in the development of equity markets. With respect to control variables, the results show that the coefficient of trade openness and population size are insignificant while the coefficient of inflation appear significant in this specification. The results of diagnostic tests indicate that both models have valid instruments.

**Table-4: System GMM Regression Analysis**

| Dependent variable: $FDMar_{it}$ | | | | |
|---|---|---|---|---|
| Variables | I | | II | |
| | Coefficient | Standard error | Coefficient | Standard error |
| $FDMar_{it}$ (lagged) | 0.701* | 0.076 | 0.669* | 0.072 |
| $EGrowth_{it}$ | 0.001* | 0.0003 | 0.006* | 0.0002 |
| $FGlob(de-facto)_{it}$ | -0.136*** | 0.075 | | |
| $FGlob(de-jure)_{it}$ | | | 0.112 | 0.098 |
| $Inst_{it}$ | 1.359*** | 0.719 | 1.289** | 0.520 |
| $TRade_{it}$ | 0.001 | 0.001 | 0.003 | 0.002 |
| $INf_{it}$ | -0.005** | 0.002 | 0.006** | 0.003 |
| $POp_{it}$ | -0.032 | 0.076 | -0.035 | 0.062 |
| Number of Countries | 23 | | 23 | |
| Number of Instruments | 18 | | 18 | |
| Sample Period | 1989-2016 | | 1989-2016 | |
| Sargen Test (P-value) | 59.84[0.72] | | 52.33[0.49] | |
| Difference-in-Hansen Test (P-value) | 72.53[0.47] | | 69.50[0.37] | |
| $AR_{(1)}$ (P-value) | -1.49[0.00] | | -1.42[0.00] | |
| $AR_{(2)}$ (P-value) | 0.35[0.59] | | 0.32[0.62] | |

Notes: 1. All regressions are estimated by using dynamic system-GMM estimator developed by Blundell and Bond (1998). 2. $AR_{(1)}$ and $AR_{(2)}$ are first order and second order serial correlation test. 3. Robust standard error are used.

4. The significance at 1%, 5 and 10% level is represented by *, ** and *** respectively. 5.Time-dummies are included in all regressions. 6. Values in brakets are P-values.

The results reported in Tables-5 to 7 support our previous findings that lagged dependent variable is positive, significant and different from unity that validates the use of dynamic model. The coefficient of economic growth appears to be positive and statistically significant in all

models, justifies the importance of economic growth for improving the efficiency of financial markets, increasing their size and enhancing their depth. The empirical findings from both data sets of financial `globalization suggest that financial globalization is negatively related to financial development. However, the evidence on finacial globalization is more significant when we use the de-facto meeasure of financial globalization. Our results support the empirical findings reported by Baltagi et al. (2009) that de-facto is a better measure of financial globalization. In general, the findings from European economies demonstrate that European economies have a deeper financial system that could easily absorb international shocks and that these developed economies are indeed reaping the fruit of risk sharing due to financial integration (Kose et al., 2009). Further, our results do not support the main policy implications of Rajan and Zingales (2003) hypothesis, that economies benefit by opening up their capital account as it helps them to develop their financial sector. Financial efficiency, financial depth and financial indices indices are positively correlated with institutional reforms. The diagnostic results are satisfactory in all three Tables 5 to 7. Specifically, the sargen test and difference-in-Hansen test fail to reject the over-identification restrictions, the null of first order serial correlation is rejected while the null of second order serial correlation is not rejected.

**Table-5: System GMM Regression Analysis**

| Dependent variable: $FIDpth_{it}$ | | | | | Dependent variable: $FMDpth_{it}$ | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Variables | I | | II | | Variables | I | | II | |
| | Coefficient | Standard error | Coefficient | Standard error | | Coefficient | Standard error | Coefficient | Standard error |
| $FIDpth_{it}$ (lagged) | 0.548* | 0.051 | 0.597* | 0.070 | $FMDpth_{it}$ (lagged) | 0.493* | 0.031 | 0.508* | 0.051 |
| $EGrowth_{it}$ | 0.008** | 0.004 | 0.006** | 0.003 | $EGrowth_{it}$ | 0.007** | 0.003 | 0.0075* | 0.003 |
| $FGlob(de-facto)_{it}$ | -0.265** | 0.089 | | | $FGlob(de-facto)_{it}$ | -0.342* | 0.070 | | |
| $FGlob(de-jure)_{it}$ | | | -0.261*** | 0.130 | $FGlob(de-jure)_{it}$ | | | -0.310** | 0.150 |
| $Inst_{it}$ | 0.381* | 0.078 | 0.352* | 0.062 | $Inst_{it}$ | 0.311* | 0.060 | 0.300* | 0.059 |
| $TRade_{it}$ | -0.004* | 0.001 | -0.003* | 0.001 | $TRade_{it}$ | -0.0034* | 0.001 | -0.0032* | 0.001 |
| $INf_{it}$ | -0.022*** | 0.012 | -0.031*** | 0.016 | $INf_{it}$ | -0.040** | 0.019 | -0.039** | 0.017 |
| $POp_{it}$ | -0.780*** | 0.430 | -0.751 | 0.496 | $POp_{it}$ | -0.802 | 0.604 | -0.861 | 0.708 |
| Number of Countries | 23 | | 23 | | Number of Countries | 23 | | 23 | |
| Number of Instruments | 18 | | 18 | | Number of Instruments | 18 | | 18 | |
| Sample Period | 1989-2016 | | 1989-2016 | | Sample Period | 1989-2016 | | 1989-2016 | |
| Sargen Test (P-value) | 48.94[0.67] | | 45.87[0.72] | | Sargen Test (P-value) | 35.04[0.58] | | 30.87[0.64] | |
| Difference-in-Hansen Test (P-value) | 71.55[0.85] | | 68.22[0.79] | | Difference-in-Hansen Test (P-value) | 82.32[0.69] | | 80.54[0.75] | |
| $AR_{(1)}$ (P-value) | -1.92[0.00] | | -1.86[0.00] | | $AR_{(1)}$ (P-value) | -1.23[0.00] | | -1.34[0.00] | |
| $AR_{(2)}$ (P-value) | 0.67[0.51] | | 0.52[0.63] | | $AR_{(2)}$ (P-value) | 0.59[0.87] | | 0.54[0.76] | |

Notes: 1. All regressions are estimated by using dynamic system-GMM estimator developed by Blundell and Bond (1998). 2. $AR_{(1)}$ and $AR_{(2)}$ are first order and second order serial correlation test. 3. Robust standard error are used. 4. The significance at 1%, 5 and 10% level is represented by *, ** and *** respectively. 5. Time-dummies are included in all regressions. 6. Values in brakets are P-values.

**Table-6: System GMM Regression Analysis**

| Dependent variable: $FIAccs_{it}$ | | | | | Dependent variable: $FMAccs_{it}$ | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Variables | I | | II | | Variables | I | | II | |
| | Coefficient | Standard error | Coefficient | Standard error | | Coefficient | Standard error | Coefficient | Standard error |
| $FIAccs_{it}$ (lagged) | 0.166*** | 0.084 | 0.195** | 0.090 | $FMAccs_{it}$ (lagged) | 0.263** | 0.115 | 0.290** | 0.125 |
| $EGrowth_{it}$ | 0.003* | 0.001 | 0.002** | 0.001 | $EGrowth_{it}$ | 0.005** | 0.002 | 0.006*** | 0.0032 |
| $FGlob(de-facto)_{it}$ | -0.388*** | 0.230 | | | $FGlob(de-facto)_{it}$ | -0.365 | 0.230 | | |
| $FGlob(de-jure)_{it}$ | | | -0.659 | 0.436 | $FGlob(de-jure)_{it}$ | | | -0.309 | 0.364 |
| $Inst_{it}$ | 1.582 | 1.301 | 1.433** | 0.702 | $Inst_{it}$ | 1.328*** | 0.712 | 1.376** | 0.921 |
| $TRade_{it}$ | -0.007* | 0.001 | -0.004* | 0.0009 | $TRade_{it}$ | -0.006* | 0.002 | -0.004* | 0.001 |
| $INf_{it}$ | -0.089** | 0.043 | -0.093*** | 0.050 | $INf_{it}$ | -0.084*** | 0.043 | -0.087 | 0.048 |
| $POp_{it}$ | -0.529 | 0.342 | -0.544 | 0.321 | $POp_{it}$ | -0.256 | 0.243 | -0.241 | 0.235 |
| Number of Countries | 23 | | 23 | | Number of Countries | 23 | | 23 | |
| Number of Instruments | 18 | | 18 | | Number of Instruments | 18 | | 18 | |
| Sample Period | 1989-2016 | | 1989-2016 | | Sample Period | 1989-2016 | | 1989-2016 | |
| Sargen Test (P-value) | 46.94[0.76] | | 48.70[0.66] | | Sargen Test (P-value) | 53.43[0.82] | | 61.79[0.74] | |
| Difference-in-Hansen Test (P-value) | 72.81[0.89] | | 74.01[0.73] | | Difference-in-Hansen Test (P-value) | 80.12[0.66] | | 85.42[0.71] | |
| $AR_{(1)}$ (P-value) | -1.90[0.00] | | -1.85[0.00] | | $AR_{(1)}$ (P-value) | -1.65[0.00] | | -1.73[0.00] | |
| $AR_{(2)}$ (P-value) | 0.27[0.31] | | 0.35[0.41] | | $AR_{(2)}$ (P-value) | 0.44[0.58] | | 0.48[0.64] | |

Notes: 1. All regressions are estimated by using dynamic system-GMM estimator developed by Blundell and Bond (1998). 2. $AR_{(1)}$ and $AR_{(2)}$ are first order and second order serial correlation test. 3. Robust standard error are used. 4. The significance at 1%, 5 and 10% level is represented by *, ** and *** respectively. 5. Time-dummies are included in all regressions. 6. Values in brakets are P-values.

**Table-7: System GMM Regression Analysis**

| Dependent variable: $FIEfcy_{it}$ | | | | | Dependent variable: $FMEfcy_{it}$ | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Variables | I | | II | | Variables | I | | II | |
| | Coefficient | Standard error | Coefficient | Standard error | | Coefficient | Standard error | Coefficient | Standard error |
| $FIEfcy_{it}$ (lagged) | 0.612* | 0.060 | 0.630* | 0.066 | $FMEfcy_{it}$ (lagged) | 0.527** | 0.260 | 0.576** | 0.255 |
| $EGrowth_{it}$ | 0.004* | 0.001 | 0.005* | 0.002 | $EGrowth_{it}$ | 0.0003* | 0.0001 | 0.0005* | 0.0002 |
| $FGlob(de-facto)_{it}$ | -0.671** | 0.310 | | | $FGlob(de-facto)_{it}$ | -0.423** | 0.209 | | |
| $FGlob(de-jure)_{it}$ | | | -0.683*** | 0.360 | $FGlob(de-jure)_{it}$ | | | -0.449 | 0.262 |
| $Inst_{it}$ | 1.380** | 0.678 | 1.831*** | 1.046 | $Inst_{it}$ | 1.083 | 0.782 | 1.089 | 1.003 |
| $TRade_{it}$ | 0.007* | 0.002 | 0.007** | 0.003 | $TRade_{it}$ | 0.007** | 0.003 | 0.006** | 0.003 |
| $INf_{it}$ | -0.002 | 0.003 | -0.002 | 0.002 | $INf_{it}$ | -0.002** | 0.001 | -0.0028** | 0.001 |
| $POp_{it}$ | -0.054 | 0.033 | 0.050 | 0.031 | $POp_{it}$ | -0.159** | 0.076 | -0.163*** | 0.083 |
| Number of Countries | 23 | | 23 | | Number of Countries | 23 | | 23 | |
| Number of Instruments | 18 | | 18 | | Number of Instruments | 18 | | 18 | |
| Sample Period | 1989-2016 | | 1989-2016 | | Sample Period | 1989-2016 | | 1989-2016 | |
| Sargen Test (P-value) | 60.14[0.51] | | 67.80[0.77] | | Sargen Test (P-value) | 76.10[0.81] | | 72.86[0.87] | |
| Difference-in-Hansen Test (P-value) | 63.46[0.87] | | 79.32[0.82] | | Difference-in-Hansen Test (P-value) | 56.42[0.73] | | 59.07[0.81] | |
| $AR_{(1)}$ (P-value) | -1.96[0.05] | | -1.98[0.001] | | $AR_{(1)}$ (P-value) | -1.66[0.06] | | -1.71[0.03] | |
| $AR_{(2)}$ (P-value) | 0.33[0.99] | | 0.57[0.76] | | $AR_{(2)}$ (P-value) | 0.58[0.87] | | 0.63[0.92] | |

Notes: 1. All regressions are estimated by using dynamic system-GMM estimator developed by Blundell and Bond (1998). 2. $AR_{(1)}$ and $AR_{(2)}$ are first order and second order serial correlation test. 3. Robust standard error are used. 4. The significance at 1%, 5 and 10% level is represented by *, ** and *** respectively. 5. Time-dummies are included in all regressions. 6. Values in brakets are P-values.

**Robustness Check**

Robustness check is carried out to examine the sensitivity of the results by using alternative measure of economic growth, indicators of financial institutions and dummy variable to capture the period of financial crisis. The first set of robustness checks involves the use of real GDP growth variable to measure economic growth of European countries. The results using new economic growth variable are reported in Table-8[2]. All coefficients have same sign and quantitively similar as those reported in Table-2. Therefore, the empirical results are robust to alternative measure of economic growth.

**Table-8: System GMM Regression Analysis**

| Dependent variable: $FDev_{it}$ | | | | |
|---|---|---|---|---|
| Variables | I | | II | |
| | Coefficient | Standard error | Coefficient | Standard error |
| $FDev_{it}$ (lagged) | 0.552* | 0.045 | 0.602* | 0.057 |
| $EGrowth_{it}$ | 0.072* | 0.020 | 0.046* | 0.012 |
| $FGlob(de-facto)_{it}$ | -0.146*** | 0.077 | | |
| $FGlob(de-jure)_{it}$ | | | -0.642* | 0.239 |
| $Inst_{it}$ | 0.229*** | 0.126 | 0.954** | 0.483 |
| $TRade_{it}$ | -0.046** | 0.023 | -0.025* | 0.009 |
| $INf_{it}$ | -0.005** | 0.002 | -0.005** | 0.002 |
| $POp_{it}$ | -0.032 | 0.021 | -0.025 | 0.016 |
| Number of Countries | 23 | | 23 | |
| Number of Instruments | 18 | | 18 | |
| Sample Period | 1989-2016 | | 1989-2016 | |
| Sargen Test (P-value) | 39.31 [0.97] | | 43.80[0.72] | |
| Difference-in-Hansen Test (P-value) | 63.06[0.52] | | 69.16[0.48] | |
| $AR_{(1)}$ (P-value) | -1.51[0.00] | | -1.92[0.00] | |
| $AR_{(2)}$ (P-value) | 0.72[0.44] | | 0.79[0.38] | |

Notes: 1. All regressions are estimated by using dynamic system-GMM estimator developed by Blundell and Bond (1998). 2. $AR_{(1)}$ and $AR_{(2)}$ are first order and second order serial correlation test. 3. The significance at 1%, 5% and 10% level is represented by * , ** and *** respectively. 4.Time-dummies are included in all regressions. 5. Values in brakets are P-values.

[2] The results using overall financial development index are presented in this section. In order to conserve time and space the results of other financial development indices are not presented here. These results will be available upon request.

The second set of robustness check involves the specification of factor analysis to construct an institution indicator. The institution indicator is calculated as the sum of five sub-ICRG[3] institution indexes: corruption, rule of law, bureaucratic quality, government stability, democracy and accountability. Because the indicators are collinear, we construct the institutions indicator using principal component analysis to reduce the problem of collinearity. The results using new institution indicator are presented in Table-9. These results are quantitatively similar to those reported in Table-2. More specifically, economic growth, financial globalization and institutions are significant at conventional levels. The finding highlights that institutional quality plays a crucial role in the development of financial institutions. Thus, the empirical results are robust to the institutions measure from ICRG.

**Table-9: System GMM Regression Analysis**

| Dependent variable: $FDev_{it}$ | | | | |
|---|---|---|---|---|
| Variables | I | | II | |
| | Coefficient | Standard error | Coefficient | Standard error |
| $FDev_{it}$ (lagged) | 0.460* | 0.031 | 0.518* | 0.037 |
| $EGrowth_{it}$ | 0.043* | 0.011 | 0.048* | 0.013 |
| $FGlob(de-facto)_{it}$ | -0.128** | 0.050 | | |
| $FGlob(de-jure)_{it}$ | | | -0.150* | 0.031 |
| | | | | |
| $Inst_{it}$ | 0.182* | 0.016 | 0.201** | 0.022 |
| $TRade_{it}$ | -0.051** | 0.020 | -0.048* | 0.009 |
| $INf_{it}$ | -0.004** | 0.002 | -0.004** | 0.002 |
| $POp_{it}$ | -0.031** | 0.015 | -0.027** | 0.013 |
| Number of Countries | 23 | | 23 | |
| Number of Instruments | 18 | | 18 | |
| Sample Period | 1989-2016 | | 1989-2016 | |
| Sargen Test (P-value) | 42.12 [0.80] | | 40.08[0.85] | |
| Difference-in-Hansen Test (P-value) | 65.09[0.70] | | 62.02[0.78] | |
| $AR_{(1)}$ (P-value) | -1.64[0.00] | | -1.59[0.00] | |
| $AR_{(2)}$ (P-value) | 0.70[0.68] | | 0.73[0.52] | |

[3] International Country Risk Guide

Notes: 1. All regressions are estimated by using dynamic system-GMM estimator developed by Blundell and Bond (1998). 2. $AR_{(1)}$ and $AR_{(2)}$ are first order and second order serial correlation test. 3. The significance at 1%, 5% and 10% level is represented by * , ** and *** respectively. 4.Time-dummies are included in all regressions. 5. Values in brakets are P-values.

The third set of robustness checks involve the introduction of dummy variable to capture the impact of global financial crisis in 2007-09. The results reported in Table 10 show that the inclusion of the crisis dummy does not alter the signs of the variables. However, the magnitudes of the estimated coefficients and their statistical significance are affected. On the other hand, it is important to note that the financial crisis significantly and negatively affects the process of financial development in the European countries. The main reasons for this negative impact are the decline in interest rates, the collapse of investment banks, the reduction in shipping rates, the downturn in stock markets, the upsurge in government debt, the increase in the unemployment rate and the reduction in saving rates. This result is in line with the findings of Rousseau and Wachtel, (2011); Breitenlechner et al. (2015). This finding allows us to conclude that global financial crisis hurt the financial development of the European countries via the globalization channel owing to the strong relationship between financial development and globalization.

**Table-10: System GMM Regression Analysis**

| Dependent variable: $FDev_{it}$ | | | | |
|---|---|---|---|---|
| Variables | I | | II | |
| | Coefficient | Standard error | Coefficient | Standard error |
| $FDev_{it}$ (lagged) | 0.258* | 0.050 | 0.290* | 0.061 |
| $EGrowth_{it}$ | 0.080*** | 0.042 | 0.083** | 0.035 |
| $FGlob(de-facto)_{it}$ | -0.112** | 0.054 | | |
| $FGlob(de-jure)_{it}$ | | | -0.123*** | 0.072 |
| $Inst_{it}$ | 0.143** | 0.071 | 0.127** | 0.060 |
| $TRade_{it}$ | -0.006** | 0.003 | -0.005 | 0.003 |
| $INf_{it}$ | -0.0003 | 0.001 | -0.0003 | 0.001 |
| $POp_{it}$ | -0.001 | 0.030 | -0.001 | 0.029 |
| $DM_{f.c}$ | -0.210** | 0.080 | -0.371* | 0.124 |
| Number of Countries | 23 | | 23 | |
| Number of Instruments | 18 | | 18 | |
| Sample Period | 1989-2016 | | 1989-2016 | |
| Sargen Test (P-value) | 40.01 [0.86] | | 45.32[0.79] | |
| Difference-in-Hansen Test (P- | 65.99[0.58] | | 60.10[0.53] | |

| | | |
|---|---|---|
| value) | | |
| $AR_{(1)}$ (P-value) | -1.49[0.00] | -1.57[0.00] |
| $AR_{(2)}$ (P-value) | 0.72[0.88] | 0.67[0.80] |

Notes: 1. All regressions are estimated by using dynamic system-GMM estimator developed by Blundell and Bond (1998). 2. $AR_{(1)}$ and $AR_{(2)}$ are first order and second order serial correlation test. 3. The significance at 1%, 5% and 10% level is represented by * , ** and *** respectively. 4.Time-dummies are included in all regressions. 5. Values in brakets are P-values. $DM_{fc}$ cpatures the impact of global financial crisis in 2007-2009.

In terms of post estimation for all robustness checks, the diagnostic tests suggest that all models are well specified. The Sargan test does not reject the over-identification restrictions, the difference-in-Hansen test is not rejected, and the absence of second-order autocorrelation AR (2) is found. The number of instruments is less than the number of cross-section countries, which is satisfactory, and no instrument proliferation problem exists.

## VI. Conclusion and Policy Implications

The paper investigates relationship between financial development, financial globalization, institutions and economic growth using data of 23 European countries over the period of 1989-2016. Since the concept of financial development is very broad, we use various indicators that cover the various dimensions of financial markets; depth, access and efficiency. Institutional quality is measured by using four types of institutions which are market creating, market stabilizing, market regulating and market legitimizing. A significant feature of our study is that we use a recently developed index of financial globalization that has been developed by Gygli et al. (2018) and breakdown it into de-facto and de-jure measures. On the basis of this data set, we try to estimate the impact of financial globalization, institutional quality and economic growth on financial development in European countries. Our study employs system Generalized Method of Moments (GMM) dynamic panel approach. Using a composite index of financial development, our empirical evidence illustrates that financial development and economic growth have a complementary relationship that supports their positive effects over time. Using the two different measures of financial globalization (de-facto and de-jure), we find that financial globalization hurt financial development in European countries. Quality institutions help to attract financial inflows, thus, increase the scope of financial development. The empirical results are robust to

including alternative measure of economic growth, to using alternative indicators of institutions and to analyzing the period of financial crisis.

The empirical findings suggest some important implications for the future policy of financial globalization and financial development. Our analysis suggests that financial globalization is the main channel that transmitted the effect of financial crisis in European countries. This mean opening the trade and capital account can result in negative response during the financial crisis period. From a policy perspective, we advocate that European economies need to build a domestic financial system by reducing their economic dependence on trade and capital flows from outside the world. To strengthen domestic financial system, European countries need to develop a strong regulatory and supervisory framework that minimizes financial stability risks. In this regard, macroeconomic policies such as monetary, fiscal and exchange rate management can play an important role in managing the financial stability risks of financial globalization. Appropriate micro-prudential policies may also be used to boost resilience. Moreover, there is need of strong international policy cooperation and cross-border supervision to mitigate the stability risks of foreign capital flow. Further, enhancing institutional infrastructure particularly rule of law, government effectiveness and property rights may encourage the development of domestic markets. The prosperity in terms of quality institutions and the quality of financial sector development will enable European economies to achieve the height of higher growth rate in the long-run. We further believe that our results are of having potential significance to policy makers of European economies in terms of reducing global integration that needs to be cautiously undertaken to ensure that the optimal possible growth and development of the economy in European countries can be achieved through the appropriate quality of institutions along with the qualitative development of both banking and stock market financial system activities.

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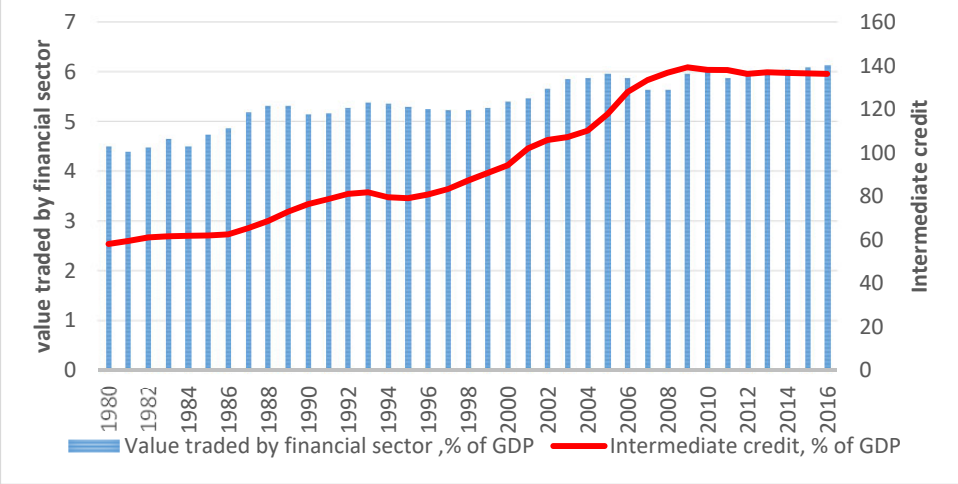
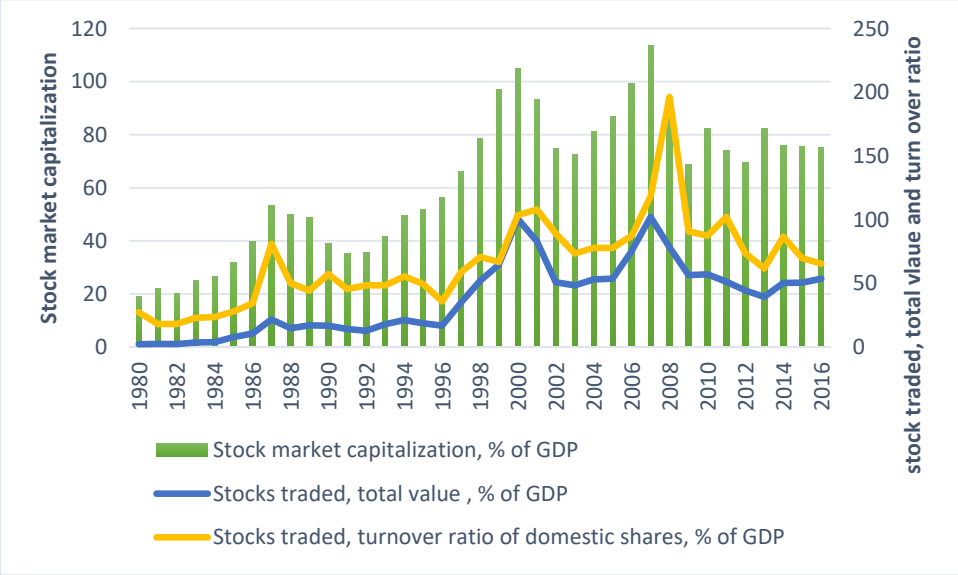
## Appendix 1

**Figure-1A (Panel-A, Panel-B & Panel-C)**: Financial activity in European countries

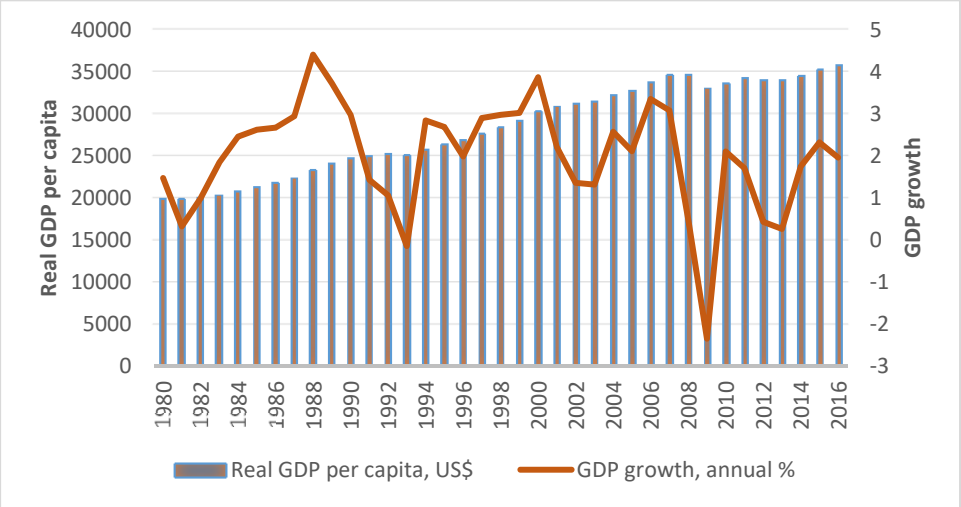
(Panel-A)




(Panel-B)



(Panel-C)




Source: Global Financial Development Database and developed by authors

**Table-A1: List of 23 Sample Countries**

| | | | |
|---|---|---|---|
| Austria | Belgium | Czech Rep. | Denmark |
| Finland | France | Germany | Greece |
| Ireland | Iceland | Italy | Luxembourg |
| Netherland | Norway | Poland | Portugal |
| Romania | Spain | Sweden | Switzerland |
| United Kingdom | Bulgaria | Cyprus | |

**Table-A2: The Indices for Financial Development**

| **Financial Institutions** | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Measure** | **Proportion** | $LL_{iab}$ | $P_{riv}C$ | $M_{fnd}A$ | $I_{prim}$ | $B_{ank}B$ | $A_{tm}$ | $N_{et}IM$ | $LD_{rate}$ | $N_{int}T_{inc}$ | $OC_{ost}$ | $RO_{ast}$ | $RO_{eqt}$ |
| *FDIns* | 64% | 0.570 | 0.449 | 0.336 | 0.416 | 0.583 | 0.492 | -0.457 | 0.342 | -0.482 | 0.602 | 0.478 | 0.432 |
| *FIDpth* | 73% | 0.590 | 0.672 | 0.563 | 0.356 | | | | | | | | |
| *FIAccs* | 63% | | | | | 0.398 | 0.437 | | | | | | |
| *FIEfcy* | 71% | | | | | | | -0.453 | 0.481 | 0.541 | 0.410 | 0.308 | 0.284 |
| **Financial Markets** | | | | | | | | | | | | | |
| **Measure** | **Proportion** | $S_{tk}MC$ | $S_{tk}T$ | $I_{nt}DS$ | $TDS_{FC}$ | $TDS_{NFC}$ | $MC_{larg}C$ | $T_{issuer}D$ | $T_{or}$ | - | - | - | - |
| *FDMar* | 75% | 0.532 | 0.510 | 0.487 | 0.426 | 0.520 | 0.514 | 0.390 | 0.422 | | | | |
| *FMDpth* | 61% | 0.601 | 0.562 | 0.534 | 0.519 | 0.466 | | | | | | | |
| *FMAccs* | 68% | | | | | | 0.410 | 0.543 | | | | | |
| *FMEfcy* | - | | | | | | | | - | | | | |

Note: The Table shows the weights that each index places on each of the standardized variables and the proportion of variance in original data that is explained by the first principal component

**Table-A3: Descriptive Statistics (Countries 23, Observations = 161)**

| **Variable** | **Measurement Unit** | **Mean** | **Std. Dev** | **Min.** | **Max.** |
|---|---|---|---|---|---|
| *EGrowth* | US $ at 2005 prices | 10.15 | 0.795 | 7.808 | 11.36 |
| $LL_{iab}$ | % of GDP | 90.27 | 74.19 | 28.95 | 472.9 |
| $P_{riv}C$ | % of GDP | 90.53 | 47.42 | 5.85 | 253.9 |
| $M_{fnd}A$ | % of GDP | 84.21 | 421 | 0.00 | 5022 |
| $I_{prim}$ | % of GDP | 2.58 | 2.51 | 0.01 | 16.0 |
| $B_{ank}B$ | Numbers | 15.1 | 15.0 | 3.21 | 97 |
| $A_{tm}$ | Numbers | 39.43 | 41.71 | 1.01 | 289 |
| $N_{et}IM$ | % | 4.98 | 4.01 | 0.03 | 41.1 |
| $LD_{rate}$ | % | 7.75 | 7.04 | 0.05 | 91 |

| | | | | | |
|---|---|---|---|---|---|
| $N_{int}T_{inc}$ | Ratio | 35.70 | 14.45 | 0.12 | 102 |
| $OC_{ost}$ | Ratio | 3.78 | 2.44 | 0.32 | 50 |
| $RO_{ast}$ | Ratio | 1.02 | 3.20 | -87.0 | 19.23 |
| $RO_{eqt}$ | Ratio | 11.04 | 40.72 | -1132 | 189.05 |
| $S_{tk}MC$ | % of GDP | 43.43 | 55.01 | 0.321 | 532.9 |
| $S_{tk}T$ | % of GDP | 27.09 | 56.21 | 0.030 | 762.1 |
| $I_{nt}DS$ | % of GDP | 22.71 | 100.02 | 0.56 | 1830 |
| $TDS_{FC}$ | % of GDP | 13.02 | 20.65 | 0.43 | 298 |
| $MC_{larg}C$ | % | 50.70 | 14.11 | 12.70 | 97.32 |
| $T_{issuer}D$ | Number | 0.43 | 0.56 | 0.00 | 0.74 |
| $T_{or}$ | % of GDP | 62.02 | 45.54 | 0.137 | 190.7 |
| *Inst* | Sum of corruption, rule of law, bureaucratic quality, Govt. stability, democratic and accountability, range from 0 to 50 | 26.22 | 7.48 | 8.00 | 46.0 |
| *Inst* | Sum of market creating, market regulating, market stabilizing and market legitimating, rage from 0 to 40 | 27.16 | 9.32 | 0 | 38.16 |
| $FGlob_{de-facto}$ | De-facto measure of financial globalization index | 76.20 | 18.66 | 12.51 | 99.68 |
| $FGlob_{de-jure}$ | De-jure measure of financial globalization index | 71.55 | 17.22 | 13.48 | 95.43 |
| $TR_{ade}$ | % of GDP | 62.52 | 18.70 | 48.26 | 169.4 |
| $IN_f$ | % | 1.53 | 0.79 | -0.83 | 6.50 |
| $PO_p$ | Numbers | 2.65E+06 | 1.97E+05 | 8.19E+05 | 1.14E+07 |

**Figure-2A: Financial Development and Economic Growth**

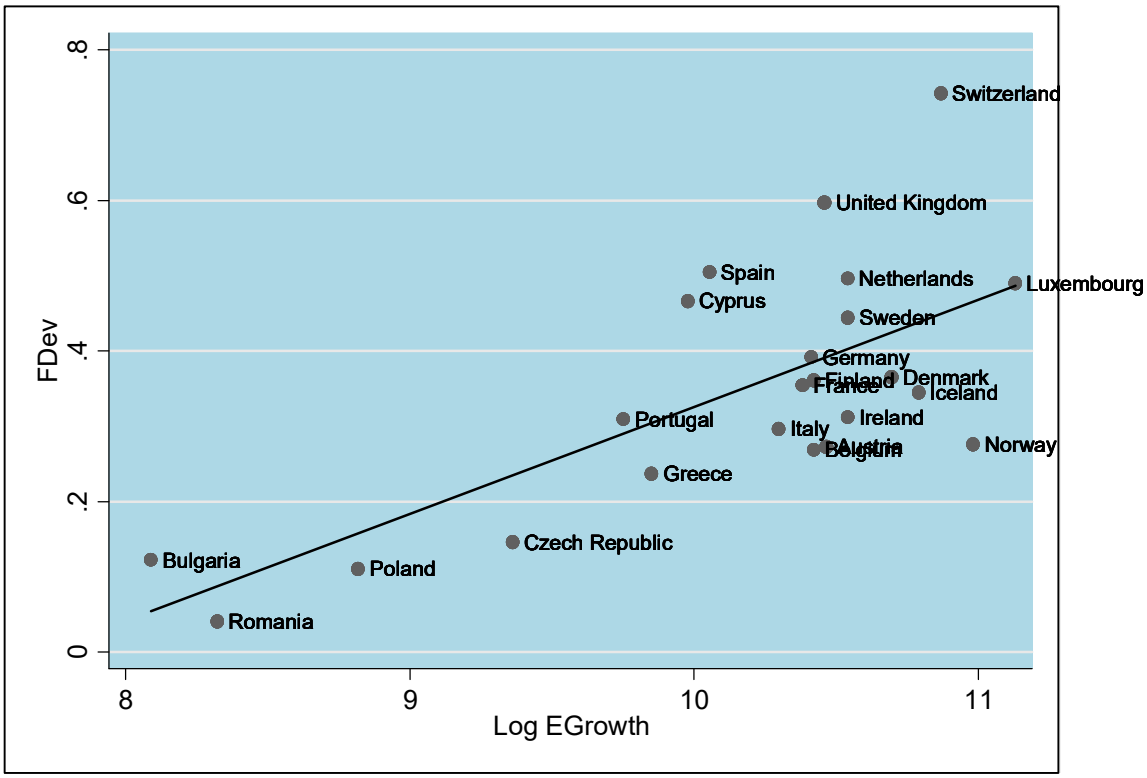



**Figure-3A: Financial Development and Financial Globalization (de-jure)**

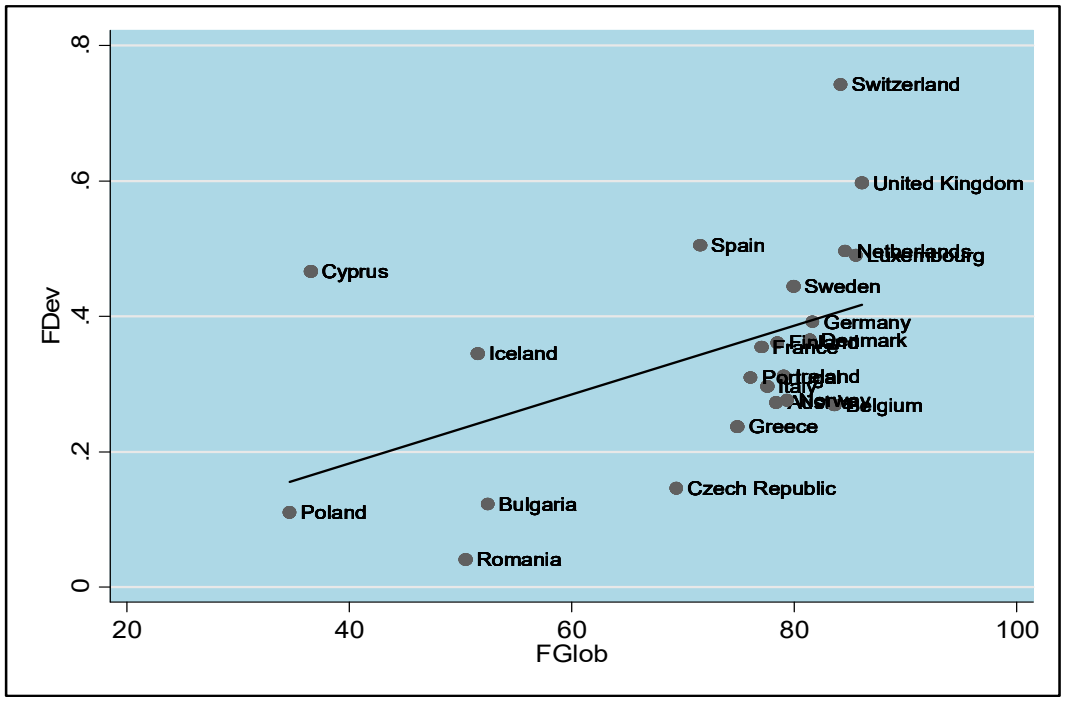


**Figure-4A: Financial Development and Financial Globalization (de-facto)**

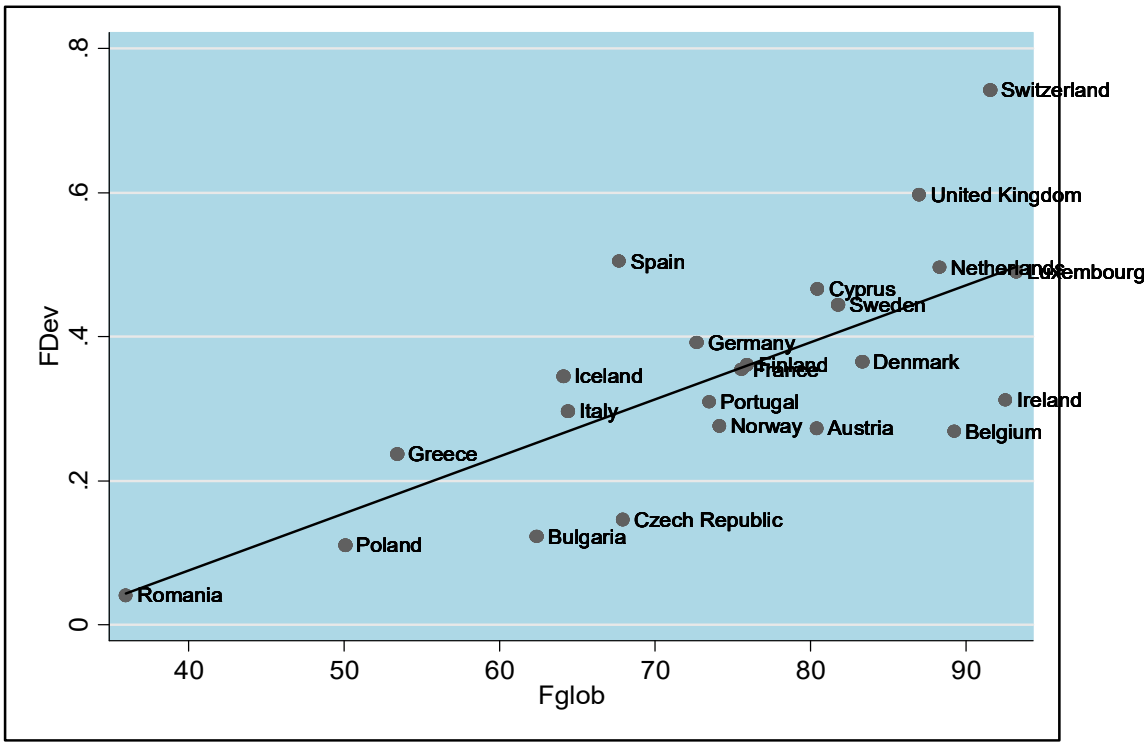
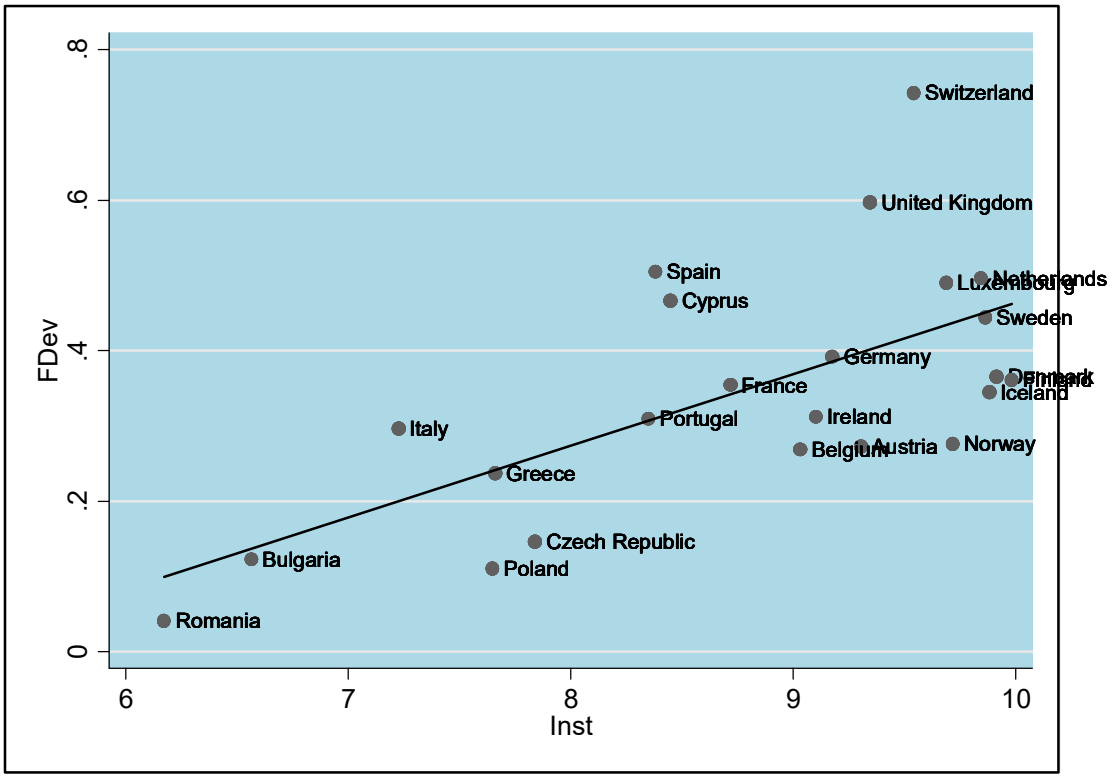



**Figure-5A: Financial Development and Institutional Quality**



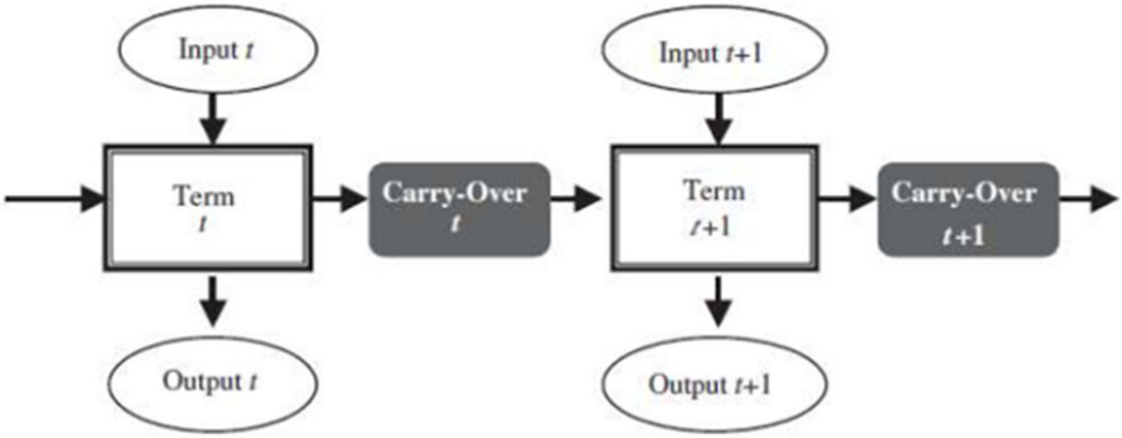
## Appendix-2

### Measuring Bank Efficiency: Non-Parametric DEA

The research into efficiency is usually based on the estimation of efficiency frontiers with the best combinations of the different inputs and outputs of the production process and then on the analysis of the deviations from the frontier that correspond to the losses of efficiency. In empirical literature, bank efficiency is measured by using parametric methods, like the Stochastic Frontier Analysis (SFA), or non-parametric methods, in particular the Data Envelopment Analysis (DEA). In the present paper, we have adopted the dynamic DEA methodology developed by Tone and Tsutsui, (2010). The Dynamic DEA model is the first innovative system that formally addresses the activities in different interconnected time periods. The Dynamic DEA model measures the interdependence between different periods (Sueyoshi and Sekitani, 2005) because it incorporates transition activities between periods, establishing the performance relationships of the DMU (decision-making units) over time (Tone and Tsutsui, 2010; Kao, 2013). Thus, Dynamic DEA is a new approach which estimates performance of a group of DMUs during several periods of time. This method takes into account the internal heterogenous organizations of DMUs for which deviations are mutually connected by link variables and trade internal products with each other. Furthermore, each DMU has carry over variables that takes into account direct or indirect factors in the previous period. This approach has enormous advantage of being able to evaluate the policy effect on the individual divisions of each DMU (Kawaguchi et al. 2014).

Tone and Tsutsui (2010) has developed Fare and Grosskopf (1996) model into a slack based framework for measuring dynamic efficiency of relative DMUs over several terms. They pointed out a concept of carry over and accounted the effect of interconnecting activities over two consecutive terms. Moreover, a dynamic slack-based performance measure by categorizing four kinds of carry over activities: good, bad, free and fixed has been proposed in empirical literature. Tone and Tsutsui (2010) has proposed a dynamic DEA model involving network structure in each period within the framework of a slack-based measure approach (see Figure B1).

Figure B1: Dynamic Structure




Source: Tone and Tsutsui (2010)

Tone and Tsutsui (2010) observed n DMUs over T terms. At each time t, each DMU has its respective input-output along with the carry-over to the next term t+1. Model assumes that they have a panel data through terms 1 to T. It further looked as the concerned enterprises as a continuum between the term 1 and between T. The dynamic DEA is distinguished from the ordinary DEA is the existence of carry-overs that connected two consecutive terms. Mariz et al. (2018) pointed out that the application of static DEA models could lead to erroneous and distorted results because classical models used only input-output variables, hence ignoring the effects as well as inefficiencies of the internal process of the system (Chen and van Delon, 2009; Chen and Delmas, 2012). In this paper, we have adopted the dynamic DEA model presented by Tone and Tsutsui (2010). The dynamic DEA can be written as:

$$\max(T-1) = \sum_{t=0}^{T-1} \sum_{j=1}^{n} w'(t)\lambda_j(t) \qquad \text{(b1)}$$

Subject to

$$\sum_{j=1}^{n} A_j(t)\lambda_j(t) \le X_k(t) \qquad \text{(b2)}$$

$$\lambda_j(t) \ge 0, all\ t = 0,1,2,.....,T-1 \qquad \text{(b3)}$$

Where $\lambda_j(t)$ is the output vector for each DMU, $X_k$ is current output, $A_j(t)$ is the corresponding input coefficient matrices and $w(t)$ is a non-negative weight vector for the multiple outputs of each DMUs.

One important point is that the calculation of the Dynamic DEA requires strictly balanced panel data. Thus, the balanced panel data set consists of 2778 observations and covered data from 597commercial banks in European countries. Therefore, we used the sample of banks that operated in the banking sector during whole analyzed period. The data set was obtained from the Bankscope database. All the data is reported on unconsolidated basis and it was converted into EUR. Owing to the homogeneity of the data set in particular we analyse only commercial banks. The observed commercial banks represent, in average, more than 80% of banking sectors' assets, thus the sample of banks is representative and results of this paper could be interpreted as results of banking sectors.

In order to conduct the DEA estimation, inputs and outputs need to be defined. In the empirical literature several main approaches (intermediation, production or value-added approach) have been developed to define the input-output relationship in financial institution behavior. We adopted intermediation approach which assumes that the banks' main aim is to transform deposits into loans. This approach is adequacy for banking sectors of European countries, where commercial banks are as financial intermediators. Consistently with this approach, we use three inputs (labor, physical capital and total deposits) and two outputs (total loans and other earning assets). Labor is measured by the total number of employees. Fixed assets are proxy for physical capital. Deposits are measured by the sum of demand and time deposits from customers, interbank deposits and sources obtained by bonds issued. Loans are measured by the net value of loans to customers and other financial institutions. Other earning assets include reverse repos and cash collateral, trading securities, derivatives, valuable for sale securities, held to maturity securities, at-equity investments, and other securities. Selected descriptive statistics for the inputs and outputs used in the DEA efficiency measurement are presented in Table B1. The average efficiency of the banking sector in European countries is presented in Table B2.

**Table B1: Bank inputs and outputs (EUR Thousand)**

| **Variable** | Mean | Std. Dev. | Minimum | Maximum |
|---|---|---|---|---|
| **Inputs** | | | | |
| Total deposits | 3406742 | 4684476 | 600 | 46800000 |
| No. of employees | 4885.73 | 6764.51 | 21 | 81684 |
| Fixed assets | 52381.92 | 82176.45 | 38.19 | 63538 |
| **Outputs** | | | | |
| Total loans | 316512 | 3807564 | 18 | 42700000 |
| Other earning assets | 2176079 | 2360675 | 18.83 | 22600000 |

**Table B2: Average Efficiency of the Banking Sector in European Countries**

| Country | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Austria | 31.9 | 33.1 | 28.4 | 28.9 | 30.3 | 30.8 | 31.0 | 31.4 | 32.0 | 32.2 | 32.6 | 32.9 | 33.1 | 33.5 | 34.7 | 35.0 | 35.3 | 35.8 | 32.7 | 32.1 | 36.6 | 39.5 | 41.1 | 41.7 | 43.2 | 44.4 | 45.2 | 46.3 |
| Belgium | 34.1 | 34.6 | 35.3 | 35.9 | 36.7 | 36.9 | 34.0 | 35.3 | 37.2 | 37.8 | 39.0 | 39.6 | 41.2 | 42.0 | 42.7 | 43.3 | 43.9 | 45.0 | 45.6 | 46.7 | 48.3 | 50.1 | 50.3 | 49.4 | 51.0 | 51.9 | 52.6 | 53.2 |
| Bulgaria | 42.3 | 42.9 | 43.5 | 44.2 | 45.0 | 45.8 | 46.2 | 46.9 | 47.6 | 46.8 | 47.0 | 47.2 | 47.9 | 48.0 | 49.1 | 49.5 | 50.3 | 50.9 | 48.0 | 47.3 | 48.8 | 49.9 | 53.2 | 54.6 | 55.2 | 55.9 | 56.8 | 57.0 |
| Cyprus | 50.2 | 50.8 | 51.6 | 52.0 | 52.8 | 50.4 | 50.0 | 49.8 | 51.4 | 52.0 | 52.5 | 53.2 | 54.0 | 54.7 | 54.9 | 55.5 | 55.8 | 56.9 | 54.0 | 53.2 | 53.8 | 55.1 | 55.4 | 59.2 | 60.9 | 62.3 | 64.0 | 65.6 |
| Czech Rep. | 64.4 | 65.2 | 65.5 | 66.2 | 66.7 | 63.9 | 68.1 | 68.0 | 68.8 | 70.3 | 70.6 | 70.7 | 70.9 | 71.7 | 72.8 | 73.0 | 73.4 | 74.9 | 74.3 | 74.2 | 75.5 | 75.6 | 76.3 | 77.9 | 76.0 | 75.8 | 76.4 | 75.3 |
| Denmark | 61.8 | 61.2 | 60.8 | 62.4 | 63.0 | 62.6 | 64.6 | 64.2 | 66.0 | 66.5 | 67.2 | 67.7 | 68.1 | 68.4 | 68.2 | 70.4 | 70.2 | 71.6 | 72.8 | 72.2 | 73.0 | 73.2 | 70.1 | 69.3 | 73.0 | 72.6 | 70.8 | 70.4 |
| Finland | 41.0 | 42.7 | 42.2 | 44.7 | 44.1 | 43.8 | 45.7 | 45.0 | 46.2 | 46.8 | 48.1 | 48.4 | 47.2 | 49.2 | 49.6 | 50.4 | 50.8 | 50.2 | 52.0 | 52.8 | 52.3 | 55.6 | 55.0 | 57.2 | 57.5 | 60.0 | 59.3 | 60.6 |
| France | 39.2 | 39.0 | 38.5 | 38.9 | 39.3 | 40.5 | 40.9 | 41.7 | 41.2 | 43.0 | 43.8 | 43.6 | 44.9 | 45.0 | 45.2 | 46.8 | 46.2 | 47.1 | 47.9 | 48.0 | 48.9 | 49.4 | 50.2 | 50.9 | 53.2 | 54.0 | 52.7 | 53.1 |
| Germany | 58.4 | 56.2 | 58.9 | 59.6 | 60.1 | 60.4 | 59.9 | 60.8 | 61.3 | 61.8 | 62.3 | 62.6 | 66.0 | 63.9 | 60.2 | 67.0 | 67.9 | 68.3 | 65.5 | 68.2 | 69.0 | 69.5 | 70.2 | 70.9 | 69.2 | 71.4 | 71.0 | 70.5 |
| Greece | 55.3 | 55.8 | 56.0 | 56.4 | 57.8 | 59.2 | 59.4 | 57.0 | 58.9 | 60.4 | 60.0 | 60.8 | 61.3 | 61.5 | 63.0 | 60.7 | 64.3 | 65.8 | 62.9 | 64.1 | 65.2 | 66.9 | 66.1 | 67.9 | 69.1 | 65.4 | 66.4 | 65.2 |
| Ireland | 43.0 | 41.5 | 41.9 | 44.2 | 39.6 | 42.7 | 42.1 | 43.0 | 43.8 | 45.9 | 46.2 | 46.0 | 47.5 | 49.4 | 49.8 | 50.0 | 50.9 | 51.6 | 48.3 | 48.0 | 49.1 | 50.6 | 53.6 | 55.0 | 55.7 | 58.1 | 60.3 | 59.7 |
| Iceland | 40.7 | 42.0 | 41.9 | 42.5 | 44.2 | 43.9 | 45.6 | 45.8 | 46.0 | 46.9 | 46.4 | 47.1 | 47.6 | 49.2 | 50.0 | 48.4 | 48.7 | 50.6 | 50.0 | 50.1 | 51.4 | 54.8 | 54.3 | 53.9 | 54.8 | 56.4 | 57.1 | 59.3 |
| Italy | 56.3 | 54.2 | 53.0 | 56.1 | 55.8 | 55.3 | 50.7 | 49.3 | 51.6 | 53.2 | 54.9 | 55.3 | 52.6 | 53.0 | 56.4 | 56.1 | 57.8 | 57.2 | 59.0 | 59.6 | 60.1 | 60.9 | 63.2 | 64.1 | 63.9 | 65.2 | 66.0 | 66.6 |
| Luxembourg | 49.6 | 49.9 | 51.4 | 53.5 | 50.7 | 50.1 | 49.9 | 52.2 | 52.8 | 53.9 | 55.0 | 54.6 | 53.7 | 55.2 | 55.9 | 58.2 | 57.9 | 56.3 | 55.7 | 57.4 | 59.6 | 59.4 | 60.1 | 60.7 | 62.0 | 64.6 | 63.1 | 64.8 |
| Netherland | 53.2 | 52.7 | 53.4 | 54.0 | 54.3 | 55.9 | 55.1 | 56.9 | 56.2 | 54.8 | 56.1 | 57.9 | 55.4 | 58.3 | 60.2 | 60.7 | 62.1 | 62.9 | 61.5 | 60.9 | 62.0 | 63.2 | 65.3 | 64.9 | 65.6 | 66.0 | 67.4 | 68.2 |
| Norway | 50.2 | 51.0 | 51.7 | 53.9 | 52.4 | 53.1 | 54.7 | 55.2 | 55.9 | 55.3 | 56.9 | 56.1 | 58.2 | 58.6 | 59.0 | 59.3 | 60.9 | 61.4 | 63.0 | 63.7 | 65.5 | 64.3 | 66.1 | 66.9 | 69.2 | 70.0 | 72.2 | 74.8 |
| Poland | 52.9 | 53.5 | 56.2 | 55.7 | 54.0 | 55.9 | 56.6 | 58.5 | 59.0 | 59.7 | 60.1 | 60.6 | 61.0 | 61.9 | 63.2 | 62.9 | 64.3 | 64.9 | 64.1 | 65.0 | 66.9 | 68.0 | 68.5 | 69.3 | 70.2 | 73.9 | 75.0 | 76.7 |
| Portugal | 49.2 | 49.6 | 50.3 | 51.8 | 52.4 | 53.0 | 54.3 | 55.9 | 59.2 | 57.8 | 54.1 | 57.0 | 58.3 | 58.9 | 59.3 | 60.0 | 60.6 | 61.1 | 61.9 | 62.0 | 61.8 | 62.9 | 63.1 | 65.3 | 64.9 | 67.4 | 68.2 | 70.4 |
| Romania | 55.2 | 56.4 | 57.1 | 58.3 | 58.0 | 59.8 | 60.9 | 60.3 | 61.6 | 62.0 | 63.4 | 64.2 | 65.9 | 65.3 | 64.8 | 66.6 | 65.9 | 66.3 | 67.0 | 67.8 | 69.3 | 68.9 | 70.1 | 72.4 | 73.0 | 73.9 | 75.5 | 76.2 |
| Spain | 52.0 | 52.5 | 53.5 | 54.0 | 54.7 | 55.3 | 55.9 | 56.8 | 58.1 | 59.7 | 60.0 | 60.4 | 61.6 | 62.0 | 62.9 | 64.2 | 63.5 | 64.9 | 65.2 | 66.1 | 64.3 | 65.0 | 66.7 | 67.5 | 68.1 | 68.9 | 71.4 | 73.8 |
| Sweden | 48.7 | 49.0 | 49.5 | 50.2 | 50.0 | 51.3 | 53.7 | 53.2 | 54.8 | 53.1 | 54.4 | 55.7 | 55.0 | 58.3 | 59.2 | 60.4 | 64.1 | 62.8 | 62.1 | 62.5 | 63.7 | 65.4 | 67.2 | 68.8 | 69.5 | 72.2 | 73.0 | 74.9 |
| Switzerland | 44.1 | 44.6 | 45.0 | 45.9 | 47.2 | 48.0 | 48.9 | 50.2 | 50.8 | 51.5 | 52.9 | 53.6 | 55.1 | 54.6 | 56.0 | 56.8 | 58.1 | 59.3 | 58.4 | 60.7 | 61.2 | 63.5 | 64.0 | 66.3 | 67.1 | 68.7 | 69.1 | 71..2 |
| United Kingdom | 49.2 | 48.4 | 48.9 | 49.8 | 50.0 | 50.8 | 53.7 | 54.3 | 55.9 | 54.1 | 56.0 | 56.9 | 57.3 | 58.6 | 55.4 | 57.4 | 59.3 | 60.9 | 62.0 | 63.2 | 61.6 | 63.6 | 64.8 | 63.6 | 65.0 | 66.2 | 68.4 | 67.5 |

Bogetoft and Otto (2011) stated that DEA analysis is often classified as non-statistical approach that does not easily allow genuine hypothesis testing. Although DEA does not emphasize to use traditional statistical tests, however, considerable progress has been made in this respect over the last several years. In general, there are several ways to conduct such tests. In this paper, we use the dynamic DEA model with assumption of variable returns to scale. The assumption of constant returns to scale is only justifiable when all decision-making units are operating at optimal scale. However, commercial banks might face either economies or diseconomies of scale in practice. Next, we have tested separability assumption by applying bootstrap method proposed by Simer and Wilson (2007). The results show that inputs and outputs have statistically significant impact on banking efficiency (see Table B3). Finally, we tested the data for independence assumption using correlation analysis and found that individual variables are independent. Thus, the correlation coefficients between input and output variables confirmed that selected variables are appropriate for efficiency evaluation (see Table B4).

Table B3: Test of Separability Assumption of Dynamic DEA Model

| Variable | Coefficient | Std. Error | Z-test |
|---|---|---|---|
| Constant | 0.3562* | 0.0412 | 8.645 |
| Total deposits | -0.00074* | 0.00010 | -7.400 |
| No. of employees | -0.00095* | 0.00013 | -7.307 |
| Fixed assets | -0.00078* | 0.00017 | -4.588 |
| Total loans | 0.00013* | 0.00002 | 6.500 |
| Other earning assets | 0.00065* | 0.00022 | 2.954 |
| /sigma | 0.1543* | 0.0320 | 4.821 |

Note: * denote rejection of null hypothesis at 1% level of significance.

Table B4: Correlation Matrix

| | Total deposits | No. of employees | Fixed assets | Total loans | Other earning assets |
|---|---|---|---|---|---|
| Total deposits | 1.000 | | | | |
| No. of employees | 0.342<br>(0.538) | 1.000 | | | |
| Fixed assets | 0.476<br>(0.632) | 0.536<br>(0.999) | 1.000 | | |
| Total loans | 0.690<br>(0.783) | 0.428<br>(0.742) | 0.730<br>(0.892) | 1.000 | |
| Other earning assets | 0.568 | 0.675 | 0.371 | 0.544 | 1.000 |

| | | | | | |
|---|---|---|---|---|---|
| | (0.833) | (0.455) | (0.550) | (0.772) | |

Note: Values in parentheses are P-values.

To consider to what extent financial liberalization, institutions and economic growth affect the efficient operation of banks, we regress the estimated efficiency scores on financial liberalization and institutions indices along with a selection of economic growth and control variables. The results are reported in Table B5.

**Table-B5: System GMM Regression Analysis**

| Dependent variable: $FIEfcy_{it}$ | | | | |
|---|---|---|---|---|
| Variables | I | | II | |
| | Coefficient | Standard error | Coefficient | Standard error |
| $FIEfcy_{it}$ (lagged) | 0.224** | 0.105 | 0.212** | 0.110 |
| $EGrowth_{it}$ | 0.015*** | 0.008 | 0.018 | 0.012 |
| $FGlob(de-facto)_{it}$ | 0.264*** | 0.151 | | |
| $FGlob(de-jure)_{it}$ | | | 0.252 | 0.179 |
| $Inst_{it}$ | 0.372*** | 0.216 | 0.324 | 0.283 |
| $TRade_{it}$ | -0.160** | 0.078 | -0.212** | 0.082 |
| $INf_{it}$ | -0.015 | 0.010 | -0.016** | 0.010 |
| $POp_{it}$ | -0.041 | 0.033 | -0.042 | 0.033 |
| Number of Countries | 23 | | 23 | |
| Number of Instruments | 18 | | 18 | |
| Sample Period | 1989-2016 | | 1989-2016 | |
| Sargen Test (P-value) | 49.321 [0.86] | | 53.70[0.83] | |
| Difference-in-Hansen Test (P-value) | 73.06[0.62] | | 79.15[0.78] | |
| $AR_{(1)}$ (P-value) | -1.71[0.00] | | -1.82[0.00] | |
| $AR_{(2)}$ (P-value) | 0.52[0.40] | | 0.69[0.65] | |

Notes: 1. All regressions are estimated by using dynamic system-GMM estimator developed by Blundell and Bond (1998). 2. $AR_{(1)}$ and $AR_{(2)}$ are first order and second order serial correlation test. 3. The significance at 1%, 5% and 10% level is represented by * , ** and *** respectively. 4.Time-dummies are included in all regressions. 5. Values in brakets are P-values.