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Abstract: This paper examines the linkages between financial development, economic globalization, institutions and economic growth in a panel of 23 European countries over the period 1989-2014. We employ a panel vector autoregressive model to test short-run and long-run Granger causal relationships between the variables. The empirical results indicate the robust long-run relationship between financial development, globalization, institutions and economic growth. Furthermore, financial development adds in economic growth. Economic globalization spurs economic growth via external factors. Institutions stimulate economic growth via economic policy effectiveness. Long-run Granger causality results reveal that economic growth tends to converge its long-run equilibrium path in response to change in financial development, globalization and institutions. In the short-run Granger causality results present mixed empirical evidence. However, there is a clear evidence that economic growth responds to various measure of financial development and changes in economic globalization and institutional quality.

Keywords: Growth, Financial development, Globalization, Institutions

1. 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 visualize the role of globalization as one of the powerful weapons 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; Intriligator, 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 et al. (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. 2014).

Despite the historical literature favoring the role of financial development in driving economic growth (Schumpeter, 1911; Gurley and Shaw, 1967; Goldsmith, 1969; and Mackinnon, 1973), Rajan and Zingales, (1998) argued 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 argue 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) argues 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) supports 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 level of banking intermediation is illustrated by the share of domestic credit. In European countries, domestic credit to GDP ratio increased from 97.79% to 147.68% in 1990-1994 and 2010-2014 respectively. European countries have recorded a high private sector lending growth in recent years. As seen in Table-1, private sector credit to GDP ratio increased from 80.11% in 1990-1994 to 103.96% in 2005-2009. Further, this ratio increased to 106.84% in 2010-2014. The ratio of broad money to GDP is an indicator of the size of financial sector. This ratio also increased gradually in the last two decades and turned out to be 93.25% in 2010-2014 (see Table-1).

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 21st 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 ratio of listed companies to

GDP was 16.01% in 1990-1994 and this increased to 96.41% in 2005-2009. The ratio declined to 81.25% in 2010-2014 due to European financial crisis. 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 32.96% to 66.01% in 1990-1994 and 2010-2014 respectively. 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 2005-2009 (see Table-1). European countries made a tremendous improvement in their GDP per capita growth. The real GDP per capita was recorded as 14700.48 (US$) in 1990-1994 and increased further to 20107.24 (US$) in 2010-2014 (see Table-1). Similarly, the value of globalization index improved from 67.17% in 1990-1994 to 82.12% in 2009-2014. All most all European countries have good democratic system and quality of institutions as represented by the value of political right index and civil liberties index close to 1 (see Table-1).

Table-1: Financial Development, GDP, Globalization, Institutions Quality Indicators

Year	1990-1994	1995-1999	2000-2004	2005-2009	2010-2014
Domestic Credit (% of GDP)	97.79	101.87	112.07	130.64	147.68
Private Sector Credit(% of GDP)	80.11	81.14	90.68	103.96	106.84
Money and Quasi Money, M_2(% of GDP)	67.28	70.24	74.31	88.08	93.25
Stock Market Capitalization(% of GDP)	16.01	39.77	73.42	96.41	81.52
Value Traded (% of GDP)	32.96	64.27	74.26	72.01	66.01
Turn Over Ratio (% of GDP)	49.50	67.66	100.28	135.13	86.37
Real GDP Per Capita (US$)	14700.48	15768.86	17876.4	19765.46	20107.24
Globalization Index	67.17	76.00	80.85	81.76	82.12

Political Right Index	2	1.5	1	1	1
Civil Liberties Index	2	1.5	1	1	1

Source: (1) World development Indicators (CD-ROM, 2014). (2) KOF index of globalization , 2015.
(3) Heritage Foundation's subjective "Index of Economic Freedom"

To the best of our knowledge, empirical work on the dynamic issue of interaction between financial development, economic globalization, institutional quality and economic growth using the panel data for 23 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, Heritage Foundation, Freedom House and Fraser Institute) are emerging, it is high to see not only developing 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. In this context, our study is motivated to examine the impacts of financial development, economic globalization and institutional quality on economic growth using the panel data for 23 European countries[1] covering the data set of 1989-2014 by employing a more advanced panel Granger technique. This empirical attempt for 23 European countries appears to be important contribution to the existing literature. Moreover, the use of panel VAR technique for examining both short-run and long-run Granger causal relationships between the series appears to be another contribution to the field of growth literature. Our empirical evidence indicates the robust long-run relationship between financial development, economic globalization, institutions and economic growth. Furthermore, financial development elevates domestic production and hence economic growth. Economic globalization has positive impact on economic growth via external factors. Institutions spur economic growth via economic policy effectiveness. Long-run Granger causality results reveal that economic growth tends to converge its long-run equilibrium path in response to change in financial development, economic globalization and institutions.

The remainder of the paper is structured as follows. Section-2 reviews a brief related empirical literature. Both descriptions of variables and data sources are analyzed in Section-3. Section-4

[1]The list of selected countries is given in the ''Appendix''.

discusses empirical techniques used in the analysis. Section-5 discusses empirical results and its interpretation. Section-6 presents concluding remarks and policy implications along with future directions.

2. Related Empirical Literature

We have already provided a snapshot of theoretical arguments on the impacts of financial development, economic globalization and institutional quality on economic growth. Numerous studies have empirically investigated this issue but by and large the findings emerged from these time-series and panel studies are inconclusive and mixed. The inclusive and mixed findings could be attributed due to the use of various time-series and panel techniques. Moreover, the findings cannot be generalized across countries or across time-series and panel studies. Therefore, our study intends to review the findings of existing studies in a very detailed manner before embarking upon the present empirical analysis.

However, the mixed and conflicting results found in the literature underlie the debate regarding whether financial development is the cause or the effect of the growth process in developed and developing countries. Empirically, King and Levin (1993) studied 77 countries over the period 1960-1989 and found that financial development causes economic growth in the early stages of economic development. This result was also supported by Fase, (2001) for the Netherlands in the 20^{th} century. Moreover, 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. Similarly, Kargbo and Adamu (2009) examined the causal linkage between economic growth and financial development in Sierra Leone for the annual data period from 1970-2008. Their empirical results strongly support the finance-led growth hypothesis due to the positive effect of financial development on economic growth. More importantly, they also show that financial development is capable of having a positive impact on economic growth through investment channel.

In the case of Ghana, Quartey and Prah (2008) analyzed the causal relationship between financial development and economic growth and strongly supported the evidence of demand-following hypothesis, i.e. demand growth helps support economic development. In this line, Odhiambo

(2009) examined the dynamic relationship between interest rate reforms, financial development and economic growth in South Africa and found a causal relationship between financial depth and 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 both financial development and economic growth are mutually determined for Kenya. Subsequently, Adu et al. (2013) examined the long-run growth effects of financial development in Ghana and found that the growth effect of financial development is sensitive to the choice of proxy. Furthermore, their findings show that both the credit to the private sector as ratios to GDP and total domestic credit are growth-enhancing financial development indicators.

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. Subsequently, Calderon and Liu (2003) examined the direction of causality between financial development and economic growth for 109 developing and industrial countries covering the period from 1960-1994. Using pooled data, the Granger causality test shows that financial deepening propels economic growth through the channels of rapid capital accumulation and productivity growth. Rousseau and Wachtel, (2005) analyzed panel data from 84 countries and used the rolling regression approach to examine the relationship between financial development and economic growth during the period from 1960-2003. They found that the less developed countries showed clearer relationships whereas the reverse was holding true for more developed ones. Similarly, Kemal et al. (2007) surveyed panel data from 19 highly developed countries and found no causality between financial development and economic growth. In this vein, Narayan and Narayan (2013) examined the impact of financial system on economic growth for a panel of 65 developing countries covering the annual operiod from 1995-2011. In their analysis, it is found that the

empirical analysis is based on the regional panels. Their findings evidence the existence of financial sector-led growth for the full panel of 65 developing countries. It is also found that bank credit is significant and adversely influences economic growth for the full panel of all countries. More specifically at the regional level, it is noticed that both banking sector and stock market developments do not contribute to economic growth for the Middle Eastern countries. But in the case of Asia, the financial sector is found to have a statistically significant and positive weak effect on 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. Moreover, they also found the insignificant short-run effect of finance on growth, indicating that too much finance can deliver a negative impact on growth in middle-income countries. They also argued that expanding financial sector will not help the growth of any economy unless the attention is not given on the appropriate type and quality of finance. More interestingly, Mishra and Narayan (2015) also used empirical non-parametric model to examine the causal relationship between financial system (banking sector & stock market developments) and economic growth for 43 countries covering the annual data from 1986 to 2012. In their panel analysis, they have considered seven panels, such as 'high-income' panel (19 countries), the 'middle-income' panel (19 countries), the 'developing country' panel (21 countries), the 'OECD' panel (22 countries), the 'East Asian' panel (13 countries), and the 'European' panel (15 countries). In light of their findings, it is important to note that economic growth is significantly and negatively related to banking sector development (domestic credit & private credit) in six of the seven panels. Moreover, they find the significant and positive effect of stock market development (stock market capitalization & stock traded) on economic growth in majority of the panels. From a policy perspective, they suggest that the policy advisers can now control the development of the banking sector as it adversely affects the economic growth.

Dreher, (2006) argued that countries that are more globalized experience higher economic growth compared to countries that are less globalized. Rao and Vadlamannati, (2011) also examined the nexus between globalization and economic growth for 21 low income African

countries and provided an optimistic view of significant positive long-run economic growth effects of globalization. According to them, the role of globalization in determining economic growth is found to be more rapid especially for low income countries. Subsequently, Rao and Hassan (2011) made an extensive empirical attempt of examining the growth effects of globalization with country-specific time series data and found a similar empirical result indicating the positive impact of globalization on economic growth in five Asian countries (Singapore, Malaysia, Thailand, India and Philippines). They document that the growth effect of globalization is also found to be the highest for India and the lowest for Philippines. Similarly, Gurgul and Lach (2014) recently examined the impact of globalization on economic growth for transition economies and found a positive effect of globalization on economic growth. Subsequently, Chang et al. (2015) examined the non-linear cointegration relationship between real output and the overall globalization index for G7 countries (Canada, France, Germany, Italy, Japan, the United Kingdom and the United States). With the use of advanced quantile method, they found positive and significant long-run real economic growth effects of overall globalization and three other dimensions of globalization.

More specifically, Vega-Gordillo and Alvarez-Arce (2003) examined the impacts of economic freedom and political freedom as proxy for institutions on economic growth in 45 developed and developing countries covering the data set from 1970-1995. By using the panel least squares and Granger causality tests, it is found that both economic and political freedom cause economic growth in Granger sense. It is further suggested in their findings that less developed countries should take advantage of broad institutional reforms to promote economic growth that will eventually help in enhancing political and economic freedom. In a similar fashion, Justesen (2008) examined the effect of economic freedom on economic growth for a panel of 77 countries covering the long five year average data set ranging from 1970-2000. By employing pooled Granger causality test, they found that economic freedom causes economic growth in Granger sense. This further implies that economic freedom matters in fostering economic growth. Law and Bany-Ariffin, (2008) conducted a panel of 72 countries analysis in examining the impact of institutions on economic development by using the data set from 1980-2001. Their results emerging from the use of pool mean regression and panel GMM techniques indicate the potential role of institutions on economic growth in middle and low income countries. Using a generalized

methods of moments (GMM), Lee and Kim (2009) conducted the causal analysis between economic growth and institutions for 63 countries covering the sample data from 1965-2002 and found the existence of bidirectional causation between the variables. It is further suggested in their findings that institutions play a significant role in inducing economic growth of both higher income and lower income countries.

Recently, Law et al. (2013) examined the causal linkage between institutions and economic developed for a panel of 60 high and low income countries. They have considered two different institutional data sets 1990-2008 for International Country Risk Guide (ICRG) and 1996-2008 for World Governance Indicators (WGI). By using panel VAR and Granger causality tests, they found the bidirectional Granger causality between institutions and economic growth. Their findings reveal that the causality patterns between institutions and economic development vary at different stages of income level. It is further suggested in their findings that better institutional quality improves economic development in higher income countries, whereas economic development fosters institutional quality in lower income countries. These findings are consistent across two different institutional data sources (e.g. IRCG and WGI). From a policy perspective, they argue that due to the presence of heterogeneous results on the causal linkages between institutions and economic development at different stages of income level, strengthening institutional quality is crucial in higher income countries in order to promote economic growth in higher income countries and fostering economic growth is also vital in order to enhance institutional quality in lower income countries. In this sense, they further argue that it may be necessary to derive different policy recommendations for different income groups rather than formulating a single policy that applies to all countries. Moreover, the designed policies aimed at higher economic growth and better institutional quality should consider different stages of economic development for high and low income countries.

In a similar manner, Law et al. (2014) 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 financial development affects economic growth and globalization positively. Moreover, economic growth leads financial development. This indicates that both economic growth and financial development are complementary each other that support their positive effects over time. Globalization adds in economic growth but 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.

3. Descriptions of Variables and Data Sources

The 23 European countries are selected for the estimation of causality between financial development, economic globalization, institutions and economic growth on the basis of data availability. The study employs data that cover the period 1989-2014. Two different measures of financial development: banking sector development and stock market development are selected for empirical analysis. The first measure of financial development comprises of three banking sector development indicators: domestic credit provided by banking sector (DC), private sector credit (PC), and money and quasi money (M_2). The second measure of financial development consists of three stock market development indicators: stock market capitalization (SMC), value

traded (VT), and turnover ratio (TR). All financial sector development indicators are expressed as ratios to GDP. Economic growth (Y) is measured by natural logarithm of real GDP per capita. KOF index of globalization (2015) is used to measure globalization. This index developed by Dreher, (2006) and covers three dimensions: economic globalization, political globalization and social globalization. However, we use economic globalization (GB) for empirical analysis. The civil liberties and political right indices are used to measure the quality of institutions (INST). Both these indices are measured on a scale of 1 to 7, 1 represents strong democratic institutions and 7 the least democratic institutions. We normalize these two measures of democracy to a range from 0 to 1 on the basis of the following computation methodology taken by Gastil et al. (1990): INST = [14-(PR+CL)]/12=0 for unstable institutions, and = 1 for stable institutions. The definitions of all variables are presented in Table-2.

Figure-1: Financial Development Index of 23 European Countries

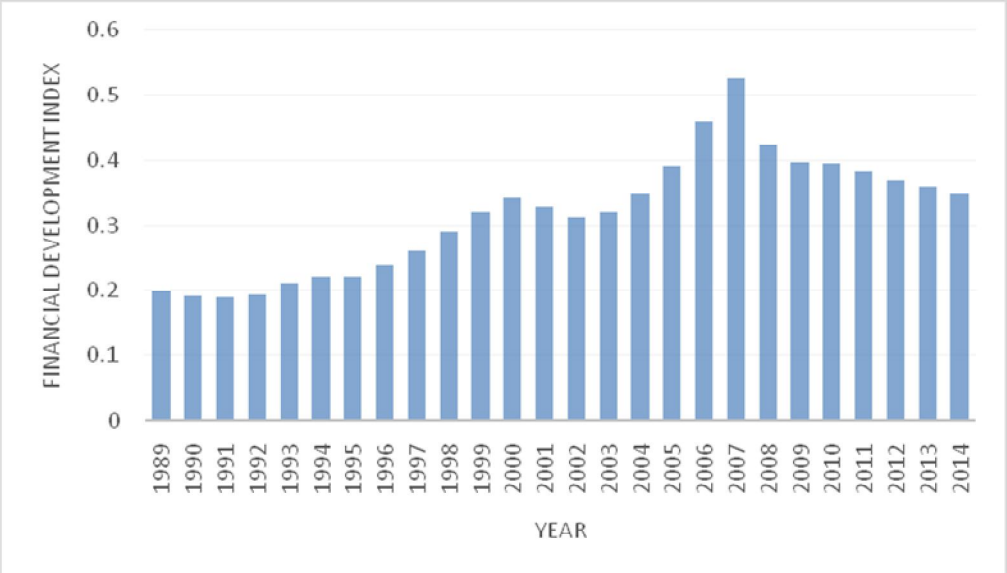


Figure-2: Banking Sector Development Index of 23 European Countries

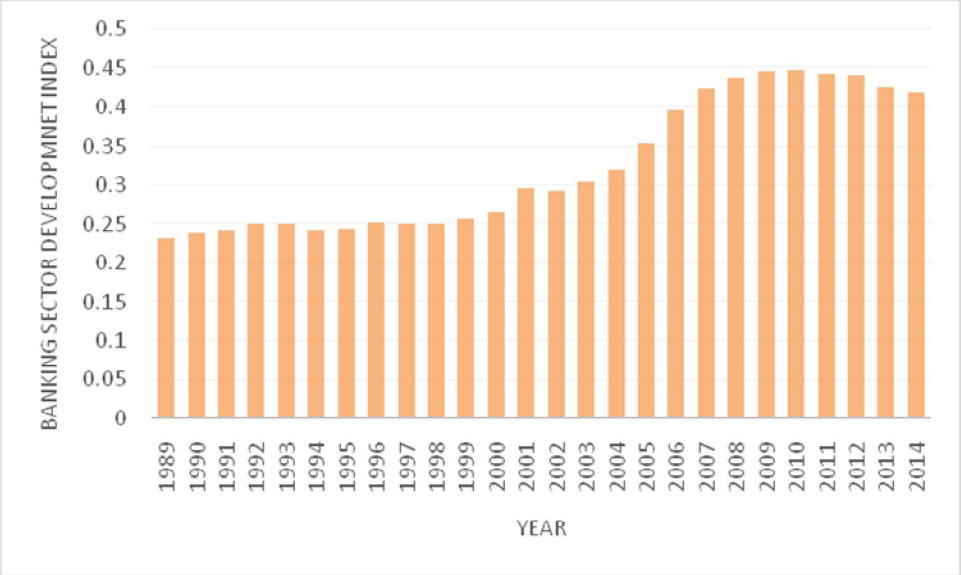
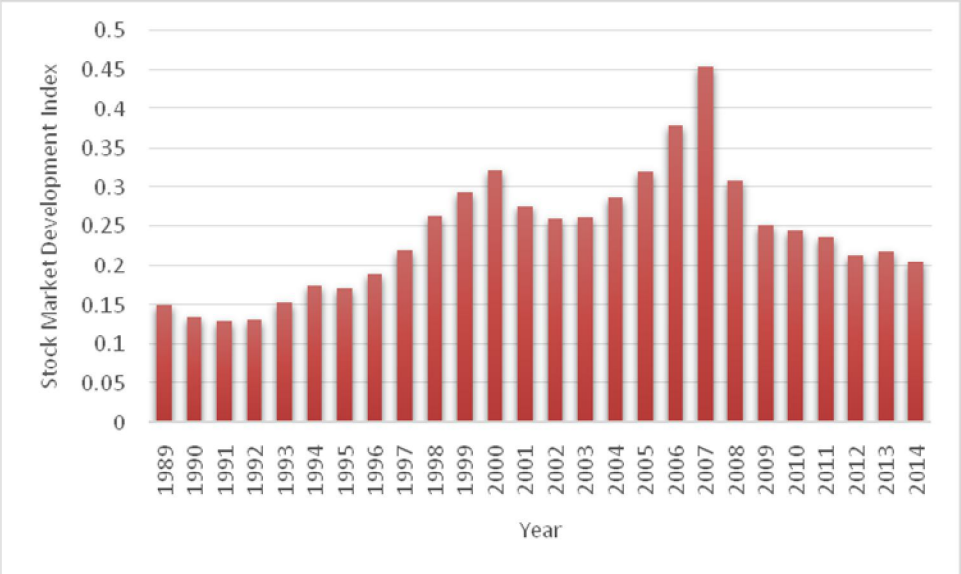


Figure-3: Stock Market Development Index of 23 European Countries



The data for financial development indicators (e.g.banking sector and stock market variables) and economic growth are taken from the World Development Indicators (World-Bank CD-ROM, 2015). The data for economic globalization is extracted from KOF index of globalization (globalization.kof.ethz.ch). The data for civil liberty and political right indices are obtained from Heritage Foundation's subjective "Index of Economic Freedom". The summary statistics and correlation matrix for all variables are displayed in Appendix-1.

Table-2: Definition of Variables

Variables	Definition
Y	Real GDP per capita is the ratio of gross domestic product (constant 2005 US$) to population and is used to measure economic growth.
DC	Domestic credit provided by banking sector includes all credit to various sectors on gross basis. The banking sector includes monetary authorities and deposit money bank as well as other banking institutions where data are available.
PC	Private sector credit measures the transfer of financial resources to private sector through loan, purchases of non-equity securities, trade credits and other accounts receivable that establish a claim for repayment.
M_2	Money and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government.
SMC	Stock market capitalization is equal to share price times the number of shares outstanding.
TR	Stock market turnover ratio is equal to ratio of total shares traded and average real market capitalization.
VT	Stock traded refers to the total value of shares traded during the period.
INST	Civil liberties and political rights indices are used to measure quality of institutions. Civil liberties index includes freedom of press and speech, self-governing judicial body, freedom of political associations and assembly, and also no restriction on travel inside and outside the country. Political rights index include individual involvement in political process and participation of elected representatives in community matters.
GB	Economic globalization is a composite index comprising two dimensions: (i) Actual flows and (ii) Restrictions. Actual flows include trade, foreign direct investment, portfolio investment, income payment to foreign nationals while restrictions include hidden imports barriers, mean tariff rate, tax on international trade and capital account restrictions.

4. Estimation Techniques

We employ a panel vector autoregressive (VAR) model in order to estimate the possible causal nexus between selected variables. The advantage of this technique is that it exploits individual time-series and cross-sectional variation in data. Thus, it eliminates biases associated with cross-sectional regression by taking into account the country specific fixed effect (Levine, 2005). The estimation strategy follow three four steps: first, panel unit root tests are employed to check the order of integration of the selected variables; second, a panel cointegration test is applied to examine long-run relation between variables; third, a panel VAR model is constructed to ascertain the direction of causality between variables.

4.1. Panel Unit Root Tests

We use Levin Lin and Chu, 2002 (LLC) and Im, Pesaran and Shin, 2003 (IPS) unit root test to check the order of integration of the selected variables. LLC can be considered for a pooled panel unit root test while IPS represents a heterogeneous panel unit root test. Both these tests are based on conventional Augmented Dickey Fuller (ADF) test. Both tests are applied by averaging individual ADF t-statistics across cross section units. The tests use the equation:

$$\Delta y_{i,t} = \alpha_i + \vartheta_i t + \rho_i y_{i,t-1} + \sum_{j=1}^{p} \phi_{i,j} y_{i,t-j} + \upsilon_{i,t} \qquad (1)$$

The LLC test assumes the coefficient of autoregressive term is homogenous across all cross-sectional units, in other words, $\rho_i = \rho \forall_i$. It test the null hypothesis that each cross-section in the panel has an integrated time series, in other words, $H_0 : \rho_i = \rho = 0 \forall_i$ against an alternative $H_a : \rho_i = \rho < 0 \forall_i$. It is clear that the null hypothesis of LLC test is very restrictive but the IPS test relaxes its assumption by allowing ρ varies across i under the alternative hypothesis. Hence the null hypothesis of IPS test is $H_0 : \rho_i = 0 \forall_i$ while the alternative hypothesis is that at least one of the individual series in the panel is stationary, in other words, the alternative $H_a : \rho_i < 0 \forall_i$.

Some recent studies (Lyhagen, 2008; Wagner, 2008) found that in the presence of cross-sectional dependence (particularly in the case of economic globalization due to unobservable common shocks), IPS, LLC tests incorrectly reject the null hypothesis of non-stationary. Therefore, we

implement these unit root tests on time demeaned series to deal with cross-sectional dependence. According to Levin et al. (2002), implementing unit root tests on time demeaned series allows to mitigate the impact of cross-sectional dependence on panel data. The results of cross-sectional dependence test are reported in Appendix-2.

4.2. Panel Cointegration Test

Granger, (1981) was the pioneer who introduced the concept of cointegration in time series data. Cointegration test was further developed by Engle and Granger (1987), Philips and Ouliaris (1990), Johansen (1988, 1991) and among others. Similar to panel unit root tests, extension of time-series cointegration to panel data is also recent. In the present paper, Pedroni panel cointegration technique (Pedroni, 2000) is applied to examine the long-run relation among selected variables. This leads usto formulatethe following regression equation:

$$Y_{it} = \alpha_{0Yi} + \alpha_{1Yi}t + \alpha_{2Yi}FD_{it} + \alpha_{3Yi}GB_{it} + \alpha_{4Yi}INST_{it} + \varepsilon_{it} \qquad (2)$$

Where $\varepsilon_{it} = \varphi_i \varepsilon_{it-1} + \xi_{it}$, α_{0Yi} is a country specific intercept term, $\alpha_{1Yi}t$ is a country specific time trend in the panel. The slope coefficients $(\alpha_{kYi};\ for\ k = 1,....,4)$ can vary from one individual to another, allowing the cointegrating vectors to be heterogeneous across countries. Pedroni, (1999) proposes seven different statistics to test for cointegration relationship in heterogeneous panel. These tests are corrected for bias introduced by potentially endogenous regressors. In the presence of cross-sectional dependence, Pedroni suggests to include common time dummies to eliminate this effect. The seven test statistics of Pedroni are classified into within dimension and between dimensions statistics. Within dimension statistics are referred to as panel cointegration statistics, while between dimension statistics are called group mean panel cointegration statistics. These cointegration test statistics are based on the extension of two step residual based strategy of Engle and Granger, (1987). The procedure involves in the estimation of seven test statistics is enlisted as following:

Step 1: Compute the residual ($\hat{\varepsilon}_{it}$) from the panel regression equation (2). The estimation includes all fixed effect, time trend or common time dummies. Step 2: Compute the residual ($\hat{\eta}_{it}$) of following differenced regression:

$$\Delta x_{i,t} = \theta_{1i}\Delta Z_{1i,t} + \theta_{2i}\Delta Z_{2i,t} + \ldots\ldots\ldots + \theta_{mi}\Delta Z_{mi,t} + v_{it} \qquad (3)$$

Step 3: Estimate the long-run variance ($\hat{\kappa}^2_{11,i}$) from the residuals ($\hat{\eta}_{it}$) of the differenced regression.

$$\hat{\kappa}^2_{11,i} = \frac{1}{T}\sum_{t=1}^{T}\hat{\mu}^2_{it} + \frac{2}{T}\sum_{s=1}^{k_i}(1-\frac{s}{k_i+1})\sum_{t=s+1}^{T}\hat{\mu}_{it}\hat{\mu}_{it-s} \qquad (4)$$

Where $\hat{\mu}_{it}$ is residual and is obtained from the error of cointegration equation (2), s and k are lag length.

Step 4: using the residual ($\hat{\varepsilon}_{it}$) of original co integrating equation (2), estimate the residual ($\hat{\mu}_{it}$) of ADF test and compute the following variances of these residuals:

$$\hat{s}^2_i = \frac{1}{T}\sum_{t=1}^{T}\hat{\mu}^2_{it} \text{ and } \overline{s}^2_{NT} = \frac{1}{T}\sum_{t=1}^{T}\hat{s}^2_i \qquad (5)$$

Where $\hat{s}^2_i$ is the individual contemporaneous variance and $\hat{\mu}^2_{it}$ is the long-run variance of the residual $\hat{\mu}_{it}$ and $\overline{s}^2_{NT}$ is the contemporaneous panel variance estimator.

Step 5: Compute the panel-t and group-t statistics (Pedroni, 1999). After the calculation of the panel cointegration test statistics the appropriate mean and variance adjustment terms are applied, so that the test statistics are asymptotically standard normally distributed.

$$\frac{X_{N,T} - \mu\sqrt{N}}{\sqrt{V}} \Rightarrow N(0,1) \qquad (6)$$

Where $X_{N,T}$ is the standardized form of test statistics with respect N and T. u and v are the functions of moment of the underlying Brownian motion functional. All statistics test the null hypothesis of no cointegration as following:

$$H_0 : \rho_i = 1 \quad for\ all\ i = 1, 2, ..., N$$

Alternative hypothesis for between dimension and within dimension for panel co integration is different. The alternative hypothesis for between dimension statistics is as following:

$$H_0 : \rho_i < 1 \quad for\ all\ i = 1, 2, ..., N$$

Where a common value for $\rho_i = \rho$ is not required. The alternative hypothesis for within dimension based statistics is given below:

$$H_0 : \rho_i = \rho < 1 \quad for\ all\ i = 1, 2, ..., N$$

Assume a common value for $\rho_i = \rho$. Under the alternative hypothesis, all the panel test statistics diverge to negative infinity. Thus, the left tail of the standard normal distribution is required to reject the null hypothesis. If all variables are found to be cointegrated, we proceed to test for the direction of causality between them.

4.3. Fully Modified Ordinary Least Square (FMOLS) Approach

To allow for cross-sectional heterogeneity in the alternative hypothesis, endogeneity and serial correlation problems to obtain consistent and asymptotically unbiased estimates of the cointegrating vectors, Pedroni (2000, 2001) proposed the Fully Modified OLS (FMOLS) estimator for cointegrated panels. Following Pedroni (2001), FMOLS technique generates consistent estimates in small samples and does not suffer from large size distortions in the presence of endogeneity and heterogeneous dynamics. The panel FMOLS estimator is defined as:

$$\hat{\beta} = N^{-1}\sum_{i=1}^{N}\left(\sum_{t=1}^{T}(y_{it}-\overline{y})^2\right)^{-1}\left(\sum_{t=1}^{T}(y_{it}-\overline{y})\right)z_{it}^{*} - T\hat{\eta}_i \qquad (7)$$

Where $z_{it}^{*} = (z_{it}-\overline{z}) - \frac{\hat{L}_{21i}}{\hat{L}_{22i}}\Delta y_{it}$, $\hat{\eta}_i \equiv \hat{\Gamma}_{21i} + \hat{\Omega}_{21i}^{0} - \frac{\hat{L}_{21i}}{\hat{L}_{22i}}(\hat{\Gamma}_{22i} + \hat{\Omega}_{22i}^{0})$ and $\hat{L}_i$ is a lower triangular decomposition of $\hat{\Omega}_i$. The associated t-statistics gives:

$$t_{\hat{\beta}^*} = N^{-1/2}\sum_{i=1}^{N} t_{\hat{\beta}^*,i} \quad \text{Where} \quad t_{\hat{\beta}^*,i} = \left(\hat{\beta}_i^{*} - \beta_0\right)\left[\hat{\Omega}_{11i}^{-1}\sum_{t=1}^{T}(y_{it}-\overline{y})^2\right]^{1/2} \qquad (8)$$

The equation-9 is used to estimate the long-run relationship between financial development, economic globalization, institutions and economic growth.

$$Y_{it} = \lambda_0 + \lambda_1 FD_{it} + \lambda_2 GB_{it} + \lambda_3 INST_{it} + \varepsilon_{it} \qquad (9)$$

4.4. VECM Estimation and Granger Causality Test

The panel Granger causality test is proposed by Holtz-Eakin, Newey, and Rosen (1988) and used by Liddle and Lung (2013), is employed to ascertain the direction of causality between financial development, economic globalization, institutions and economic growth. The following econometric models are used.

$$\Delta Y_{it} = \eta_{Yj} + \sum_{k=1}^{p_1}\alpha_{Yik}\Delta Y_{it-k} + \sum_{k=1}^{p_2}\beta_{Yik}\Delta FD_{it-k} + \sum_{k=1}^{p_3}\sigma_{Yik}\Delta GB_{it-k} + \sum_{k=1}^{p_4}\gamma_{Yik}\Delta INST_{it-k} + \omega_{Yi}ECT_{yit-1} + \varepsilon_{Yit} \quad (10)$$

$H_0 : \beta_{Yik} = 0, \sigma_{Yik} = 0, \gamma_{Yik} = 0, \omega_{Yik} = 0$ *for* $k = 1.....p_1 - p_4$

$H_a : \beta_{Yik} \neq 0, \sigma_{Yik} \neq 0, \gamma_{Yik} \neq 0, \omega_{Yik} \neq 0$ *for* $k = 1.....p_1 - p_4$ *for at least one k*

$$\Delta FD_{it} = \eta_{FDj} + \sum_{k=1}^{p_1}\alpha_{FDik}\Delta FD_{it-k} + \sum_{k=1}^{p_2}\beta_{FDik}\Delta Y_{it-k} + \sum_{k=1}^{p_3}\sigma_{FDik}\Delta GB_{it-k} + \sum_{k=1}^{p_4}\gamma_{FDik}\Delta INST_{it-k} + \omega_{Yi}ECT_{FDit-1} + \varepsilon_{FDit} \qquad (11)$$

$$H_0 : \beta_{FDik} = 0, \sigma_{FDik} = 0, \gamma_{FDik} = 0, \omega_{FDik} = 0 \ \ for\ k = 1.....p_1 - p_4$$
$$H_a : \beta_{FDik} \neq 0, \sigma_{FDik} \neq 0, \gamma_{FDik} \neq 0, \omega_{FDik} \neq 0 \ \ for\ k = 1.....p_1 - p_4 \ \ for\ at\ least\ one\ k$$

$$\Delta GB_{it} = \eta_{GBj} + \sum_{k=1}^{p_1} \alpha_{GBik} \Delta GB_{it-k} + \sum_{k=1}^{p_2} \beta_{GBik} \Delta FD_{it-k} + \sum_{k=1}^{p_3} \sigma_{GBik} \Delta Y_{it-k} + \sum_{k=1}^{p_4} \gamma_{GBik} \Delta INST_{it-k} + \omega_{GBi} ECT_{GBit-1} + \varepsilon_{GBit} \quad (12)$$

$$H_0 : \beta_{GBik} = 0, \sigma_{GBik} = 0, \gamma_{GBik} = 0, \omega_{GBik} = 0 \ \ for\ k = 1.....p_1 - p_4$$
$$H_a : \beta_{GBik} \neq 0, \sigma_{GBik} \neq 0, \gamma_{GBik} \neq 0, \omega_{GBik} \neq 0 \ \ for\ k = 1.....p_1 - p_4 \ \ for\ at\ least\ one\ k$$

$$\Delta INST_{it} = \eta_{INSTj} + \sum_{k=1}^{p_1} \alpha_{INSTik} \Delta GB_{it-k} + \sum_{k=1}^{p_2} \beta_{INSTik} \Delta FD_{it-k} + \sum_{k=1}^{p_3} \sigma_{INSTik} \Delta Y_{it-k} + \sum_{k=1}^{p_4} \gamma_{INSTik} \Delta INST_{it-k} + \omega_{INSTi} ECT_{INSTit-1} + \varepsilon_{INSTit} \quad (13)$$

$$H_0 : \beta_{GBik} = 0, \sigma_{GBik} = 0, \gamma_{GBik} = 0, \omega_{GBik} = 0 \ \ for\ k = 1.....p_1 - p_4$$
$$H_a : \beta_{GBik} \neq 0, \sigma_{GBik} \neq 0, \gamma_{GBik} \neq 0, \omega_{GBik} \neq 0 \ \ for\ k = 1.....p_1 - p_4 \ \ for\ at\ least\ one\ k$$

The ECTs are error correction terms which represent long-run dynamics and are derived from cointegrating equations. Coefficients with differenced variables represent short-run dynamics between variables. These models are meaningful if selected variables are integrated of order one, I(1) and are cointegrated. We examine both short-run and long-run causality from the above mentioned models. The short-run causality is measured through the significance of F-statistic of the lagged change in the independent variables while long-run causality is measured through the significance of the t-statistics of the lagged ECTs. Prior to estimation, it is necessary to specify the number of lag length in the estimation process. Unfortunately, there is no standard rule for deciding the optimal lag-length, although some reliable formal model specification criteria are available in econometric literature. We estimate each equation by choosing the combination of lags which minimize the Schwartz Bayesian Criteran (SBC).

5. Empirical Results and Their Discussions

The results of LLC and IPS panel unit root test in the presence of intercept and, intercept and trend are reported in Table-3 and 4. All variables are tested in level and first difference form using demeaned data. The empirical results suggest that all the series are non-stationary at their level form, but found to be stationary at first difference. Therefore, in our panel of 23 countries, we conclude that all the variables are integrated at I(1). This unique order of integration of the variables helps us to apply panel cointegration presented by Pedroni, (2000) to examine long run relationship between the series. Table-5 reports the results of panel cointegration tests. The empirical evidence indicates that the null hypothesis of no cointegration is rejected in most cases. Therefore, we say that there is evidence of cointegrating relationship among all variables in the model- financial development, economic globalization, institutions and economic growth- over time across all countries in the sample.

Table-3: The IPS Unit Root Test Results

Variables	**At level**				**At 1st Difference**			
	Constant	P-value	Constant & Trend	P-value	Constant	P-value	Constant & Trend	P-value
Y_{it}	1.031	0.848	0.932	0.824	-5.269	0.000	-2.984	0.001
DC_{it}	-0.193	0.423	3.198	0.999	-3.347	0.000	-5.330	0.000
PC_{it}	0.313	0.623	-0.168	0.433	-6.102	0.000	-3.018	0.001
M_{it}	-0.806	0.210	1.036	0.850	-10.69	0.000	-8.671	0.000
SMC_{it}	-1.183	0.118	1.942	0.974	-7.498	0.000	-6.424	0.000
TR_{it}	-0.873	0.191	-0.212	0.416	-9.793	0.000	-7.824	0.000
VT_{it}	-1.108	0.133	-1.185	0.118	-7.267	0.000	-5.886	0.000
GB_{it}	2.955	0.998	0.535	0.704	-5.428	0.000	-3.520	0.000
$INST_{it}$	-0.331	0.370	1.417	0.921	-9.330	0.000	-7.694	0.000

Table-4: The LLC Unit Root Test Results

Variables	**At level**				**At 1st Difference**			
	Constant	P-value	Constant	P-value	Constant	P-value	Constant	P-value

			& Trend				& Trend	
Y_{it}	1.187	0.882	0.834	0.798	-4.192	0.000	-2.584	0.005
DC_{it}	0.067	0.527	2.230	0.987	-6.212	0.000	-6.616	0.000
PC_{it}	-1.219	0.111	-0.620	0.267	-7.590	0.000	-6.274	0.000
M_{it}	-0.178	0.429	3.684	0.999	-7.944	0.000	-5.381	0.000
SMC_{it}	-0.843	0.199	-0.302	0.381	-3.941	0.000	-2.398	0.008
TR_{it}	-0.748	0.227	0.079	0.531	-5.462	0.000	-2.810	0.002
VT_{it}	-0.916	0.179	1.441	0.925	-4.543	0.000	-2.859	0.002
GB_{it}	-0.168	0.433	-0.520	0.301	-10.09	0.000	-8.355	0.000
$INST_{it}$	2.350	0.990	5.312	1.000	-5.797	0.000	-2.366	0.009

Table-5: The Pedroni Cointegration Test Results

Statistics	**Model 1**: $(Y_{it}, DC_{it}, GB_{it}, INST_{it})$		**Model 2**: $(Y_{it}, PC_{it}, GB_{it}, INST_{it})$	
	Value	P-value	Value	P-value
Panel υ-statistic	3.176	0.000	3.023	0.001
Panel σ-statistic	1.587	0.943	1.956	0.974
Panel ρρ-statistic	-0.475	0.317	0.563	0.713
Panel adf-statistic	-1.414	0.078	-0.279	0.390
Group σ-statistic	2.510	0.994	2.953	0.998
Group ρρ-statistic	-0.784	0.216	0.534	0.703
Group adf-statistic	-1.840	0.032	-1.688	0.045
	Model 3: $(Y_{it}, M_{it}, GB_{it}, INST_{it})$		**Model 4: $(Y_{it}, SMC_{it}, GB_{it}, INST_{it})$**	
Panel υ-statistic	2.829	0.203	2.914	0.002
Panel σ-statistic	-0.135	0.446	1.496	0.932
Panel ρρ-statistic	-1.490	0.068	-0.209	0.417
Panel adf-statistic	-1.342	0.089	-0.140	0.443
Group σ-statistic	0.786	0.784	2.111	0.982
Group ρρ-statistic	-1.515	0.064	-0.797	0.212
Group adf-statistic	-1.839	0.033	-1.891	0.029
	Model 5: $(Y_{it}, TR_{it}, GB_{it}, INST_{it})$		**Model 6: $(Y_{it}, VT_{it}, GB_{it}, INST_{it})$**	
Panel υ-statistic	3.110	0.000	3.124	0.000

Panel σ-statistic	0.990	0.839	1.140	0.837
Panel ρρ-statistic	-0.878	0.189	-0.672	0.250
Panel adf-statistic	-0.654	0.256	-1.644	0.050
Group σ-statistic	1.995	0.977	1.878	0.969
Group ρρ-statistic	-0.599	0.274	-0.721	0.235
Group adf-statistic	-1.864	0.031	-1.322	0.093

Table-6 reports estimates of equation-9 that are estimated by utilizing FMOLS method for six alternative financial development indicators namely domestic credit, private credit, money and quasi money, stock market capitalization, turnover ratio and value added. The results show that selected financial development indicators are positively related to economic growth and all are statistically significant, thus indicating that financial development is an important determinant of economic growth. These results support the findings of Levine and Zervos (1998), Beck et al. (2000), Levine (2005) and Falahaty et al. (2012). Economic globalization is positive and statistically significant in all estimated models. This result is consistent with the view of Stiglitz (2004) and Mishkin (2004) that economic globalization is a powerful force for enhancing economic growth. The coefficients of institutional quality are also positive and statistically significant in all cases. These results suggest that institutional quality must be improved to get the benefits of economic growth.

Following previous studies (Xu, 2000; Fase and Abma, 2003; Rioja and Valev, 2004; Tahir, 2008), we use financial development index constructed on the basis of principal component analysis (PCA) for empirical analysis. The Principal component analysis can decrease the dimension of data and transform the data into new variables that have more explanatory power (see Stock and Watson, 20002a, b). First of all, PCA is applied on two categories of financial development: banking sector indicators and stock market indicators separately and finally a composite index of financial development is constructed by including both categories (for detail see Appendix 3). The results reported in Table-5 show that banking sector development index in the presence of globalization and institutions has positive and highly significant effect on economic growth of European countries. The effect of stock market development index on economic growth is also found to positive and significant at 1% level. Similar, results are also observed by using composite index of financial development.

Table-6: The FMOLS Regression Results

Dependent Variable: Y_{it}					
Variables	Coefficient	P-value	Variables	Coefficient	P-value
FD =Domestic Credit			**FD =Private Credit**		
DC_{it}	0.002	0.000	PC_{it}	0.001	0.000
GB_{it}	0.015	0.000	GB_{it}	0.016	0.000
$INST_{it}$	0.240	0.002	$INST_{it}$	0.276	0.000
FD = Money and Quasi Money (M_2)			**FD = Stock Market Capitalization**		
M_{it}	0.003	0.000	SMC_{it}	0.025	0.007
GB_{it}	0.015	0.000	GB_{it}	0.021	0.000
$INST_{it}$	0.269	0.000	$INST_{it}$	0.755	0.000
FD = Turn Over Ratio			**FD = Value Traded**		
TR_{it}	0.0005	0.018	VT_{it}	0.0007	0.000
GB_{it}	0.021	0.000	GB_{it}	0.017	0.000
$INST_{it}$	0.999	0.000	$INST_{it}$	0.248	0.013
FD = Banking Sector Development Index			**FD = Stock Market Development Index**		
$BDINDEX_{it}$	0.587	0.000	$SDINDEX_{it}$	0.155	0.010
GB_{it}	0.015	0.000	GB_{it}	0.017	0.000
$INST_{it}$	0.258	0.000	$INST_{it}$	0.260	0.007
FD = Financial Development Index					
$FDINDEX_{it}$	0.504	0.000			
GB_{it}	0.015	0.000			
$INST_{it}$	0.269	0.000			

Long-run Causality

The empirical properties of the variables examined above require estimation of the Granger causality using vector error correction model (VECM) and utilizing equation-10-13. From Table-7, Model 1-6, when ΔY_{it} is the dependent variable, lagged error correction term (ECT_{t-1}) is statistically significant in five models. It is found to be insignificant in last model 6. This implies that economic growth tends to converge its long-run equilibrium path in response to change in its regressors ($DC_{it}, PC_{it}, M_{it}, SMC_{it}, TR_{it}, GB_{it}, INST_{it}$). The significance of the ECT_{t-1} coefficient in ΔY_{it} equation in each of the five models confirm the long-run equilibrium and indicate the long-run causality running from different measures of financial development ($DC_{it}, PC_{it}, M_{it}, SMC_{it}, TR_{it}$), economic globalization and institutions to economic growth. The empirical results allow us to conclude that if there is any deviation from the long-run equilibrium between the chosen variables, then economic growth responds to correct this deviation. The highest rate of correction is recorded for PC_{it} followed by $DC_{it}, SMC_{it}, TR_{it}$ and M_{it}.

The lagged error correction term in ΔDC_{it}, $\Delta M_{it}, \Delta SMC_{it}$ and ΔTR_{it} equations are found to be insignificant while it is found to be significant in ΔPC_{it} and ΔVT_{it} equations. Hence, most of the financial development indicators show no evidence of long-run causality. The ECT_{t-1} in ΔGB_{it} equation is found to be statistically significant in all six models. Similarly, in $\Delta INST_{it}$ equations, the ECT_{t-1} is found to significant only in Model 3 and 4. On the basis of these results we can say that if there is any deviation from long-run equilibrium, economic growth and economic globalization respond positively to correct this deviation while most of the indicators of financial development and institutions respond independently.

Table-7: The VECM Granger Causality Results

Model 1: ($Y_{it}, DC_{it}, GB_{it}, INST_{it}$)				
	ΔY_{it}	ΔDC_{it}	ΔGB_{it}	$\Delta INST_{it}$
ΔY_{it}	-	9.027 (0.000)	0.098 (0.906)	0.735 (0.479)
ΔDC_{it}	1.386	-	0.554	0.332

	(0.250)		(0.574)	(0.717)
ΔGB_{it}	7.808 (0.000)	5.192 (0.006)	-	0.109 (0.896)
$\Delta INST_{it}$	3.200 (0.041)	0.260 (0.071)	0.904 (0.405)	-
ECT_{t-1}	-0.041* [-8.111]	-0.367 [-1.454]	-0.464* [-8.502]	-0.0008 [-1.587]
Model 2: ($Y_{it}, PC_{it}, GB_{it}, INST_{it}$)				
	ΔY_{it}	ΔPC_{it}	ΔGB_{it}	$\Delta INST_{it}$
ΔY_{it}	-	2.643 (0.072)	0.319 (0.726)	1.020 (0.361)
ΔPC_{it}	0.065 (0.937)	-	2.460 (0.086)	0.364 (0.694)
ΔGB_{it}	7.547 (0.000)	3.542 (0.029)	-	0.029 (0.971)
$\Delta INST_{it}$	2.738 (0.065)	0.368 (0.692)	0.665 (0.514)	-
ECT_{t-1}	-0.055* [-9.007]	-0.840*** [-1.931]	-0.479* [-8.068]	0.0008 [0.158]
Model 3: ($Y_{it}, M_{it}, GB_{it}, INST_{it}$)				
	ΔY_{it}	ΔM_{it}	ΔGB_{it}	$\Delta INST_{it}$
ΔY_{it}	-	4.945 (0.007)	2.275 (0.104)	0.917 (0.400)
ΔM_{it}	1.117 (0.327)	-	0.690 (0.502)	0.072 (0.925)
ΔGB_{it}	9.039 (0.000)	0.640 (0.527)	-	2.067 (0.127)
$\Delta INST_{it}$	2.348 (0.096)	0.400 (0.670)	0.476 (0.621)	-

ECT_{t-1}	-0.008* [-6.100]	-0.042 [0.540]	-0.083* [-6.525]	-0.0007* [-7.023]
Model 4: (Y_{it}, SMC_{it}, GB_{it}, $INST_{it}$)				
	ΔY_{it}	ΔSMC_{it}	ΔGB_{it}	$\Delta INST_{it}$
ΔY_{it}	-	0.084 (0.919)	1.780 (0.169)	1.024 (0.359)
ΔSMC_{it}	53.57 (0.000)	-	5.644 (0.004)	0.104 (0.091)
ΔGB_{it}	4.388 (0.013)	1.013 (0.363)	-	1.296 (0.274)
$\Delta INST_{it}$	2.924 (0.054)	0.054 (0.946)	0.786 (0.456)	-
ECT_{t-1}	-0.030* [-7.017]	-0.241 [0.577]	-0.307* [-7.787]	-0.002* [-5.126]
Model 5: (Y_{it}, TR_{it}, GB_{it}, $INST_{it}$)				
	ΔY_{it}	ΔTR_{it}	ΔGB_{it}	$\Delta INST_{it}$
ΔY_{it}	-	2.255 (0.081)	7.549 (0.000)	2.156 (0.092)
ΔTR_{it}	2.474 (0.060)	-	4.871 (0.002)	0.967 (0.407)
ΔGB_{it}	9.349 (0.000)	0.644 (0.587)	-	0.071 (0.931)
$\Delta INST_{it}$	1.405 (0.240)	0.176 (0.912)	11.47 (0.000)	-
ECT_{t-1}	-0.011*** [-1.811]	-1.474 [-2.298]	2.936* [11.70]	0.002 [3.392]
Model 6: (Y_{it}, VT_{it}, GB_{it}, $INST_{it}$)				
	ΔY_{it}	ΔVT_{it}	ΔGB_{it}	$\Delta INST_{it}$
ΔY_{it}	-	1.269	0.216	2.853

		(0.284)	(0.855)	(0.037)
ΔVT_{it}	8.649 (0.000)	-	2.401 (0.067)	1.707 (0.164)
ΔGB_{it}	9.579 (0.000)	0.397 (0.755)	-	0.065 (0.978)
$\Delta INST_{it}$	1.529 (0.206)	0.189 (0.903)	0.432 (0.730)	-
ECT_{t-1}	-0.007 [-0.976]	-1.897** [-2.294]	-0.521* [-7.567]	0.002 [-1.095]

Note: Wald F-statistics reported with respect to short-run changes in the independent variables. ECT represents the coefficient of the error correction term. Values in ( ) are p-values and values in [ ] are t-ratios. *, **and *** denote significance at 1% , 5% and 10% level respectively.

Short-run causality

In contrast to long-run causality, the study also shows short-run causality results between four variables. The results are summarized in Table-8. In model 1, we find the evidence of unidirectional causality running from economic growth to domestic credit to private sector [GDP $\Rightarrow$ DC], economic globalization to economic growth [GDP $\Leftarrow$ GB], institutions to economic growth [GDP $\Leftarrow$ INST] and institutions to domestic credit to private sector [DC $\Leftarrow$ INST]. The evidence of no causality is observed between domestic credit to private sector and economic globalization [DC $\neq$ GB], economic globalization and institutions [GB $\neq$ INST]. In Model 2, the results indicate the existence of unidirectional causality running from economic growth to domestic credit to private sector [GDP $\Rightarrow$ PC], economic globalization to economic growth [GDP $\Leftarrow$ GB] and institutions to economic growth [GDP $\Leftarrow$ INST]. We also find the evidence of bidirectional causality between economic globalization and domestic credit to private sector [PC $\Leftrightarrow$ GB]. However, no causality is observed between domestic credit to private sector and institutions [PC $\neq$ INST], economic globalization and institutions [GB $\neq$ INST].

In model 3, we note the existence of unidirectional causality running from economic growth to money and quasi money [GDP $\Rightarrow$ M], economic globalization to economic growth [GDP $\Leftarrow$ GB] and globalization to institutions [GDP $\Leftarrow$ INST]. The evidence of no causality is found between money and quasi money and economic globalization [M $\neq$ GB], money and quasi money and

institutions M ≠ INST, economic globalization and institutions [GB ≠ INST]. In model 4, the results report the existence of unidirectional causality running from stock market capitalization to economic growth [GDP ⇐ SMC], economic globalization to economic growth [GDP ⇐ GB], institutions to economic growth [GDP ⇐ INST], stock market capitalization to economic globalization [SMC ⇒ GB] and institutions to stock market capitalization [SMC ⇐ INST]. Additionally, the results show evidence of no causality between economic globalization and institutions [GB ≠ INST].

In model 5, the results reveal bidirectional causality between economic growth and turnover ratio [GDP ⇔ TR] and between economic growth and economic globalization [GDP ⇔ GB]. Further the results show the evidence of unidirectional causality running from economic growth to institutions [GDP ⇒ INST], turnover ratio to economic globalization [TR ⇒ GB] and institutions to economic globalization [GB ⇐ INST] and no causality between turnover ratio and institutions [TR ≠ INST]. In model 6, value traded Granger cause GDP [GDP ⇐ VT], economic globalization Granger cause GDP [GDP ⇐ GB], GDP Granger cause institutions [GDP ⇒ INST] and value traded Granger economic globalization [VT ⇒ GB]. The results also reveal no causality between value traded and institution [VT ≠ INST] and between economic globalization and institution [GB ≠ INST].

Table-8: The summary of Short-run Granger Causality Analysis

Causal relationship tested in the Model	Direction of causality observed in Model 1	Direction of causality observed in Model 2	Direction of causality observed in Model 3
GDP vs FD	GDP ⇒ DC	GDP ⇒ PC	GDP ⇒ M
GDP vs GB	GDP ⇐ GB	GDP ⇐ GB	GDP ⇐ GB
GDP vs INST	GDP ⇐ INST	GDP ⇐ INST	GDP ⇐ INST
FD vs GB	DC ≠ GB	PC ⇔ GB	M ≠ GB
FD vs INST	DC ⇐ INST	PC ≠ INST	M ≠ INST

GB vs INST	GB ≠ INST	GB ≠ INST	GB ≠ INST
Causal relationship tested in the model	Direction of causality observed in Model 4	Direction of causality observed in Model 5	Direction of causality observed in Model 6
GDP vs FD	GDP ⇐ SMC	GDP ⇔ TR	GDP ⇐ VT
GDP vs GB	GDP ⇐ GB	GDP ⇔ GB	GDP ⇐ GB
GDP vs INST	GDP ⇐ INST	GDP ⇒ INST	GDP ⇒ INST
FD vs GB	SMC ⇒ GB	TR ⇒ GB	VT ⇒ GB
FD vs INST	SMC ⇐ INST	TR ≠ INST	VT ≠ INST
GB vs INST	GB ≠ INST	GB ⇐ INST	GB ≠ INST

Perturbation results

Finally we employ impulse response function to access the nature of response to perturbations of the different variables in the system of equations. For this purpose, we have applied generalized impulse response functions (GIRFs). GIRFs imply the effect of a one-off shock to one of the innovations on the current and future values of the endogenous variables. The main advantage of GIRFs is that the responses are invariant to any re-ordering of the variables in VECM. It allows for the meaningful interpretation of the initial impact response of each variable to shock to other variable. Figure: 3-9 display the graph of GIRFs for all selected panels. In particular, GIRFs indicate how long and to what extant both economic globalization and institutions react to change in financial development-growth nexus in the panel of European countries.

Graph of impulse response functions shows the response of all variables to a one standard deviation shock in other variables. The response of economic growth to financial development shocks is found to be negative in Figure-3, 4, and 5 and positive in Figure-6. While in Figure-8 and 9, the response of economic growth to financial development shocks to be positive for a short time period and converge to be negative. This implies that for financial development, banking sector shocks have different effect than stock market shocks on economic growth. This is consistent with the graphical presentation above, as stock market indicators experienced frequent volatility weakening their association to economic growth over time. On the other hand, the response of financial development to economic growth shocks is found to be positive in all

six figures. The response of economic growth to economic globalization shocks and response of economic globalization to shocks to economic growth is observed to be positive in all figures. The effect of institutions to economic growth shocks is observed to be positive in all figures and 6 while the reverse causation is found to be negative in selected panel. The response of financial development to economic globalization shock is found to be negative in Figures-4, 8 and 9 while in Figures-5, 6 and 7 it is found to be negative for a short time period and converge to be positive. The reverse causation varies based on the indicators of financial development. Moreover, the effect of institutional shocks on financial development is found to be positive in Figures-3, 4 and 8 while negative in Figures-6, 7 and 9. Again, the effect of institutions on financial development varies based on the indicators of financial development.

Figure-4: Model 1:

$(Y_{it}, DC_{it}, GB_{it}, INST_{it})$

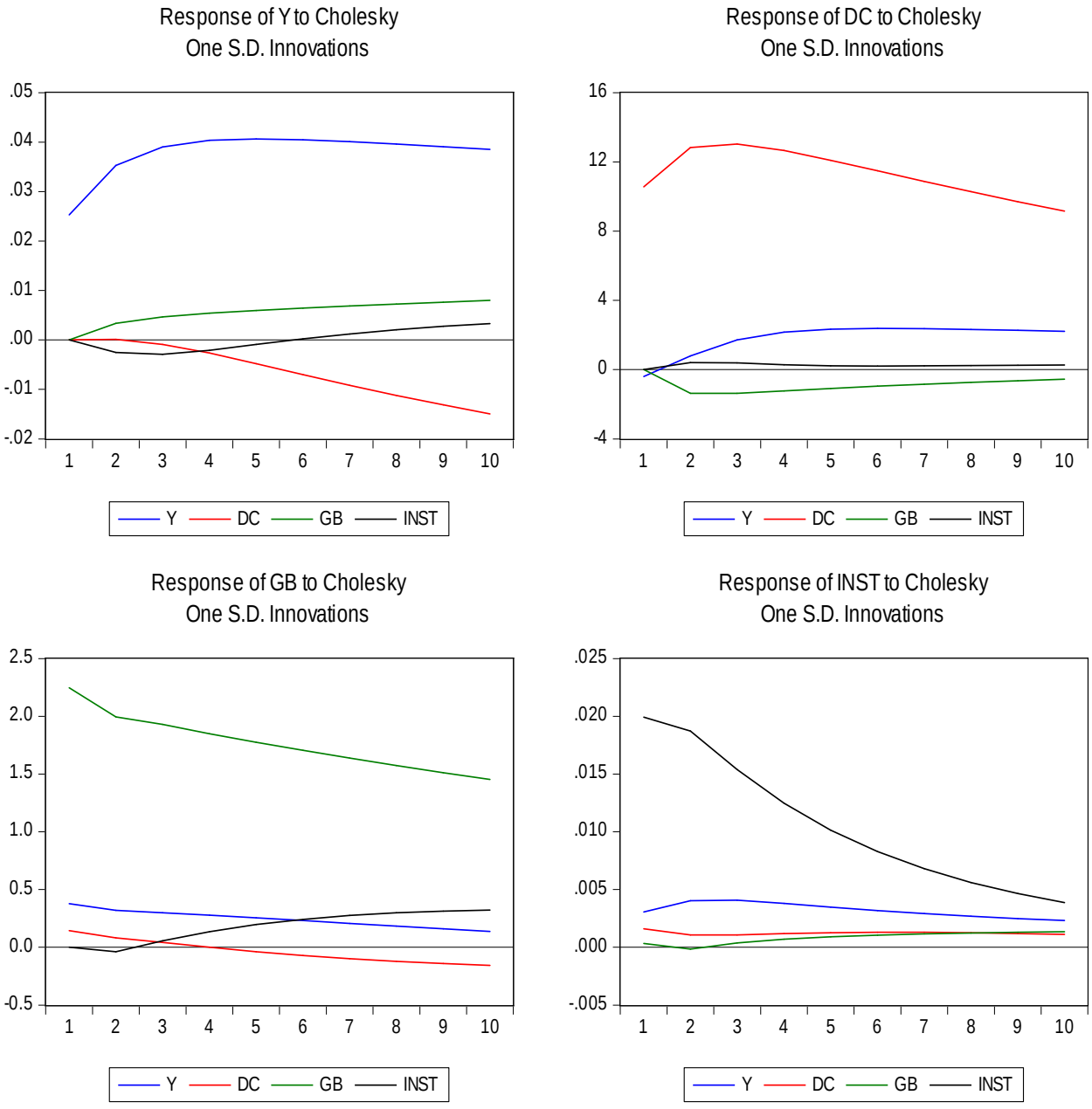


Figure-5: Model 2: (Y_{it} , PC_{it} , GB_{it} , $INST_{it}$)

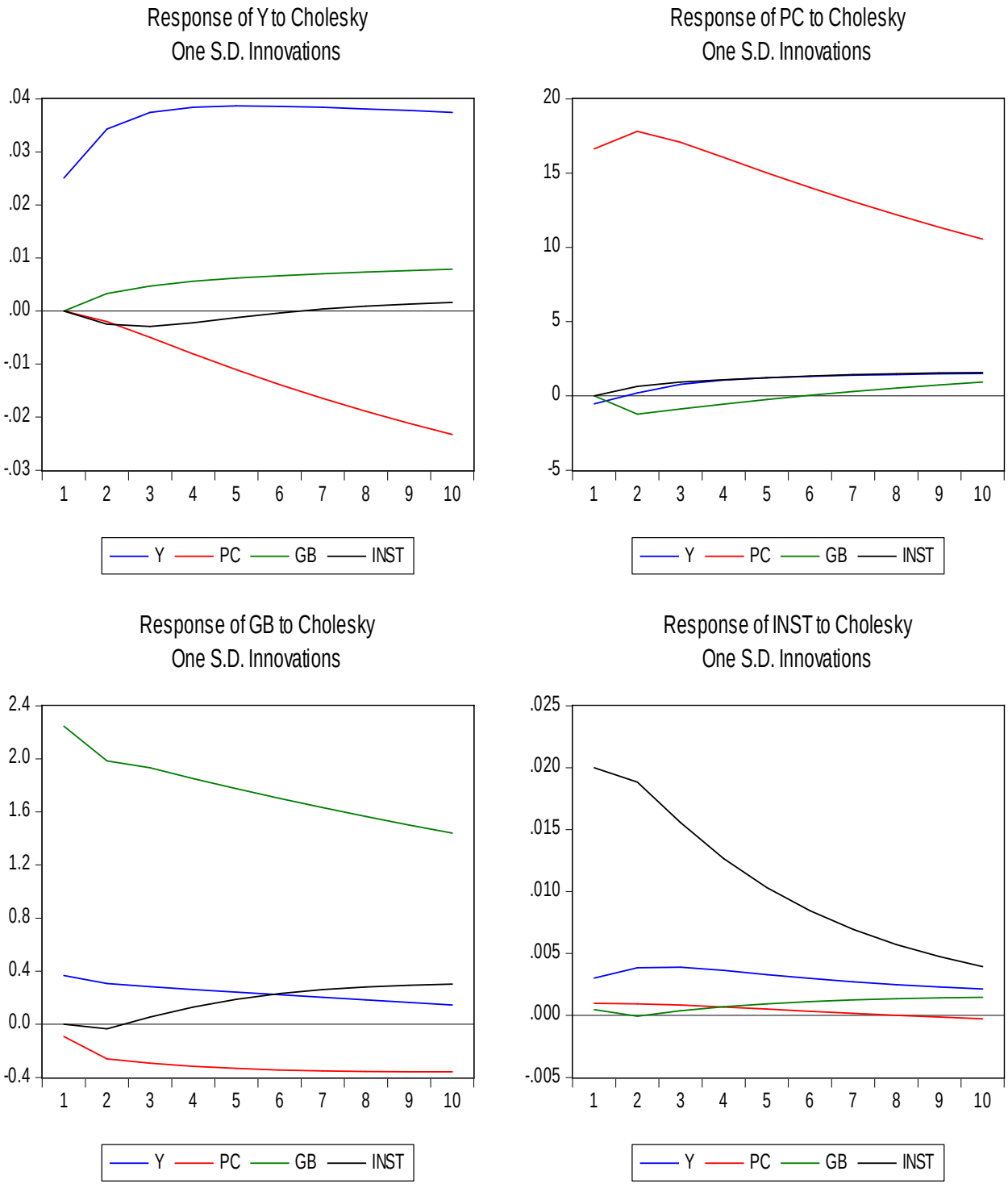


Figure-6: Model 3: (Y_{it}, M_{it}, GB_{it}, $INST_{it}$)

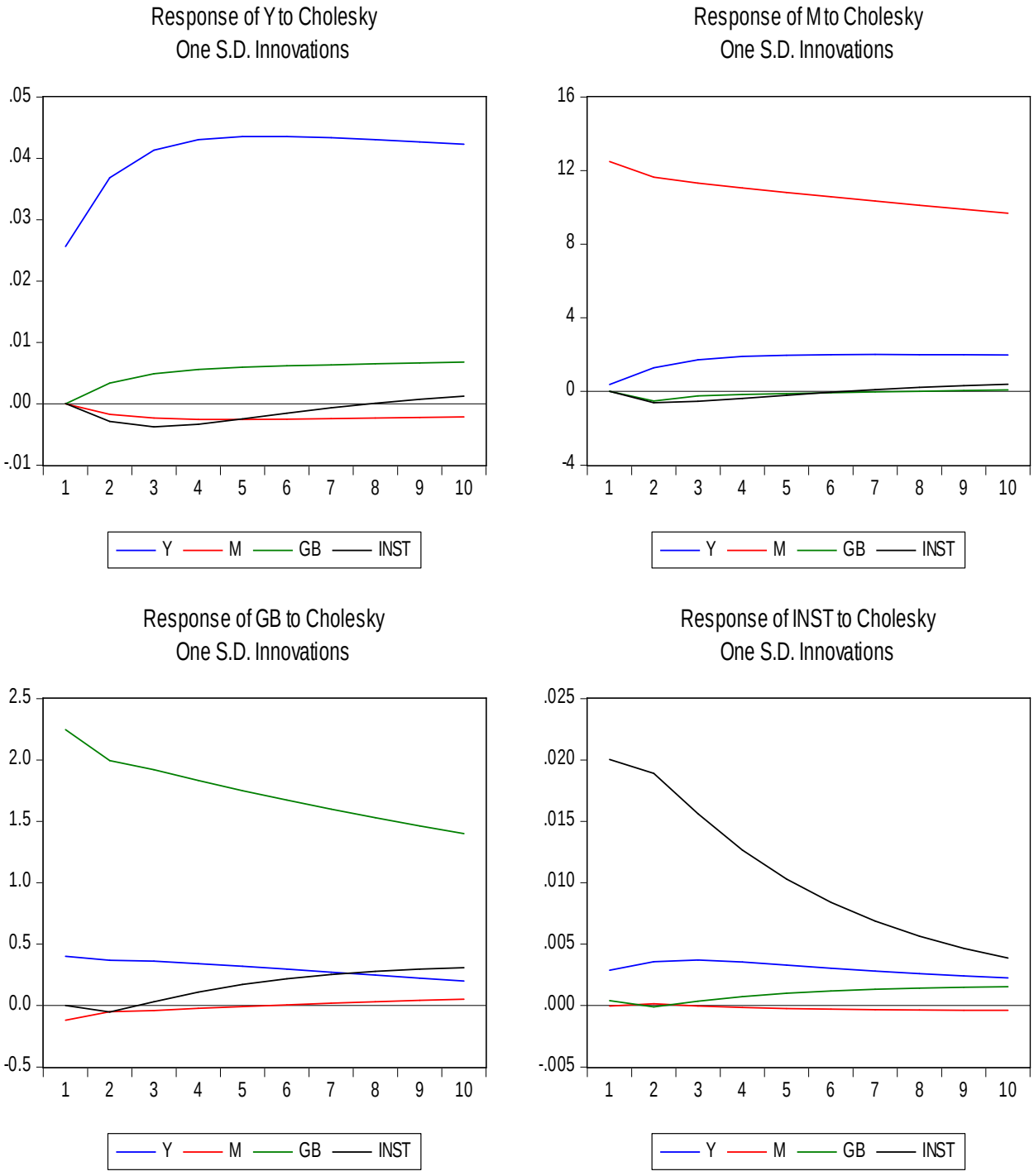


Figure-7: Model 4: (Y_{it} , SMC_{it} , GB_{it} , $INST_{it}$)

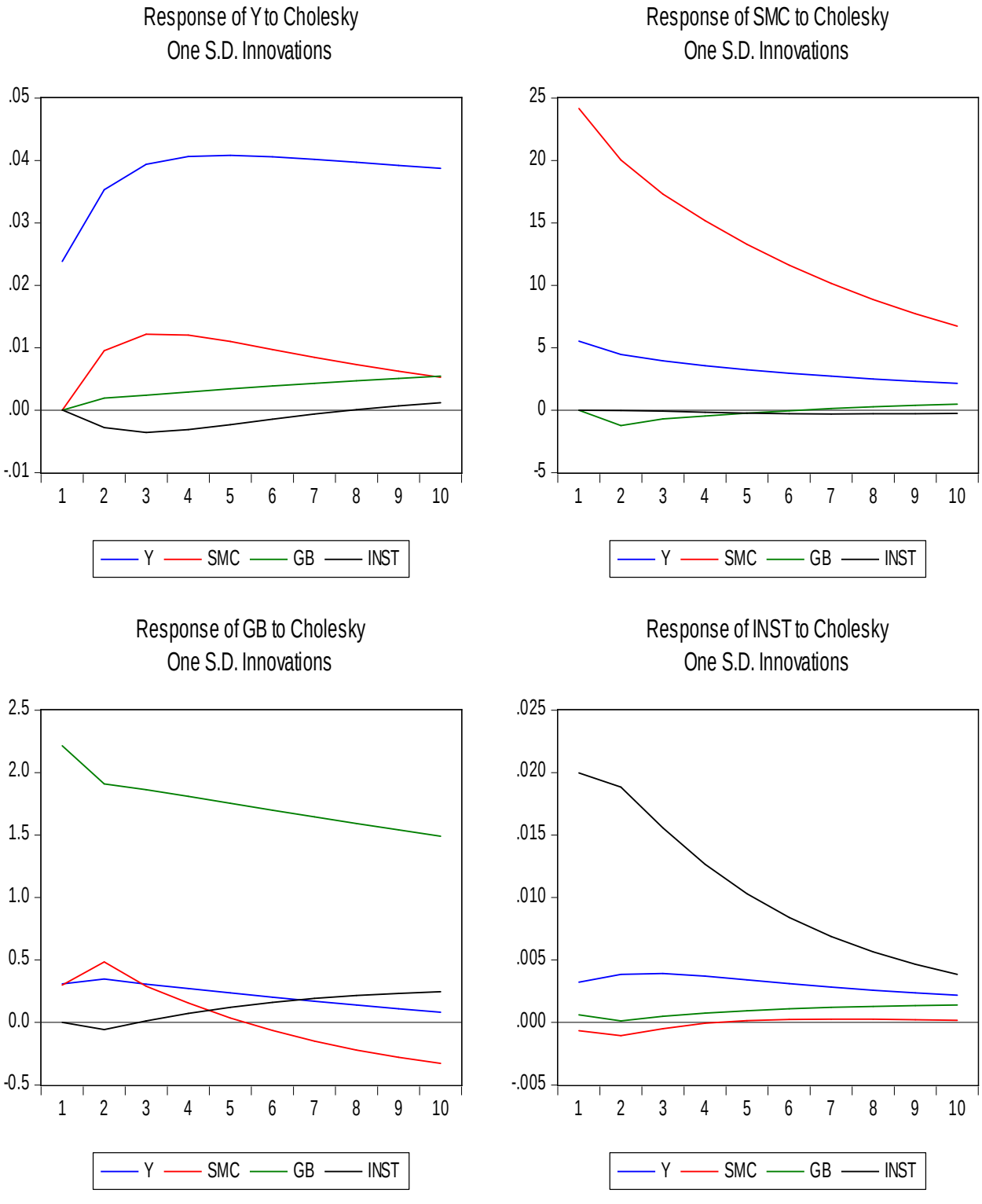


Figure-8: Model 5: (Y_{it}, TR_{it}, GB_{it}, $INST_{it}$)

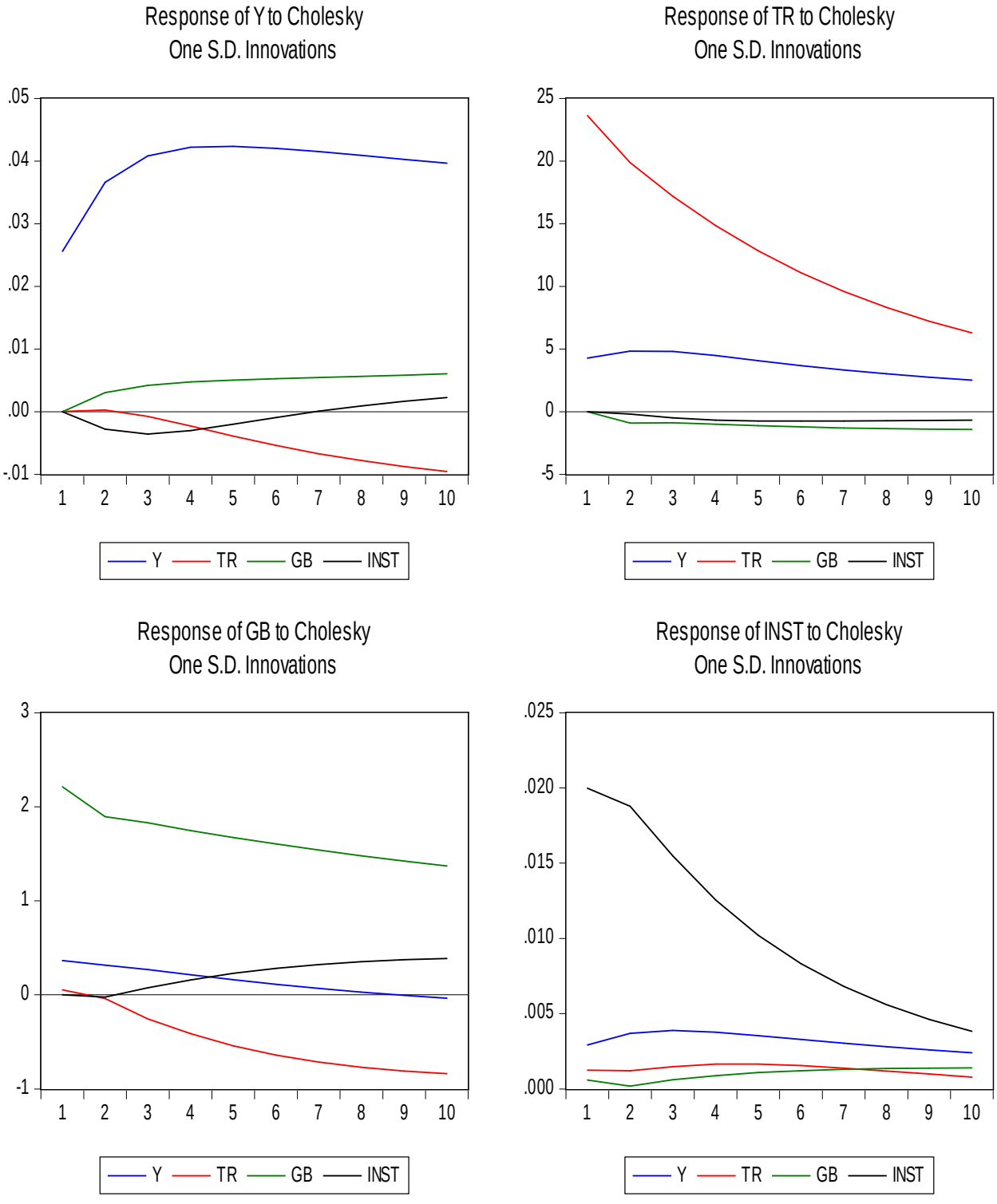
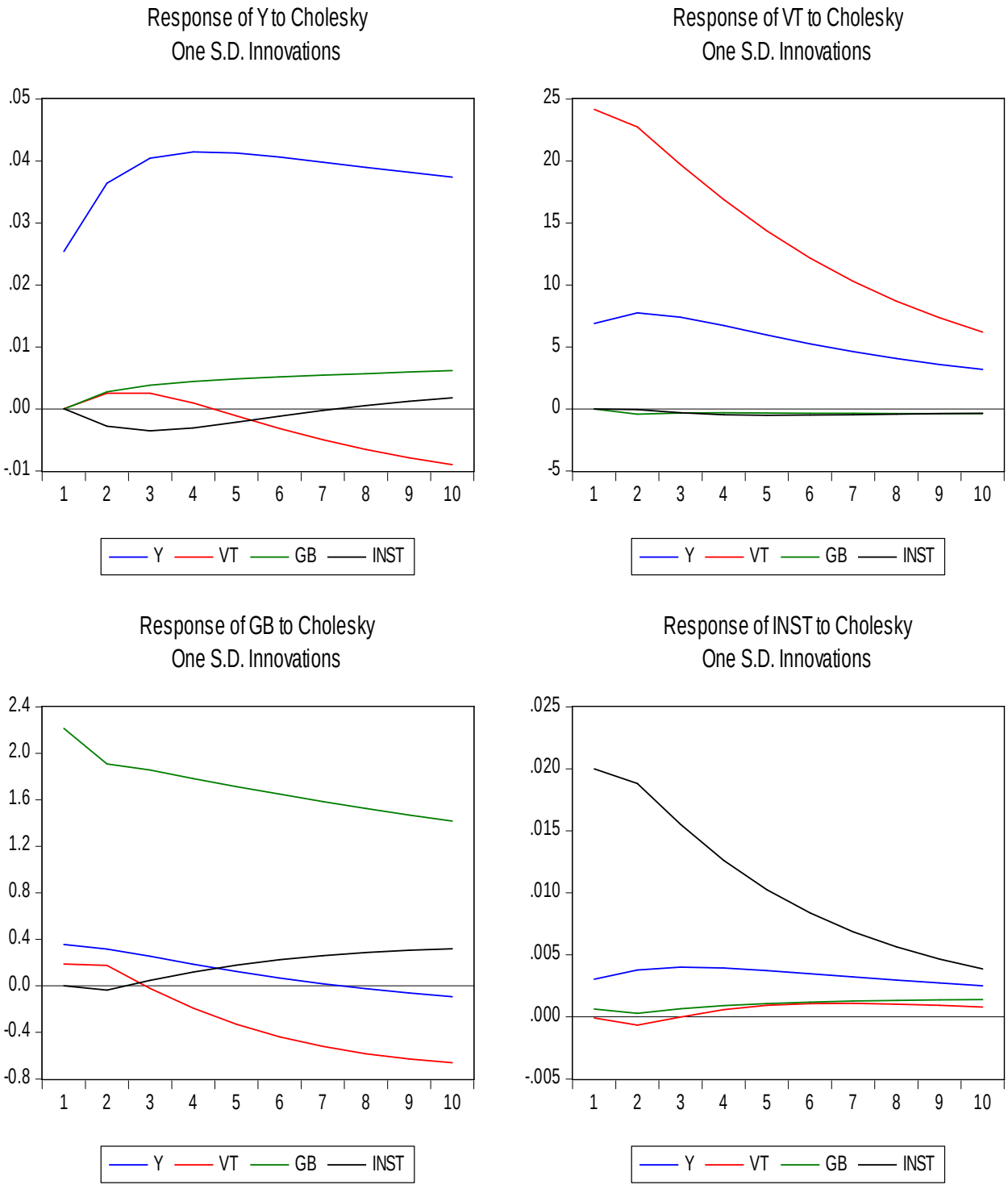


Figure-9: Model 6: (Y_{it}, VT_{it}, GB_{it}, $INST_{it}$)



6. Conclusion and Policy Implications

The paper investigates the causal dynamic relationships between financial development, economic globalization, institutions and economic growth using panel data of 23 European countries over the period of 1989-2014. Since the concept of financial development is very broad, we use six indicators to measure the development of financial sector; these are being DC (Domestic Credit), PC (Private Credit), M (Money Supply), SMC (Stock Market Capitalization), TR (Turnover Ratio) and VT (Value Traded). A significant contributory feature of our study is that we try to estimate the possibility of causal linkages between different indicators of financial development and economic growth by incorporating economic globalization and institutions simultaneously in European countries.

Our study employs panel cointegration and panel causality tests. We found a general long-run equilibrium relationship between financial development, economic globalization, institutions and economic growth. Our empirical evidence illustrates that financial development and economic growth have a complementary relationship that supports their positive effects over time. Economic globalization enhances economic growth. One possible explanation is that economic globalization may relax constraints on external trade and financing, increasing incentives for high growth rate. Quality institutions help to attract financial inflows, increase the scope of financial integration and thus the pace of economic growth. Granger causality results reveal that economic growth adjusts to correct any deviation from the long-run relationship between financial development, economic globalization and institutions. In the short-run, Granger causality results present a complex set of evidence which present no clear picture as to which of six financial sector development indicators Granger cause economic growth, economic globalization and institutions. However, the results show clear evidence that economic growth responds to various measures of financial development and changes in economic globalization and institutional quality.

In terms of policy implications, the general results of the study suggest that the European countries in order to take advantage of the positive interaction between financial development and economic growth, should liberalize the economy, enhance quality institutions and promote global integration. More specifically, higher growth rate helps to mobilize domestic credit in

support of private sector activity, which seems to be the only indicator of financial development that is highly dependent on the fundamentals that underline high growth rate. Further, the development of the stock market indicators, namely stock market capitalization and turnover ratio, helps boost investors' confidence in support of higher economic growth rate over time. It is also interesting to note that stock market development indicators Granger cause economic globalization. More developed stock market may provide liquidity that lowers the cost of foreign capital especially when countries cannot generate saving due to low interest rates. Further, strong performance in the stock market increases investors' appetite to flow funds into a large and deep financial system, increasing financial integration and globalization at large.

From a policy perspective, we further suggest that governments of European countries need to give more attention on global integration. Because growing global integration is widely considered as hunting ground through which the quality of institutions and quality and appropriate types of financial sector development (banking sector and stock market development) are expected to grow in the long-run. This 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 enhancing 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.

In addition, our study adds some worthy directions for future research. Any future research in the filed of growth and applied financial literature needs to understand better dynamics of economic growth by adding various channels of globalization into the production function. In the present study, we also find the significant role of domestic financial sector development index on growth dynamics in European countries. In doing this, we only observe the relationship between broad domestic finance and growth in European economies. Given that adding international capital inflows into the dynamics of growth understanding will provide some extra insights for policy makers while designing their financial and development policies for European countries.

Appendix-1

Table-A1: Descriptive Statistics and Correlation Matrix

Variables	Y_{it}	DB_{it}	PC_{it}	M_{it}	SMC_{it}	TR_{it}	VT_{it}	GB_{it}	$INST_{it}$
Mean	10.15	89.52	115.4	89.16	55.77	62.35	40.43	76.06	0.956
Std. Dev	0.795	47.92	59.69	75.25	52.85	48.39	53.92	13.14	0.098
Min.	7.808	3.084	12.85	19.46	-85.19	0	0	34.42	0
Max.	11.36	311.0	380.3	511.5	337.5	269.8	372.4	99.03	1
Y_{it}	1.000								
DB_{it}	0.497	1.000							
PC_{it}	0.484	0.893	1.000						
M_{it}	0.336	0.283	0.331	1.000					
SMC_{it}	0.487	0.392	0.318	0.482	1.000				
TR_{it}	0.271	0.250	0.221	-0.174	0.248	1.000			
VT_{it}	0.348	0.418	0.312	0.021	0.674	0.719	1.000		
GB_{it}	0.636	0.342	0.360	0.390	0.449	0.047	0.217	1.000	
$INST_{it}$	0.647	0.392	0.312	0.180	0.257	0.189	0.205	0.580	1.000

Appendix-2

Table-A2: Cross Sectional Dependence Test

Test statistics	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Pesaran	17.49	10.86	15.33	35.82	29.41	32.78
P-value	0.000	0.000	0.000	0.000	0.000	0.000

Appendix-3

Table-A3: Financial Development Index using PCA

	Eigenvalue	Difference	Proportion	Cumulative
PC1	2.90776	1.43409	0.4846	0.4846
PC2	1.47367	0.449367	0.2456	0.7302
PC3	1.0243	0.629506	0.1707	0.9010
PC4	0.394797	0.283419	0.0658	0.9668
PC5	0.111378	0.023291	0.0186	0.9853
PC6	0.088086	-	0.0147	1.0000

Principal components (Eigenvectors)

Variables	PC1	PC2	PC3	PC4	PC5	PC6
DB	0.4804	0.2246	-0.4365	-0.1805	-0.3508	0.6104
PC	0.4522	0.2883	-0.4807	0.0310	0.3953	-0.5693
M	0.2366	0.5725	0.4503	0.5955	-0.2399	-0.0366
SMC	0.4388	0.0380	0.5710	-0.4271	0.5028	0.2116
TR	0.4594	-0.4315	0.2082	-0.1844	-0.5763	-0.4396
VT	0.3243	-0.5925	-0.0792	0.6289	-0.2399	0.2528

Table-A3.1: Banking Sector Development Index using PCA

	Eigenvalue	Difference	Proportion	Cumulative
PC1	2.07034	1.24552	0.6901	0.6901
PC2	0.824813	0.719963	0.2749	0.9650
PC3	0.10485	-	0.0350	1.0000

Principal components (Eigenvectors)

Variables	PC1	PC2	PC3
DB	0.6505	-0.2967	0.6991
PC	0.6596	-0.2355	-0.7137
M	0.3764	0.9255	0.0425

Table-A3.2: Stock Market Development Index using PCA

	Eigenvalue	Difference	Proportion	Cumulative
PC1	2.11809	1.36604	0.7060	0.7060
PC2	0.752047	0.622179	0.2507	0.9567
PC3	0.129868	-	0.0433	1.0000
Principal components (Eigenvectors)				
Variables	PC1	PC2	PC3	
SMC	0.5193	0.7327	0.7497	
TR	0.6615	-0.0187	0.4944	
VT	0.5411	-0.6802	0.4398	

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