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Research Article

The Nexus of Economic Growth, Trade Openness and Banking Sector Depth In OIC: An Application of Panel Data Analysis

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ABSTRACT

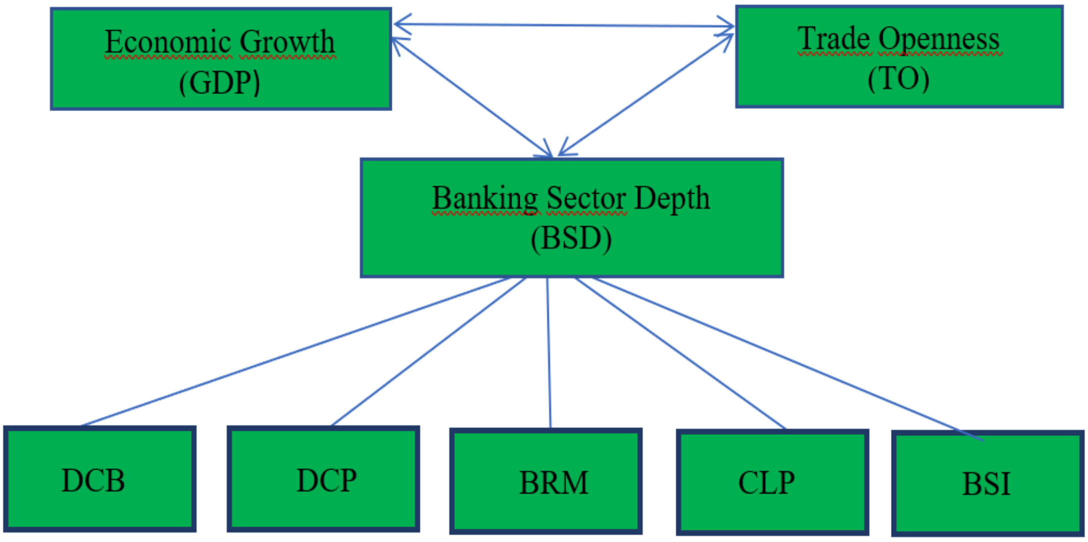
This article is investigated the connections between economic growth, trade openness and banking sector depth, using a panel data set including seventeen countries in the Islamic Cooperation Organization (OIC), where participation and conventional banking co-exist, for the period 1990–2016. Using a multivariate framework, it is primarily found that all the variables are not integrated of order one (I). Since the series are not stationary, cross-dependence tests and Westerlund (2007) cointegration analysis are performed to the series and it is determined that the series are cross-dependent and cointegrated. Then, the models are estimated with three estimators by writing the panel as panel ARDL model to determine the long-term and short-term relations. The results of the study indicate a general long-run equilibrium connection between economic growth, trade openness and banking sector depth as well as a short-run connection among these variables. Policy suggestions include those that will increase greater banking sector depth as well as promoted trade openness.

Keywords: Economic Growth, Trade Openness, Banking Sector Depth, Panel Data, Participation Banking

1. Introduction

The relationship among economic growth and trade openness is one of the warmest arguments in the literature of growth economics. Mostly many studies on this relationship is based on the thought that trade openness causes economic growth. Empirical studies about relationships among trade openness and economic growth stated that trade openness has an important effect on economic growth (Levine and Renelt, 1992; Greenaway and Sapsford, 1994; Romer, 1998). Broadly, it can be stated that trade openness positively effects the economic growth in four ways: efficiency of comparative advantage effects, the multiplier of foreign trade effect on real production, improvement in foreign exchange markets, and accelerated capital formation and technical change (Kugler, 1991; Reppas and Christopoulos, 2005). On the other hand, banking sector depth itself may be connected to trade openness and economic growth. It could affect economic growth directly through the usual expenditure channels while indirectly through its impact on trade openness. There are some in the literature examining the relationship between economic growth and banking sector depth (For Example, Kar et al., 2011; Gries et al., 2009; Ang and McKibbin, 2007; Dritsakis and Adamopoulos, 2004; Craigwell et al., 2001; Ahmed and Ansari, 1998; Greenwood and Smith, 1997). However, in these studies, a common conclusion could not be reached about the relationship between the related concepts. Some of the countries in the sample discussed in the study are oil exporting countries and their economic growth is mostly based on oil exports. These countries aim to diversify their economic growth by encouraging the development of other economic sectors since the 1980s (Al-Moulani, 2016). In this respect, participation banking can be one of the important alternative channels to achieve this. Furthermore, it is important to examine the long- and short-term relationship between trade openness and economic growth within the framework of the determined models.

In this study, rather than working with just time series data or taking only cross-sectional units, panel data is used which give more and healthy information than other methods and explain the relationship between the variables. Also, this study is one of the rare studies examining the relationship between related variables, especially in terms of the sample discussed. Moreover, the limited number of studies examining these three concepts together is another original aspect of the study. In addition, the use of the banking sector depth composite index variable to represent financial depth in a broad sense is another point that makes the study unique. On the other hand, examining the relationship between the related variables by using panel data analysis, which is one of the strong econometric methods, and looking at the short and long term relationship between the variables by using panel ARDL method is one of the features that make the study different from the similar ones. The representation of the relationship between economic growth, banking sector depth and trade openness is presented in Figure 1.



Note: BSD is the banking sector depth index constructed from DCB, DCP, BRM, CLP BSI; GDP is per capita economic growth; TO (trade openness). All the variables are defined in Table 3.

Figure 1. The structural framework on the possible linkages between banking sector depth, economic growth, and trade openness. Sources: Pradhan et al. (2017a), Puryan (2017).

In this study, we investigate to answer questions related the nature of the relationship between economic growth, trade openness and. banking sector depth. The novel features of this paper are that: (1) we use a group of 17 OIC (Organization of Islamic Countries) countries over a long time, from 1990 to 2016; (2) we combine a broad scope of the literature; and (3) we apply principal component analysis, first and second generations of unit root tests, cross-dependence tests, Westerlund (2007) cointegration test, PMG, MG and DFE estimators to test panel ARDL models. These formulations are rarely employed in the finance-growth literature. The remainder of the paper is structured as follows: Section 2 provides an overview on two sides of the economic growth literature: one examining the relationship between banking sector depth and economic growth, and the other seeking trade openness and economic growth. This part also motivates the study by indicating the unique contributions of the current research. Section 3 gives a brief summary on conventional and participation banks. Section 4 describes the variables in more detail and presents the data source used in the analysis. Section 5 outlines the empirical econometric model and estimation strategy, and this is continued by section 6 which is showing the results. The final section contains a summary and the policy implications of our results.

2. Literature Review

2.1. Relationship Between Economic Growth and Banking Sector Depth

The relationship between finance and growth begins with Bagehot's (1873) articles on classical thought and later with the work of Schumpeter (1912). On the other hand, modern literature on economic growth often begins with research that led Robert Solow to receive a Nobel Prize in the mid-1950s. Nevertheless, the theoretical and empirical literature of this period has focused mostly on the role of capital and labor resources and the use of technology as growth resources to ensure economic growth. Therefore, the role of the financial sector in the growth process has been ignored until the 1970s (Wachtel, 2001). Conceptual and empirical studies on the relationship between finance and economic growth have increased, especially as some important economists such as Goldsmith (1969) and McKinnon (1973) draw attention to the relationship between financial structure and banking to economic growth. Thus, in the last quarter of the century, many studies have been conducted both theoretically and empirically using various data sets to investigate the relationship between financial development and economic growth, The findings generally provide evidence to the view that financial development, and particularly the development of the banking sector, supports economic growth (e.g., Beck et al., 2000; Levine et al., 2000). Although the relationship between financial development and economic growth has been discussed for many years, there is still no common judgment There are basically four opinions on the subject. The first view is the supply-leading view that means “financial development promotes economic growth and ensures economic growth”. The second view is that financial development only follows economic growth and its role in achieving economic growth is exaggerated. In short, the second view is demand following hypothesis that the concept of "economic growth leads to financial development". In addition to the above two hypotheses, a third view is that of those who argue that economic growth and financial development can complement each other. According to these, there is a bilateral causality between economic growth and financial development (Greenwood and Smith, 1997). According to proponents of this hypothesis, financial development is indispensable to economic growth, and good economic growth inevitably requires a well-functioning and efficient financial system. The fourth view is that of those who argue that financial development and economic growth can develop independently from each other and therefore there is no causality between them (Chandavarkar, 1992). As the Finance-Growth literature both expanded and developed, complex models emerged from the early 1990s on the relationship between financial development and economic growth. As the studies of Greenwood and Jovanovic (1990), King and Levine (1993b), Pagano (1993), Bencivenga et al. (1995), Greenwood and Smith (1997), Blackburn and Hung (1998), various techniques have been used to model the connection between financial development and economic growth. Some of the new findings point out that the link between finance and growth is not linear, so it is suggested that the relationship between banking sector depth and economic growth has become negative after a certain level (Huang and Lin, 2009; Arcand et al., 2012; Barajas et al., 2013a). Judging from the empirical studies, empirical studies on the relationship between financial sector and economic growth have been shaped from King and Levine's (1993a) research on post-war countries in the 1990s, and from Wachtel and Rousseau's (1995) long time series for several countries. Later, there has been a huge increase in studies on financial depth and economic growth. In particular, the 2008-2009 Global Financial Crisis has enabled us to closely examine not only the global financial system and economy, but also the studies in the fields of finance and economy. One of the first studies to investigate the relationship between financial development and economic growth is Goldsmith's (1969) study. In this study, data from 35 countries between 1860 and 1963 were analyzed in an empirical model. As a result of this study based on the OLS (Ordinary Least Square) model, it was stated that an above-average financial development (represented by the ratio of financial intermediation assets to gross national product) was accompanied by high economic growth periods. Along with the financial development representing banking variables, new studies have been conducted examining the contribution of stock markets to economic growth with the development of stock markets. For example, Atje and Jovanovic (1969) applied the OLS technique using the annual observations of 94 countries between 1960-1985. As a result, there have been some conclusions that stocks markets had positive effects to the economic growth. On the other hand, Barro (1991) and King and Levine (1993a, b) 's work on the relationship between finance and growth has been the trigger for studies with cross-country data sets. Barro (1991), in the study of 98 developed and developing economies in the 1960-1985 period, used GDP per capita and some human capital variables. The study was concluded that the growth rate of GDP per capita is positively related to human capital and negatively correlated with the initial level of GDP per capita. One of the recent cross-sectional regression studies is Beck (2011). The author examines the finance-growth relationship in resource-based economies to determine whether there is an abundance dilemma in financial development. In this study, the ratio of private sector loans to GDP, the ratio of liquidity debts to GDP and some natural resources were selected as financial development proxies. As a result of the study, it was concluded that there is no significant difference between natural resources-based economies and financial development compared to other countries. Secondly, empirical studies based on time series analysis examining the relationship between finance and growth were examined. In these studies, mostly vector autoregressive (VAR) technique, Granger causality tests, multivariate cointegration tests techniques were used. Jung (1986) applied the Granger causality tests to the data of the period of 1950-1981 belonging to 56 countries. The narrow money (M1) and the broad money (M2) variable, were used as two alternative financial development variables. The results supported the "finance supports growth" approach, which is the supply-leading view. In addition, in the studies of Rousseau and Sylla (2003), the researchers re-confirmed the approach that financial development supports economic growth by using the data of 17 countries between 1850 and 1997. Moreover, Rousseau (1999) applied a Meiji period in Japan in 1868-1884 using VAR procedures in a time series study on a single country. As a result, it is concluded that the financial sector serves Japan's explosive growth. Mohamed (2008) examined the impact of financial development on economic growth in Sudan between 1970 and 2004. The short-term and long-term relationship between financial development and economic growth was estimated using the autoregressive distributed lag (ARDL) cointegration approach developed by Pesaran and Shin (1999). ARDL results indicate cointegration between variables. Accordingly, it was found that there was a positive but statistically insignificant relationship between the ratio of broad money supply to GDP and economic growth. In addition, a negative and statistically insignificant relationship is found between the ratio of private sector loans to GDP and economic growth. In summary, the author concludes that financial development indicators do not have a direct impact on real economic growth. This is due to the inefficient allocation of resources by banks, the lack of a suitable investment environment necessary to promote significant private investment in the long run, and the poor credit quality of the banking sector. Although the time series studies have increased and enriched the financial-growth literature, they have serious problems arising from short estimation periods, especially due to limited data. In other words, the use of short time series prevents reliable time series analysis because it requires long time series to appropriately calculate the link between variables and effective dynamics. To cope with the degree of freedom, many studies describe only a lag in the empirical model specifications. This gives serial correlation problems and / or poorly defined models. Another commonly known problem with time series studies is the misinterpretation of Granger causalities. In Granger causality tests, if the lagged values of one variable help to predict the present value of another variable, it is therefore not correct to say that there is definitive evidence of the cause-effect relationship. Among some panel data studies, Benhabib and Spiegel (2000) examined whether financial intermediation development affects economic growth, investment and total factor productivity increase by using panel data covering 1965-1985. In the study conducted using the GMM panel estimator, financial development indicators are found to be associated with both total factor productivity increase and accumulation of both physical and human capital. What differentiates the study from its peers is the various variables they use for financial and economic growth. Loayza and Ranciere (2004) examined the finance-growth relationship through a panel error correction model derived from the panel ARDL (autoregressive distributed lag model). As an alternative to traditional time series methods, pooled mean group (PMG) estimator of Pesaran, Shin and Smith (1999) is used to find long- and short-term effects between variables. As a result, it was found that there is a long-term positive relationship between financial intermediation and growth, but the study also concludes that there is a short-term but negative relationship between these variables. Furthermore, the study concluded that the positive relationship between long-term economic growth and financial development is less in countries affected by the banking crisis than in countries not affected by the crisis. Law and Singh (2014) was examined the relationship between the development of the financial system and economic growth by using dynamic panel data analysis using 1980-2010 period of 87 developed and developing countries data. In the study, the three main variables used for financial depth (ratio of private sector loans to GDP, ratio of liquidity liabilities to GDP, ratio of domestic loans to GDP) and various control variables are used to represent economic growth in the literature representing the development of financial system. As a result of the study, it was concluded that there was a threshold point in the relationship between economic growth and finance, and financial depth in economies below the threshold point will positively affect economic growth. In addition, there is some evidence on that the economies above the threshold, financial depth will adversely affect economic growth and that financial depth is not always good for economic growth, and even after a certain threshold, it is detrimental to economic growth. Aliu and Abazi (2015) were investigated whether financial depth had a significant effect on economic growth by using the annual data of 7 Western Balkan countries in the period 1980-2014. In the study carried out by taking various variables related to depth of financial sector, broad of financial sector and quality of financial sector as a criterion of financial deepening, the effects of these variables on economic growth are estimated by using panel data analysis. The findings are different from the expectation that financial deepening accelerated economic growth. In fact, conclusions have been reached in line with the findings of recent studies emphasizing that more than a certain level of financial deepening may turn into a disadvantage for economic growth. Apart from these studies, some of the other cross-sectional, time series and panel data studies related to the subject are given in Table 1.

Studies	Sample	Data	Method	Result
Goldsmith (1969)	35 Country	1860-1963	Cross-Section	There is a positive and significant relationship between financial development and growth.
Levine (1991)	49 Country	1960-1990	Cross-Section	Liquidity in financial markets facilitates long-term investments and increases productivity by increasing productivity.
Hermes &Lensink (2003)	67 developing country	1970–1995	Cross-Section	It is stated that a certain level of financial development is a prerequisite for obtaining growth benefits from foreign direct investment.
Ghali (1999)	Tunisia	1963-1993	Time series	It is confirmed that financial development is the cause of economic growth.
Neusser &Kugler (1998)	14 OECD country	1970-1991	Time series	For the size of the financial system, if the value-added measures provided by the financial system are used instead of simple criteria, the effect on economic growth will be positive and strong.
Arestis et al. (2001)	France, Germany, Japan, United Kingdom, United States	1973-1997 1972-1998 1974-1998 1968-1997 1974-1998	Time series	The study is concluded that banks are more powerful in supporting economic growth than stock markets.
Boulila&Trabelsi (2004)	16 Country	1960-2002	Time series	In nine of the fifteen countries included in the study, there is a long-term relationship between financial development and economic growth.
Nili&Rastad (2007)	12 Petroleum Exporting Country	1975-2000	Panel data	The interaction between the development of financial intermediation and investments is negatively associated with economic growth in highly oil-dependent countries.
Kar et al. (2011)	15 MENA Country	1980-2007	Panel data	It is stated that financial sector development does not support economic growth in MENA region. The findings confirm the source-based demand following approach.
Abu-Bader&Abu- Qarn (2008)	Algeria, Egypt, Israel, Morocco, Syria, Tunisia	1960-2004	Time series	The results confirm the approach that financial development supports long-term economic growth.
Bhattacharyya&Hodler (2014)	133 Country	1970- 2005	Panel data	It is stated that strong and democratic political institutions support financial development in a resource rich economy.

Table 1. Some studies on Economic Growth and Banking Sector Depth

2.2. The Relationship of Economic Growth and Trade Openness

The relationship between economic growth and trade openness is one of the most current debates in the field of development economics. Many of the study results on this relationship are based on the approach that trade openness provides economic growth. In the literature, this approach is called the "trade-oriented growth" hypothesis (Giles and Williams, 2000; Reppas and Christopoulos, 2005). It is stated that trade openness has the role of a locomotive for the growth of the real economy along with many benefits other than the productivity it provides (Manteli, 2015). On the other hand, it could be better if less developed countries orient their development towards an output expansion for their domestic market. In the theoretical context, Adam Smith (1937) and David Ricardo (1973) first confirmed the positive relationship between trade openness and growth. According to the Smith and Ricardian model, countries increase their per capita income by specializing in the field in which they have comparative labor-productivity advantages (Pigka-Balanika, 2013). This approach is called "comparative advantage theory". On the other hand, Walter et al. (2012) stated that theories examining the relationship between trade openness and macroeconomic variables can be classified into four approaches: Keynesian income approach, flexibility approach, absorption approach and monetary approach

(Dornbusch, 1975; Johnson, 1977). The Keynesian approach suggests that growth with domestic capital plays a key role in trade openness relative to foreign capital, while the flexibility approach emphasizes the importance of exchange rate in determining trade openness. Moreover, the absorption approach argues that the increase in economic growth increases the trade openness, while the monetary approach plays an important role in the rapid increase in the money supply. Based on these four approaches, it can be said that trade openness is mostly related to economic growth and other macroeconomic common variables. Although there are many studies suggesting that trade openness will positively affect economic growth based on endogenous growth theory, on the other hand, based on the Romer (1990), Grossman and Helpman (1990), Rivera-Batiz and Romer (1991), Matsuyama (1992), Yanikkaya (2003) stated that trade constraints can reduce the growth rate around the world. Although many different models and theories have been proposed for the link between trade openness and economic growth, as seen in conceptual literature studies, this relationship is still not fully elucidated. On the other hand, the view that trade openness supports economic growth is supported by many empirical studies. According to some empirical studies; for example, Dollar (1992), Edwards (1998), Frankel and Romer (1999), there is a positive relationship between trade openness and economic growth. On the other hand, Rodriguez and Rodrik (2000) stated that this effect will vary according to the methodology and preferred proxy for trade openness. Abbas (2014), also, argued that trade openness have a negative impact on economic growth. On the other hand, Srinivasan and Bhagwati (2001) claim that Rodriguez and Rodrik (2000)'s criticism of the positive relationship between economic growth and trade openness is not sufficiently convincing and evidence-based. In this context, the literature on the relationship between economic growth and trade openness can be divided into three parts in a broad sense. These are cross-sectional analysis studies, time series studies and panel data studies. Edwards (1998) examined the relationship between trade openness and total factor productivity with the method of cross-sectional analysis by taking 98 country data into account. In this study, nine different indices are used to investigate whether there is a generally accepted positive relationship between these indices and economic growth. According to the results of the study, more open economies have grown faster than other economies. Sachs and Warner (1995) investigated the relationship between trade openness and economic growth with the cross-sectional data of 122 countries based on production function. Although researchers found some evidence that economic growth will be positively affected by trade openness, they stated that it is not enough to produce growth. Along with trade openness, they were concluded that there is a need for stable macroeconomic policies, structural policies and institutions in order to achieve economic growth. Studies using cross-sectional data have been criticized for some problems. One of them is the pseudo-correlation problem that arises from the fact that it is not stationary in the cross-sectional data. Another problem arising from the use of cross-sectional data is that it is not allowed to examine the causality aspect of variables conducted with such kind of data (Christopoulos and Tsionas, 2004). In their study, Hansson and Jonung (1997) examined the long-term relationship between financial development and economic growth with cointegration analysis, one of the time series analysis methods, using Sweden's data from 1830 to 1990. The empirical study shows that there is an interaction between the studied variables and that the estimated contribution of the financial system to economic growth is highly dependent on the time period of study and the variables used. Yapraklı (2007) examined the interaction between the economic, financial and trade openness on economic growth in Turkey. In the study conducted using data from 1990-2006 period, cointegration, causality and vector error correction tests, one of the time series methods, were tested. According to the empirical results, economic growth was positively affected by trade openness and negatively affected by financial openness in the long term. In addition, the causality tests created by vector error corrections were found to be a two-way causality between economic growth and financial and trade openness. However, it was concluded that there is another unilateral causality from trade openness variable to the financial openness variable. Solarin and Shahbaz (2015) investigated the relationship between economic growth and trade openness through the ARDL boundary approach, cointegration analysis, and granger causality tests, using the 1971-2002 annual data of the Malaysian economy. The results of the causality analysis were feedback between the series, so there was a variety of evidence that economic growth promotes economic growth as well as trade openness. Edwards (2004) examined the impact of trade openness and financial openness on economic growth performance using data from 157 countries for the period 1970-2001. In this study using panel data, He found that the countries that are more commercially open have a lower growth tendency than the countries with a lower degree of trade openness. On the other hand, there were some conclusions that the negative impact on the economic growth resulting from financial openness is reduced through trade openness. Kök et al. (2010) investigated the relationship between trade openness and economic growth with a production function established using data from 1971-2002 period of 51 developed and developing countries. In the study using panel cointegration estimation methods, [trade volume to GDP ratio * (country population / world population)] was taken as a measure of trade openness. According to the results, the finding that trade openness was an important factor hindering economic growth in less developed countries was found to be significant. This was in parallel with the “impoverishing growth” approach expressed in the literature. On the other hand, one of the other results was that trade openness is a factor that increases economic growth in developed countries. Apart from these studies, some other studies are given in Table 2.

Studies	Sample	Data	Method	Result
Levine& Renelt (1992)	119 Countries	1960-1989 1974-1989	Cross-Section	It was stated that there is a relationship between trade openness and economic growth and its existence may be due to the increase in resource accumulation, not the better allocation of resources.
Arteta et al. (2001)	61 Countries	1973-1981 1982-1987 1988-1992	Cross-Section	There was some evidence to show that liberalization in capital movements encourages growth.
Bahmani& Niroomand (1999)	59 Countries	1960-1992	Time Series	It was concluded that there is a long-term positive relationship between trade openness and economic growth.
Ghatak et al. (1995)	Turkey	1955-1990	Time Series	In accordance with the internal growth theory, it was found that there is a stable, common long-term relationship between real GDP per capita and trade liberalization, human and physical capital.
Chang et al. (2013)	9 Provinces of South Africa	2013	Panel data	There might be evidence that the relationship between economic growth and exports was varying from province to province, and that expansion of exports may not be an effective strategy for achieving economic growth in South Africa.
Yanikkaya (2003)	100 developed &developing countries	1970- 1997	Panel data	Several findings have been showed that trade opening, along with trade barriers, has a positive effect on growth.
Sarkar (2008)	51 Countries	1981- 2002	Panel data	Various evidence has been found to suggest a positive relationship between trade openness and economic growth in rich countries.

Table 2. Some studies on economic growth and trade openness

2.3. Conventional and Participation Banking

There are various types of banks in the world and among these banks, the two most striking types are conventional and participation banking. Conventional banking can be defined as all banks operating on the principle of interest. Participation banking, on the contrary, refers to the types of banking that are established based on Islamic principles and principles that carry out their financial activities without interest. As a field of activity, conventional banks collect funds, act as intermediary between customers, provide loans, support the implementation of monetary and credit policies, provide financial support to investors and businesses, become partner in projects, buy and sell various securities and safeguard customers' securities in safe deposit boxes. Conventional banks also have services as actively participating in stock and stock activities, supporting the development of the country through various investments and projects. Participation banks are one of the financial institutions that perform banking activities according to Islamic procedures. As it is understood from the definition, these banks should carry out all kinds of activities within the framework of Islamic principles. Participation banking has succeeded in attracting customers who do not wish to use conventional banking, which is based on interest, especially in their financial business, thus making a significant contribution to the economy by activating non-circulating resources. Interest-free banking has become increasingly widespread not only in the Middle East but also in other countries such as the United States and the United Kingdom. With the introduction of the interest rate prohibition in Islam, credit societies and cooperatives, which have been working without interest in many Muslim countries since then, have gained a different dimension with the emergence of the first example of interest-free banking institutions in the early 1960s. Between 1963 and 1967, an attempt was made to establish Islamic principles for the realization of financial relations in the Egyptian city of Mit-Ghamr. The Mit-Ghamr initiative, modeled with German savings banks, is circulated small savings in rural areas largely through savings accounts. In this attempt, no interest is paid to account holders, but as an incentive, they are entitled to receive small short-term interest-free loans for investment purposes, and account holders can withdraw their deposits on demand. In addition, investment accounts on Mudaraba basis are introduced. The funds mobilized in this way are based on profit sharing and loss sharing with entrepreneurs (Zaher and Hassan, 2001).

3. Variables and Data Structure

Variables that would represent the banking sector depth, economic growth and trade openness determined by the literature and Pradhan et al., (2017a) study. In particular, it is important to consider the variables of banking sector depth in a broad context in order to reflect the depth of the sector sufficiently. As many previous researchers have pointed out (eg Gries et al., 2009; Pradhan et al., 2017a; Karabıyık and Taşkın, 2016; Naceur and Ghazouani, 2007; Rousseau and Wachtel, 1998; Levine and Zervos, 1998; Abu-Bader and Abu -Qarn, 2008; Beck and Levine, 2004) depth of banking sector variable may not be indicated by a single criterion (proxy) or variable. In this study, five variables were used to represent the depth of the banking sector. These variables are domestic credit provided by the banking sector (DCB), domestic credit to the private sector (DCP), broad money supply (BRM), claims on the private sector (CLP) Composite index of banking sector depth (BSI). The last variable (BSI) is a composite index and is derived from four other variables using principal component analysis. The definition of the first four variables taken from the World Bank is detailed in Table 3. This table also describes the other variables used in the study. Other variables used in the study are the annual growth rate of per capita income representing economic growth (GDP) and the ratio of trade openness to gross domestic product representing trade openness (TO). As Harrison (1996) states, the ratio of exports plus imports to gross domestic product is a fundamental and widely used indicator of trade openness. The conceptual framework of the study is shown in Figure 1 for clarity.

Variables	Definitions
DCB	Domestic credit provided by the banking sector: This includes all credit to various sectors on a gross basis, except for credit to the central government, which is net. The banking sector includes monetary authorities and deposit money banks, as well as other banking institutions such as building loan associations and mortgage. This variable is expressed as a percentage of gross domestic product.
DCP	Domestic credit to the private sector: This refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment. This variable is expressed as a percentage of gross domestic product.
BRM	Broad money supply: This is the sum of currency outside banks; demand and term deposits, including time, savings, and foreign currency deposits of resident sectors (other than the central bank); traveler and bank's checks; and other securities such as trade paper and certificates of deposit. This variable is expressed as a percentage of gross domestic product
CLP	Claims on the private sector: This includes claims on central government that cover loans to central government institutions (net of deposits) –stated as a percentage of gross domestic product.
BSI	Composite index of banking sector depth: This is obtained using four indicators: domestic credit provided by the banking sector, domestic credit to the private sector broad money supply, claims on the private sector. This index is obtained using principal component analysis. The four indicators are defined in this table.
TO	Trade openness: The sum of exports and imports of goods and services (total volume of trade) measured as a percentage of gross domestic product.
GDP	Growth rate of per capita income (in percentage): Income is called as gross domestic product (GDP). It is the measure of economic growth.

Source: https://data.worldbank.org/products/wdi

Table 3. Definitions of Variables

The data of the study is obtained from World Development Indicators (WDI) website and the UN statistical database (https://unstats.un.org/home/). In this study, which is based on data from the period 1990-2016, the countries included in the analysis consist of 17 members of the Organization of Islamic Cooperation, which has a dual banking (conventional and participation banking) system. In the study, these seventeen countries are abbreviated as All Countries Group (ACG). These countries are Algeria, Bahrain, Bangladesh, Egypt, Indonesia, Jordan, Kuwait, Lebanon, Malaysia, Pakistan, Qatar, Saudi Arabia, Senegal, Gambia, Tunisia, Turkey, United Arab Emirates, over the period 1990–2016. Also, it is aimed to carry out the research in a much wider scope by considering the banking sector depth and stock sector depth which are two dimensions of financial depth. However, due to the fact that the stock markets of some countries were established very recently (for example the United Arab Emirates) and some countries do not have a sufficiently long time series (Naceur et al., 2014), the study was carried out only by taking into account the variables of banking sector depth. On the other hand, due to the fact that a significant part of the financial depth or development and the basis of the financial market is based on the banking sector more than the other countries (Aliyu et al. 2017; Hussain et al., 2015; Kammer et al., 2015) in this sample, the findings are of great importance in terms of reflecting the overall financial system in the sample.

4. Econometric Modelling and Estimation Strategy

The following model specification outlines the link between the GDP growth rate, trade openness and banking sector depth in this study;

$$GDP_{it} = f\left(TO,\ BSD\right) \tag{1}$$

GDP=GDP growth per capita, TO = trade openness, BSD = variables of banking sector depth. The term BSD have five different banking sector depths variables representing (DCB, DCP, BRM, CLP and BSI) into the model. Each of these variables included the model (while other variables stay constant) respectively. If the variables of the banking sector depth are expressed more clearly, the five basic model specifications used in the study can be shown as follows;

$$GDP_{it} = f\left(TO,\ DCB\right) \tag{2}$$

$$GDP_{it} = f\left(TO,\ DCP\right) \tag{3}$$

$$GDP_{it} = f\left(TO,\ BRM\right) \tag{4}$$

$$GDP_{it} = f\left(TO,\ CLP\right) \tag{5}$$

$$GDP_{it} = f\left(TO,\ BSI\right) \tag{6}$$

TO= trade openness, DCB= domestic credit provided by the banking sector, DCP= domestic credit to the private sector, BRM= broad money supply, CLP= claims on the private sector, BSI= Composite index of banking sector depth.

One of the methods used to analyze the relationships between panel data variables is cointegration analysis. Cointegration analysis determine whether the variables in the series move independently or dependently in the long run. If there is a cointegration relationship between the series, this means that the deviation from the existing long-term relationship between the variables is not permanent but temporary and that the error correction function corrects these deviations and converges to the long-term relationship (Uslu, 2012). The two traditional techniques used to test for cointegration between variables are the Engle and Granger method and Johansen technique. The Engle and Granger method is a one-equation technique and can therefore lead to conflicting results, especially if there are two integrated variables. Also, in Johansen technique, if there are more than one cointegration vectors, it is often difficult to interpret each economic relationship and find the most suitable vector (Ang, 2010). In addition, since the validity of both Engle-Granger and Johansen techniques are dependent to first-order stationary of variables, these techniques are criticized (Samargandi, 2015). Therefore, if the variables have a mixed stasis at the level of I (0) and I (1), the two cointegration techniques cannot be used. In this study, Westerlund (2007) error-based cointegration and Pesaran, Shin and Smith (1999) panel cointegration (ARDL) technique called autoregressive distributed lag model approach was used. The error correction panel cointegration test proposed by Westerlund (2007) is one of the important tests used to test for cointegration. This method developed by Westerlund (2007) uses four tests to determine whether there is cointegration or not. Two of these tests (Gt and Ga) show group statistics and two of them (Pt and Pa) show panel statistics. While group statistics provide inference for the units in the panel, panel statistics make inferences for the whole panel. The basic logic in this method is to test for cointegration by determining whether there are error corrections for individual panel members or for the entire panel. This method is one of the most suitable cointegration test methods that can be used in case of unit root and cross-sectional dependence (Gautam and Paudel, 2018). Error correction based cointegration tests are very flexible and allow heterogeneous determination of both long- and short-term specifications of the error correction model (Westerlund, 2007). The panel ARDL model approach is testing the existence of a cointegration relationship between the series without requiring equal integration of series. In general, the autoregressively distributed lag ARDL (p, q) (p represents the lag of the dependent variable and q represents the lag of the independent variable) can be expressed as follows;

$$Y_{it} = \sum_{j=1}^{p} \lambda_{ij} Y_{i,t-j} + \sum_{j=0}^{q} \delta_{ij} X_{i,t-j} + \mu_i + \varepsilon_{it} \tag{7}$$

Here, i = 1,2, .., N is the total number of countries, t = 1,2,... T time series in the series, μ_i constant effects, j = the number of lags, X_{it} independent variables vector (kx1), $Y_{i,t-j}$ dependent the lagged value of the variable, δ_{ij} (kx1) coefficients vector and λ_{ij} the coefficient of lags of the dependent variable.

In the above equation (7), the variables at the level can be re-arranged after grouping and expressed as error correction equation as follows (Mamun et al., 2013: 570);

$$\Delta Y_{it} = \mu_i + \phi_i (Y_{i,t-1} + \theta'_i X_{i,t}) + \sum_{j=1}^{p-1} \lambda_{ij}^{*} \Delta Y_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij}^{'*} \Delta X_{i,t-j} + \varepsilon_{it} \tag{8}$$

Here, $\phi_i = -(\beta_i / \phi_i)$ refers to the long-term or equilibrium relationship between Yit and Xit. λ_{ij}^{*} shows the previous-term coefficients of the dependent values in the model and δ_{ij}^{*} is the short-term coefficients of the lagged independent variables. However, the error correction coefficient ϕi is the measurement value of the convergence rate of Yit to the long-term equilibrium value following the change in the independent variable (Xit). It can be said that there is a long-term relationship if the negative value of ϕi is met (ϕi <0). Therefore, if the coefficient ϕi is negative and statistically significant, it proves that there is a cointegration relationship between Y_{it} and X_{it}. Since the main purpose of this study is to examine the depth-growth-trade-openness relationship of the banking sector, ARDL and error correction modeling is fully consistent to determine the long-term relationship and short-term dynamics between banking sector depth, economic growth and trade openness.

In a panel data specification, the basic model specification in this study shown in Equation 1 can be shown as the panel ARDL model as follows;

$$\ln GDP_t = \beta_0 + \sum_{j=1}^{p} \lambda_i \ln GDP_{t-i} + \sum_{j=0}^{q_1} \delta_j \ln TO_{1t-l} + \sum_{j=0}^{q_2} \varphi_l \ln BSD_{2t-l} + \varepsilon_t \quad (9)$$

lnDP is the logarithm of GDP growth per capita; lnTO is the logarithm of trade openness and lnBSD is a set of depth determinants that includes banking sector variables (DCB, DCP, BRM, CLP, BSI).

The five basic models (by writing 5 different variables of banking sector depth individually in this study), which are formed as an error correction model (ECM) of panel ARDL model given by equation (9) can be expressed as follows;

Model 1.

$$\Delta \ln GDP_{it} = \beta_0 + \beta_1 \ln GDP_{t-1} + \beta_2 \ln TO_{t-1} + \beta_3 \ln DCB_{t-1} + \sum_{i=1}^{p} \lambda_i \Delta \ln GDP_{t-1} + \sum_{j=0}^{q_1} \delta_i \Delta \ln TO_{t-j} + \sum_{l=0}^{q_2} \varphi_l \Delta \ln DCB_{t-l} + \varepsilon_{it}$$

Model 2.

$$\Delta \ln GDP_{it} = \beta_0 + \beta_1 \ln GDP_{t-1} + \beta_2 \ln TO_{t-1} + \beta_3 \ln DCP_{t-1} + \sum_{i=1}^{p} \lambda_i \Delta \ln GDP_{t-1} + \sum_{j=0}^{q_1} \delta_i \Delta \ln TO_{t-j} + \sum_{l=0}^{q_2} \varphi_l \Delta \ln DCP_{t-l} + \varepsilon_{it}$$

Model 3.

$$\Delta \ln GDP_{it} = \beta_0 + \beta_1 \ln GDP_{t-1} + \beta_2 \ln TO_{t-1} + \beta_3 \ln BRM_{t-1} + \sum_{i=1}^{p} \lambda_i \Delta \ln GDP_{t-1} + \sum_{j=0}^{q_1} \delta_i \Delta \ln TO_{t-j} + \sum_{l=0}^{q_2} \varphi_l \Delta \ln BRM_{t-l} + \varepsilon_{it}$$

Model 4.

$$\Delta \ln GDP_{it} = \beta_0 + \beta_1 \ln GDP_{t-1} + \beta_2 \ln TO_{t-1} + \beta_3 \ln CLP_{t-1} + \sum_{i=1}^{p} \lambda_i \Delta \ln GDP_{t-1} + \sum_{j=0}^{q_1} \delta_i \Delta \ln TO_{t-j} + \sum_{l=0}^{q_2} \varphi_l \Delta \ln CLP_{t-l} + \varepsilon_{it}$$

Model 5.

$$\Delta \ln GDP_{it} = \beta_0 + \beta_1 \ln GDP_{t-1} + \beta_2 \ln TO_{t-1} + \beta_3 \ln BSI_{t-1} + \sum_{i=1}^{p} \lambda_i \Delta \ln GDP_{t-1} + \sum_{j=0}^{q_1} \delta_i \Delta \ln TO_{t-j} + \sum_{l=0}^{q_2} \varphi_l \Delta \ln BSI_{t-l} + \varepsilon_{it}$$

Here, Δ is the first difference operator; GDP is the logarithm of GDP growth rate per capita; lnTO is the logarithm of trade openness; DCB, DCP, BRM, CLP, BSI refers to the logarithm of variables of banking sector depth. Stata14, Eview10 and Gauss10 package programs are used to analyze the model.

5. Empirical Results and Discussion

5.1. Descriptive Statistics and Unit Root Tests

5.1.1. Descriptive Statistics

After creating the banking sector depth index through Principal Components analysis, descriptive statistics (mode, median, deviation, etc.) of economic growth, trade openness and banking sector depth variables are determined and the correlation between them are given in Table 4. When Table 4 is examined, it shows that there is a significant variability between the countries.

Variables	**GDP**	**TO**	**DCB**	**DCP**	**BRM**	**CLP**	**BSI**
Mean	0.81	4.99	-2.75e-07	-1.20e-07	2.22e-07	7.18-08	2.82e-10
Median	1.42	5.01	0.05	0.06	-0.11	0.20	0.06
Max.	5.24	6.09	2.06	2.06	2.65	1.76	2.07
Min.	-4.36	3.63	-3.13	-3.06	-2.97	-5.01	-3.14
Standard D.	1.70	0.51	1.00	1.00	1.00	0.99	1.00
Skewness	-0.68	-0.05	-0.55	-0.53	0.10	-2.10	-0.54
Kurtorsis	2.57	2.55	3.19	3.10	3.48	9.08	3.18
Correlation							
GDP	1	-0.13	-0.02	-0.01	-0.04	0.22	-0.02
TO		1	0.57	0.56	0.48	-0.06	0.56
DCB			1	0.99	0,74	0.18	0.99
DCP				1	0.73	0.19	0.97
BRM					1	-0.03	0.74
CLP						1	0.18
BSI							1

Table 4. Descriptive Statistics and Correlations of Variables

When the correlation between the variables is examined, it shows that the indicators representing the depth of the banking sector are highly correlated with each other and with the created banking sector depth index. This means that if all the variables of the banking sector, economic growth variable and trade openness variable expressed simultaneously in a regression equation, it may cause multiple linear connection problems. Therefore, in this study, the relationship between economic growth and trade openness is examined by considering the variables of banking sector depth separately.

5.1.2. The Findings of Unit Root and Stationary Analysis Test in Panel Data for All Countries Group (ACG)

The first-generation unit root tests applied to the ACG group are LLC, ADF, PP and IPS. For all four tests, the null hypothesis H0 indicates that all seven variables (GDP, TO, DCB, DCP, BRM, CLP, BSI) have a unit root (non-stationary), while the alternative hypothesis states that the variables do not have a unit root (stationary). The results of the analysis are shown in Table 5.

Variable	Level		LLC	ADF	PP	IPS
GDP	Level	Stat.	-5.76*	10.3*	22.3*	-8.30*
		Prob.	0.00	0.00	0.00	0.00
	First Difference (FD)	Stat.	-13.3	48.5	103.3	-14.27
		Prob.	0.00	0.00	0.000	0.00
TO	Level	Stat.	-1.22	3.90*	2.85*	-1.33
		Prob.	0.11	0.00	0.002	0.09
	First Difference (FD)	Stat.	-8.39*	23.4	46.6	-10.81*
		Prob.	0.00	0.00	0.00	0.00
DCB	Level	Stat.	-1.09	0.29	-1.31	2.35
		Prob.	0.14	0.38	0.90	0.99
	First Difference (FD)	Stat.	-10.4*	27.9*	32.6*	-9.34*
		Prob.	0.00	0.00	0.00	0.00
DCP	Level	Stat.	-1.37	0.28	-1.35	1.96
		Prob.	0.09	0.39	0.91	0.97
	First Difference (FD)	Stat.	-10.5*	28.4*	33.0*	-9.44*
		Prob.	0.00	0.00	0.00	0.00
BRM	Level	Stat.	-1.94**	7.82*	1.39	1.90
		Prob.	0.03	0.00	0.08	0.97
	First Difference (FD)	Stat.	-5.99	21.1	51.9 *	-10.76*
		Prob.	0.00	0.00	0.00	0.00
CLP	Level	Stat.	-5.36*	12.9*	28.4*	-9.023*
		Prob.	0.00	0.00	0.00	0.00
	First Difference (FD)	Stat.	-17.5	61.1	97.2	-13.87
		Prob.	0.00	0.00	0.00	0.00
BSI	Level	Stat.	-1.09	0.29	-1.31	2.35
		Prob.	0.14	0.39	0.91	0.99
	First Difference (FD)	Stat.	-10.2*	27.7*	32.6*	-9.34
		Prob.	0.00	0.00	0.00	0.00

Note: * and ** represent statistical significance at 1% and 5%, respectively.

Table 5. Unit Root Test Results of All Countries Group

When the results obtained in Table 5 are examined, it is seen that some of the variables are stationary at level I (0), and some of them are stationary in the first difference I (1).

5.1.3. The Findings of Cross-Sectional Dependence Test

The findings obtained from the first-generation unit root test show that some of the variables used in the study are stationary at level and some of them are stationary in the first difference I (1). In other words, the fact that the variables become stationary at different levels suggests that the cross-sectional dependence problem may have occurred. Because if there is a cross-sectional dependence between the variables, the unit root can lead to rejection of non-stationary null hypothesis (O'Connell, 1998). In this context, the findings in Table 5 suggest that there may be more rejections than expected. In other words, since the analyzes are performed assuming the lack of inter-unit correlation between the variables in first generation root tests, , it is possible to give biased results.

Therefore, the CDLM1 test of Berusch-Pagan (B-P) (1980), one of the cross-sectional dependence tests which test whether there is correlation between units, is given in Table 6 together with Pesaran (2004) CDLM2 tests. In addition, the findings obtained for each model are given in Table 7.

	All Countries Group			
Variables	**Tests**			
	LM1 (Breusch, Pagan)		**LM2 (Peseran CD)**	
	Stat.	**Prob.**	**Stat.**	**Prob.**
GDP	184.690	0.0034834	2.952	0.0015774
TO	253.010	0.0000000	7.095	0.0000000
DCB	214.391	0.0000206	4.753	0.0000010
DCP	264.796	0.0000000	7.809	0.0000000
BRM	420.630	0.0000000	17.258	0.0000000
CLP	228.068	0.0000012	5.582	0.0000001
BSI	298.379	0.0000000	9.846	0.0000000

Table 6. Cross-Sectional Analysis Results of Variables (All Countries Group)

	All Countries Group			
Models	**Tests**			
	LM1 (Breusch, Pagan)		**LM2 (Peseran CD)**	
	Stat.	**Prob.**	**Stat.**	**Prob.**
Model 1	179.563	0.007	2.641	0.004
Model 2	182.760	0.005	2.835	0.002
Model 3	168.815	0.029	1.990	0.023
Model 4	170.693	0.023	2.104	0.018
Model 5	5179.563	0.007	2.641	0.004

Table 7. Cross-Sectional Analysis Results of Models (All Countries Group)

As a result of the test of the cross-sectional dependence of the variables and models given in Table 6 and Table 7, the null hypothesis (H0), which has no cross-sectional dependence, is rejected. Therefore, since it is concluded that there is a cross-sectional dependence, second generation unit root tests are applied.

5.1.4. Second Generation Unit Root Test Results

In Table 8, the critical values in the I (b) and II (b) tables of Pesaran (2007) and the t-statistics obtained from the second-generation unit root tests CADF and CIPS test are given.

	Fixed Model							Critical Values		
Countries	GDP	TO	DCB	DCP	BRM	CLP	BSI	0.01	0.05	0.10
Bahrain	3.93[b]	-4.12[b]	3.87[b]	-2.75	-2.45	-3.32[c]	-2.98	-4.12	-3.36	-2.98
Kuwait	-2.07	-2.55	3.65[b]	-3.23[c]	-1.91	-2.55	-3.61[b]	-4.12	-3.36	-2.98
S. Arabia	-1.80	-2.68	3.03[c]	-4.10[b]	-2.63	-1.41	-3.18[c]	-4.12	-3.36	-2.98
U. Arab Emirates	4.33[a]	-2.88	-1.54	-1.75	-3.25[c]	-3.18[c]	-4.06[b]	-4.12	-3.36	-2.98
Qatar	3.32[c]	-2.86	-2.00	-3.49[b]	-4.35[a]	-2.77	-2.79	-4.12	-3.36	-2.98
Turkey	-2.89	-3.60[b]	-2.54	-2.60	-2.93	-2.61	-3.12[c]	-4.12	-3.36	-2.98
Algeria	-2.54	-3.11[c]	3.00[c]	-2.64	-1.25	-2.76	-2.95	-4.12	-3.36	-2.98
Lebanon	-2.48	-3.07[c]	-2.24	-2.23	-3.71[b]	-2.78	-2.32	-4.12	-3.36	-2.98
Malaysia	-2.88	-2.01	-2.69	-2.61	-2.59	-2.86	-2.68	-4.12	-3.36	-2.98
Bangladesh	-1.96	-3.15[b]	-1.73	-2.68	-4.00[a]	-2.80	-2.41	-4.12	-3.36	-2.98
Egypt	3.40[b]	-2.22	-1.46	-1.90	-3.02[c]	-4.84[a]	-2.84	-4.12	-3.36	-2.98
Indonesia	-2.85	-2.22	-3.51	-2.44	-2.82	-3.36[b]	-2.84	-4.12	-3.36	-2.98
Jordan	-2.48	-2.78	-2.32	-2.38	-2.09	-2.05	-2.37	-4.12	-3.36	-2.98
Tunisia	3.31[c]	-2.36	-2.21	-1.86	-3.33[c]	-1.53	-1.30	-4.12	-3.36	-2.98
Pakistan	-2.21	-3.39[b]	3.53[b]	-3.44[b]	-1.82	-4.28[a]	-2.65	-4.12	-3.36	-2.98
Senegal	-2.93	-3.56[b]	-1.95	-3.06[c]	-2.58	-3.87[b]	-2.06	-4.12	-3.36	-2.98
Gambia	-2.73	-2.87	4.68[a]	-3.50[b]	-1.98	-2.97	-4.99[a]	-4.12	-3.36	-2.98
CIPS	2.83[a]	-2.91[a]	2.70[a]	-2.74[a]	-2.75[a]	-2.93[a]	-2.89[a]	-2.45	-2.25	-2.14

Note: In the test statistic results a, b, c show statistical significance at 1%, 5% and 10% levels, respectively. In the table above, the individual critical value of each country is based on the Table I (b) mentioned in Pesaran (2007) 's survey on pages 275-276 and the nearest value for N = 17, t = 27 is obtained by taking the values corresponding to N=15, T = 30. In addition, critical values of the overall panel were obtained by looking at Table II (b) in the same study.

Table 8. Fixed Model' s CADF Test Results at Level (All Countries Group)

Table 8 shows the second generation CADF test for the fixed model in level. In contrast to the null hypothesis that there is a unit root, we test the case where at least one of the series is stationary in the alternative hypothesis. If the CADFcalculated<CADFcritical, the null hypothesis cannot be rejected, and the series is said to have a unit root. When the Table 8. is examined, it can be said that most of the calculated value of each variable of the country data is generally lower than the critical values corresponding to the critical values of Table I (b) of Pesaran (2007) and given in Table 8 and therefore contains unit root. The other part shows a weak stagnation (expressed c in the 10% significance level and related table). However, for each variable, it is found that all the variables for the overall model expressed by CIPS are stationary in the fixed model at the level. The CADF and CIPS second generation unit root test of the fixed and trendy model was performed for all countries. In the second generation CADF and CIPS test for the fixed and trend model at the level, the null hypothesis is "there is a unit root", while the alternative hypothesis "at least one of the series is stationary" is tested. In this test, if the $CADF_{calculated}$<$CADF_{critical}$, the null hypothesis cannot be rejected, and the series is said to have a unit root. When the Table 8 is examined, it is concluded that a very important part of the country data except for very little of the calculated value of each variable is generally lower than the critical values corresponding to the critical values of Table I (c) of Pesaran (2007) and therefore contains unit root. The other part shows a weak stationary (in 10% significance level and expressed as “c” in the Table 8). In addition to this, it is founded that for each of the variables expressed by the CIPS model for the general variables BRM, CLP and BSI variable at level and trend model with 1% and 5% significance levels are not stationary and shows a weak stationarity at the 10% significance level while the other variables shows stationarity at 5% significance level. When the CADF test findings are evaluated in general for the "fixed model" and "fixed and trend model", it is concluded that a significant part of the country data is not stationary, and a small part is stationary. Moreover, when the CIPS values of each variable are examined for the overall model, it is concluded that the data in the fixed model is stationary at 1%, 5% and 10% significance level, but in the "fixed and trend" model some of the variables show weak stationarity and the remaining part is stationary at 5% significance level. Since both stationary and non-stationary results were obtained in both model of variables (fixed model and fixed and trend model), CADF test was applied in both models by taking the first difference. Thus, it was tested whether the variables for the country series and the model in general turned stationary I (1) in the first difference. The fixed model table with the first difference is given in Appendix 1. When the table of first difference of fixed model in Appendix 1 is examined, it is shown that a very important part of all country series reached stationarity at 1% and 5% significance levels, while a few of them were stationary at a 10% significance level. As a result, it is observed that all country series reached stationarity in I (1). On the other hand, in the CIPS test which gives information about the whole model, it is observed that all variables are stationary at a significance level of 1%, in other words, I (1). In short, when the first- and second-generation unit root analysis results are evaluated together, panel Westerlund (2007) cointegration analysis and panel ARDL cointegration analysis were applied for the following reasons;

1. As a result of the first generation unit root tests, some of the variables reached stasis in I (0) and some of them reached I (1). For this reason, panel Westerlund (2007) and panel ARDL cointegration analysis, which are suitable for series that do not reach at the same level of stationarity, were used.

2. As a result of the second generation unit root tests, which are stronger than the first generation tests and taking into account the cross-sectional dependence, some of the country series and the variable series for the whole of the panel are stationary at level I (0) and the other part is stationary at level (1).

For this reason, Westerlund (2007) error correction cointegration test and panel ARDL cointegration analysis, which is consistent for series that do not reach at the same level of stationarity, have been used (Pesaran and Smith, 1995; Pesaran, Shin and Smith (1999); Gerni et al., 2013). Also, the fact that the series is I (1) is a prerequisite for the cointegration analysis (Koçbulut and Altıntaş, 2016). For the above reasons, Westerlund (2007) and panel ARDL cointegration analysis will be used instead of conventional panel cointegration tests (Pedroni, 1999; Johnsen, 1988). In addition to this, instead of cointegration tests of Pedroni (1999, 2004) and Panel CUSUM of Westerlund (2005), assuming cross-sectional independence,it is preferred to use the Westerlund (2007) and panel ARDL approach. Among these, firstly, Westerlund (2007) error correction based cointegration test was used to determine whether there is cointegration between variables or not. Then, short-term dynamic impact and long-term relationships will be examined using panel data estimators based on the panel ARDL approach.

5.1.5. The Results of Westerlund (2007) Cointegration Test of ACG

Westerlund (2007) uses four test statistics to test the existence of cointegration. For group statistics (Gt and Ga), the null hypothesis is "there is no cointegration for cross-sectional units" and the alternative hypothesis is that "there is no cointegration in some units but there are cointegration in some units". Similarly, the null hypothesis of the Pa and Pt test statistics that indicating information for all panel is "no cointegration for all cross-sectional units" and the alternative hypothesis is "cointegration for all cross-sectional units". The Westerlund (2007) cointegration test using the xtwest command in the Stata Program states that the results of the study with small data sets (such as the study with T = 27) may be sensitive to the selection of parameters such as lag, lead and kernel width Westerlund (2007). Therefore, it is recommended that the number of lags and leads be small and the kernel width shorter to avoid excessive parameterization (Westerlund, 2007; Demetriades and James, 2011). In our study, the number of lags was taken as 1 (lag=1) as stated in the following sections. In addition, the number of leads was determined as 1. The kernel width was determined to be approximately 3 (4. (27/100) 2 / 9≈3) with the formula 4 (T / 100) 2/9 as suggested by Persyn and Westerlund (2008). Critical values required for testing these hypotheses are determined with the help of bootstrap cycle (Westerlund, 2008: 200-203). The presence of cointegration in 5 different models for each group of countries in the study was tested separately and the findings are presented in Table 9.

	Test	Value	Z-value	P-value	Robust P-value
Model 1: GDP TO DCB	Gt	-2.803	-3.437	0.000	0.000
	Ga	-10.529	-0.923	0.178	0.000
	Pt	-11.916	-4.699	0.000	0.000
	Pa	-10.810	-3.646	0.000	0.000
Model 2: GDP TO DCP	Gt	-2.870	-3.739	0.000	0.000
	Ga	-10.815	-1.111	0.133	0.000
	Pt	-11.782	-4.570	0.000	0.000
	Pa	-10.832	-3.663	0.000	0.000
Model 3: GDP TO BRM	Gt	-2.807	-3.456	0.000	0.000
	Ga	-8.788	0.221	0.588	0.020
	Pt	-10.599	-3.424	0.000	0.000
	Pa	-8.397	-1.867	0.031	0.000
Model 4: GDP TO CLP	Gt	-2.876	-3.765	0.000	0.000
	Ga	-10.317	-0.784	0.217	0.000
	Pt	-12.083	-4.861	0.000	0.000
	Pa	-10.539	-3.447	0.000	0.000
Model 5: GDP TO BSI	Gt	-2.803	-3.437	0.000	0.000
	Ga	-10.529	-0.923	0.178	0.000
	Pt	-11.916	-4.699	0.000	0.000
	Pa	-10.810	-3.646	0.000	0.000

Table 9. Westerlund (2007) Cointegration Test (All Countries Group)

When the P-value and Robust P-value values of the test statistics obtained in Table 9 are examined, the null hypothesis which is “there is no cointegration” is rejected in almost all five models according to the P-value values of all statistics. Similarly, according to the value of the Robust P-value, for all statistics "there is no cointegration" hypothesis was rejected. Accordingly, cointegration was obtained in all models for all countries. If a long-term relationship is found between the variables as a result of panel cointegration, long and short term relationships can be estimated by various methods. Fully modified least squares (FMOLS) and panel model with ordinary least squares (PDOLS) can only estimate long-term parameters (Yerdelen, 2013a). PMG, MG and DFE estimators can predict both long and short term parameters. In this context, PMG, MG and DFE estimators are used to obtain long and short term relationships and parameters between the variables in the panel ARDL cointegration model.

5.1.5.1. Analysis of All Countries Group (ACG) by PMG, MG and DFE Estimator

Model 1. GDP TO DCB

First, the long and short term relationships of the trade openness (TO) and DCB, one of the banking sector depth measure and GDP variable will be determined. For this purpose, autoregressive distributed lag model (ARDL) was applied by using pooled mean group (PMG), mean group (MG) and dynamic fixed effects (DFE) estimators. For simplicity, the pooled average group, average group, and dynamic constant effects estimators will be expressed as PMG, MG and DFE estimators, respectively. Before applying these three estimator approaches, it is necessary to determine the number of lags of the model. Choosing too much lag may increase the error in estimates, while too little lag may result in lack of information. There are many information criteria procedures to select the appropriate lags. Three commonly used criteria are Schewartz's Bayesion Information Criteria (SBC), Akaike's Information Criteria (AIC), and Hannen and Quinn Information Criteria (HQ). The lag selection in the ARDL model can be performed using a single equation estimate for each panel unit. Thus, by eliminating serial correlation, selecting an appropriate lag sequence also eliminates problems arising from potential endogenity (Lanzafame, 2013). However, especially in the analysis of short-term parameters, it is recommended to assign the same lag sequence to the variable selected and model (Loayza and Ranciere, 2004). Therefore, it is preferred that the variables in the model have the same number of lags. The Schwarz Bayes Criterion (Schwartz, 1978) is used because it performs better than most other alternatives (Maddala, 1992; Mills and Prasad, 1992). Based on this, the optimal number of lags in all models by reference to the SBC information criterion is obtained 1 when taking the maximum number of lags as 3.

Table 10 shows Model 1 results using PMG, MG and DFE estimators of all countries. In addition, by using Hausman test, PMG and MG estimators and PMG and DFE estimators were compared to determine which estimator was more effective than the other two estimators and the results were reported in the same table. If the probability value of Hausman test is less than 0.05, zero hypothesis is rejected, and alternative hypothesis is accepted. PMG estimator maintains long-term coefficients constant, but allows all slope coefficients, error variations and error correction coefficients (adjustment rate) to vary between countries. On the other hand, the MG estimator allows all slope coefficients and error variations to vary between countries in the short and long run. In addition, the DFE estimator uses the assumption of fixed effects when estimating the error correction model and does not calculate by units since it keeps all parameters constant (Yerdelen, 2013b: 244).

In this context, when the results obtained in Table 10 are examined, the statistically significant error correction coefficient (Ø) with negative signs obtained from all three estimators indicates that there is a long-term relationship between GDP variable and TO and DCB variables. This means that even in case of deviations from the equilibrium in case of crisis, it will converge to the equilibrium again. In other words, the error correction coefficient indicates the speed at which short-term deviations due to non-stationary series reach equilibrium in the next period (Yerdelen, 2013b: 245). For example, according to the PMG estimator, approximately 82% of imbalances in a period will improve in the next period and approach the long-term balance. Furthermore, when the results Table 10 are considered, according to the PMG estimator, it is observed that the TO variable has a positive and statistically significant effect on GDP in the long term and a positive but insignificant effect in the short term. Accordingly, a 1% increase in the TO variable will increase GDP by about 0.84% in the long run. When the effect of DCB variable on GDP was examined, it was found that DCB variable had a positive and significant effect on GDP in the long term and a positive but insignificant effect in the short term. On the other hand, according to the MG estimator, the TO variable is positive on GDP in the long run and negative in the short run, but these effects are insignificant in both periods. However, DCB variable has a significant negative effect a on GDP in the long run but a negative but insignificant effect on GDP in the short term. Moreover, according to the DFE estimator, it was found that the TO variable had a positive and significant effect on the significance level of 1% in the long run, whereas it had a negative and insignificant effect on GDP in the short run. DCB was found to have a negative and significant effect in the long term and a negative and insignificant effect in the short term. In the Hausman test (Yerdelen, 2013b: 255), which tests the homogeneity of long-term coefficients and can be used to choose among estimators, the hypothesis that PMG estimator which is zero hypothesis is more effective than MG estimator was first tested. In the Hausman test, as expected, the PMG estimator with the null hypothesis was more effective than the MG estimator, and the hypothesis could not be rejected, suggesting that PMG is a more effective predictor than MG. This result, as Hsiao et al. (1999) stated, the MG approach is ineffective for small sample and short time series. In addition, the Hausman Test between DFE and PMG estimators rejected the hypothesis that the PMG Estimator with zero hypothesis is more effective than the DFE estimator, which clearly supports the hypothesis that the DFE estimator is more effective than the PMG and MG. In summary, as the DFE estimator is a more effective estimator than the MG and PMG estimators, when we look at the results of the DFE estimator again, 75% of the imbalances in one period will improve in the next period and approach the long-term equilibrium. In addition, it is found that TO has a positive and significant effect on GDP in the long run with 1% significance level and it had a negative and insignificant effect on GDP in the short run. Accordingly, a 1% increase in the TO variable will increase GDP by 1.81% in the long run. The DCB variable has a negative and significant effect on GDP in the long run and a negative and insignificant effect on the short run. Thus, a 1% increase in the DCB variable will reduce GDP by 0.53% in the long run. In this model, the most effective estimator DFE is the result of the Hausman test and in the DFE estimator, since the error correction model is estimated with the assumption of constant effects and all parameters are kept constant, it is not possible to calculate coefficients according to the related model individually (Yerdelen, 2013b: 244).

Dependent variable: GDP	PMG		MG		DFE	
	Coefficients	Std. Error	Coefficients	Std. Error	Coefficients	Std. Error
Long Term Coefficients						
TO	0.842***	0.215	1.371	1.164	1.807***	0.619
DCB	0.255**	0.112	-1.041**	0.487	-0.531**	0.223
Error Correction Coefficient (Ø)	-0.821***	0.069	-0.989***	0.064	-0.747***	0.046
Short Term Coefficients						
ΔTO (-1)	0.148	1.019	-0.261	1.282	-1.036	0.721
ΔDCB (-1)	-0.956	0.857	-0.242	0.618	-0.064	0.341
C (Constant)	-2.577***	0.224	-4.619	6.488	-6.131***	2.330
Number of observations	459		459		459	
Number of countries	17		17		17	
Hausman Test			5.49[a]		20.83[b]	
p-value			0.0643		0.000	

Note: ***, **, * indicate the significance level of 1%, 5% and 10%, respectively. The table reports results for pooled mean group (PMG), mean group (MG) and dynamic constant effects (DFE) estimators. The dependent variable is GDP. The first panel (LR) shows long-term effects, while the second panel shows both equilibrium velocity (Ø) and short-term effects (SR). Hausman:
[a] = PMG is a more effective estimator than MG under the null hypothesis.
[b] = PMG is a more efficient estimator than DFE under the null hypothesis.

Table 10. PMG, MG, DFE Test Results for Model 1 (GDP TO DCB) (All Countries Group)

Model 2. GDP TO DCP

Secondly, PMG, MG and DFE estimator results were found for Model 2 of all countries group. More specifically, the PMG, MG and DFE estimator results are given in Table 16 to determine the long- and short-term relationships of the TO and DCP variables with the GDP variable. In this context, when results obtained in Table 11 are examined, the error correction coefficient (Ø) is statistically significant and has a negative sign in all three estimators, indicating that there is a long-term relationship between the GDP, TO and DCP variables, and that shows short-term deviations will converge to the long-term equilibrium. Also, Hausman test gives that the DFE estimator is a more effective estimator than the MG and PMG estimators in the same Table. DFE estimator coefficients in Table 11 are representing that the speed of imbalances in the short term approaching to equilibrium in the following period is high (75%). According to the results obtained in this model, in short, the DFE estimator is a more effective estimator than the MG and PMG estimators, and according to the results of this estimator, TO and DCP variables have positive and significant negative effects on GDP in the long run and significant but insignificant in the short run. More specifically, a 1% increase in the TO variable will increase GDP by 1.79% in the long run. The 1% increase in the DCP variable will reduce GDP by 53% in the long run. In this model, as in Model 1, the most effective estimator DFE is the result of the Hausman test and in the DFE estimator, the coefficient calculations of the relevant model cannot be made according to units (countries) since the error correction model is estimated with the assumption of constant effects and all parameters are kept constant.

Dependent variable: GDP	PMG		MG		DFE	
	Coefficients	Std. Error	Coefficients	Std. Error	Coefficients	Std. Error
Long Term Coefficients						
TO	0.918***	0.231	1.292	1.174	1.789***	0.617
DCP	0.212*	0.122	-1.111**	0.498	-0.526**	0.223
Error Correction Coefficient (Ø)	-0.820***	0.066	-0.996***	0.065	-0.746***	0.046
Short Term Coefficients						
ΔTO(-1)	0.045	0.973	-0.251	1.254	-1.038	0.721
ΔDCP(-1)	-0.749	0.737	-0.129	0.557	-0.081	0.344
C(Constant)	-2.898***	0.242	-4.062	6.553	-6.060***	2.324
Number of observations	459		459		459	
Number of countries	17		17		17	
Hausman Test			5.49[a]		19.28[b]	
p- Value			0.0642		0.0001	

Note: ***, **, * indicate the significance level of 1%, 5% and 10%, respectively. The table reports results for pooled mean group (PMG), mean group (MG) and dynamic constant effects (DFE) estimators. The dependent variable is GDP. The first panel (LR) shows long-term effects, while the second panel shows both equilibrium speed (Ø) and short-term effects (SR). Hausman:
a = PMG is a more effective estimator than MG under the null hypothesis.
b = PMG is a more efficient estimator than DFE under the null hypothesis.

Table 11. PMG, MG, DFE Test Results for Model 2 (GDP TO DCP) (All Countries Group)

Model 3. GDP TO BRM

Table 12 shows the PMG, MG and DFE estimator results for the Model 3 of the all countries groups. In this model, PMG, MG and DFE estimator results were found in order to determine the long and short term relationships of the TO and BRM variables with the GDP variable. In the results in Table 12, since the error correction coefficient (Ø) has negative signs in all three estimators and it is statistically significant, there is a long-term relationship between the GDP variable and the TO and BRM variables, so that short-term deviations will converge to long-term equilibrium. According to Hausman tests, PMG estimator is more effective estimator than MG and DFE estimators. Also, in Table 12, PMG estimator coefficients indicated that the convergence rate of the imbalances that occur in the short term is high in the following periods (76%). In short, according to the results in this model, PMG estimator is a more effective estimator than MG and DFE estimators, and according to these estimator results, the TO variable increase in TO will increase GDP by 0.74%. When the effect of BRM variable on GDP is examined, it is seen that BRM variable has a positive and significant effect on GDP in the long term and a negative and significant effect in the short term. Accordingly, the 1% increase in the BRM variable will increase GDP by 0.24% in the long term and decrease by 1.92% in the short term. The results of the PMG estimator for the country (unit) for Model 3 are given in Appendix 2. Thus, the error correction parameter is significant and negative in all countries, so it is found that there is a long-term relationship between GDP, TO and BRM variable in all countries. When short-term coefficients are analyzed in the same table, it is seen that only in Bangladesh and Indonesia countries TO variable has a short-term and significant relationship with GDP variable. The fact that both countries have more populations than other countries may be a reason to explain the relationship between GDP and TO as well as the short-term relationship. In addition, the countries where the BRM variable has a short-term and significant relationship with the GDP variable are Kuwait, Qatar, Saudi Arabia, Turkey and the United Arab Emirates. The fact that the BRM (broadly defined ratio of money supply to GDP), one of the banking sector depth variables, is associated with GDP in both the long and short term, may be a reason to explain this relationship, especially in those countries where participation banking is more advanced than in other countries.

Dependent variable: GDP	PMG		MG		DFE	
	Coefficients	Std. Error	Coefficients	Std. Error	Coefficients	Std. Error
Long Term Coefficients						
TO	0.744***	0.238	0.868	1.240	1.008	0.680
BRM	0.244**	0.102	0.0742	0.629	0.030	0.262
Error Correction Coefficient (Ø)	-0.759***	0.063	-0.869***	0.062	-0.727***	0.044
Short Term Coefficients						
ΔTO (-1)	0.490	0.657	0.609	0.906	-0.103	0.701
ΔBRM (-1)	-1.929***	0.542	-2.291***	0.615	-2.486***	0.375
C(Constant)	-2.079***	0.198	-1.808	5.804	-2.991	2.494
Number of observations	459		459		459	
Number of countries	17		17		17	
Hausman Test			0.05^{a}		0.80^{b}	
p- Value			0.9732		0.6692	

Note: ***, **, * indicate the significance level of 1%, 5% and 10%, respectively. The table reports results for pooled mean group (PMG), mean group (MG) and dynamic constant effects (DFE) estimators. The dependent variable is GDP. The first panel (LR) shows long-term effects, while the second panel shows both equilibrium velocity (Ø) and short-term effects (SR). Hausman:
a= PMG is a more effective estimator than MG under the null hypothesis.
b= PMG is a more effective estimator than DFE under the null hypothesis.

Table 12. PMG, MG, DFE Test Results for Model 3 (GDP TO BRM) (All Countries Group)

Model 4. GDP TO CLP

For Model 4, PMG, MG and DFE estimator results of all group of countries with dual banking are given in Table 13. In this model, PMG, MG and DFE are used to analyze the long and short term relationships between TO, CLP and GDP variables. When we look at the results in Table 13, we find that there is a long-term relationship between the GDP, TO and CLP variables since the error correction coefficient (Ø) has a negative sign and is statistically significant in all three estimators as in previous models. Therefore, this model shows that the deviations that may occur in the short term will converge to the equilibrium in the long term. According to the results of Hausman tests, DFE estimator results are more effective than PMG and MG estimators. When the DFE estimator coefficients in Table 13 are examined again, the rate at which short-term imbalances converge to equilibrium in subsequent periods is quite high (about 77%). The results of this model show that the DfE estimator is a more effective estimator than the PMG and MG estimators, and that the TO variable has a positive effect on GDP in the long term and negative in the short term but these effects are significant in both periods. Accordingly, the 1% increase in the TO in the long term will increase GDP by 1.31% and reduce it by 1.26% in the short term. The CLP variable has a positive and significant effect on GDP in the long run. Thus, a 1% increase in the CLP variable in the long run will increase GDP by 0.24%. In the short term, CLP variable has a positive but insignificant effect on GDP. In this model, as in Model 1 and 2, the most effective estimator DFE is the result of the Hausman test, and in the DFE estimator, since the error correction model is estimated with the constant effects and all parameters are kept constant, it is not possible to calculate coefficients separately according to the units (countries).

Dependent variable: GDP	PMG		MG		DFE	
	Coefficients	Std. Error	Coefficients	Std. Error	Coefficients	Std. Error
Long Term Coefficients						
TO	1.336***	0.133	0.184	1.0834	1.314**	0.558
CLP	-0.060	0.0711	0.178	0.265	0.244*	0.137
Error Correction Coefficient (Ø)	-0.757***	0.062	-0.891***	0.063	-0.765***	0.047
Short Term Coefficients						
ΔTO (-1)	-0.722	1.075	-0.118	1.431	-1.256*	0.710
ΔCLP (-1)	0.559**	0.242	0.422*	0.245	0.103	0.077
C(Constant)	-4.422***	0.400	0.803	6.601	-4.408**	2.137
Number of observations	459		459		459	
Number of countries	17		17		17	
Hausman Test			1.77a		7.67b	
p- Value			0.4126		0.0216	

Note: ***, **, * indicate the significance level of 1%, 5% and 10%, respectively. The table reports results for pooled mean group (PMG), mean group (MG) and dynamic constant effects (DFE) estimators. The dependent variable is GDP. The first panel (LR) shows long-term effects, while the second panel shows both equilibrium velocity (Ø) and short-term effects (SR). Hausman:
a= PMG is a more effective estimator than MG under the null hypothesis.
b=PMG is a more effective estimator than DFE under the null hypothesis.

Table 13. PMG, MG, DFE Test Results for Model 4 (GDP TO CLP) (All Countries Group)

Model 5. GDP TO BSI

Finally, PMG, MG and DFE estimator results for Model 5 of all group of countries with dual banking have been found. In this model, PMG, MG and DFE estimator results are used to determine long-term and short-term relationships between the trade openness (TO), composite variable of the banking sector depth (BSI) and gross domestic product growth rate (GDP). The results are given in Table 14. Accordingly, when the results obtained in Table 14 are examined, since the error correction coefficient (Ø) is negative and statistically significant for all three estimators, there is a long-term relationship between GDP variable and TO and BSI variables, which may occur in the short term. It shows that deviations will converge to equilibrium in the long term. According to the results of Hausman tests, the DFE estimator is a more effective estimator than the MG and PMG estimators. DFE estimator coefficients in Table 14 also shows that the speed of short-term imbalances approaching equilibrium in the next period is quite high (approximately 75%).) According to the results of this model, in summary, the DFE estimator is a more effective estimator than the MG and PMG estimators, and according to this estimator results, the TO variable has a positive and significant effect on GDP in the long run and a negative and insignificant effect in the short run. Accordingly, a 1% increase in the TO variable will increase GDP by 1.81% in the long run. It is concluded that BSI variable has a negative and significant effect on GDP in the long run and a negative and insignificant effect on the short run. Accordingly, a 1% increase in the BSI variable over the long term will reduce GDP by about 0.53%. This shows how closely the composite index derived from the other four variables is related to GDP. In this model, as in Models 1 and 2 and 4, the most effective estimator DFE is the result of the Hausman test, and in the DFE estimator, since the error correction model is estimated with the constant effects and all parameters are kept constant, it is not possible to calculate coefficients individually according to the units (countries).

Dependent variable: GDP	PMG		MG		DFE	
	Coefficients	Std. Error	Coefficients	Std. Error	Coefficients	Std. Error
Long Term Coefficients						
TO	0.843***	0.215	1.371	1.164	1.807***	0.619
BSI	0.255**	0.113	-1.043**	0.487	-0.533**	0.223
Error Correction Coefficient (Ø)	-0.821***	0.069	-0.989***	0.064	-0.747***	0.046
Short Term Coefficients						
ΔTO(-1)	0.148	1.019	-0.261	1.282	-1.036	0.721
ΔBSI(-1)	-0.957	0.858	-0.242	0.619	-0.065	0.342
C(Constant)	-2.577***	0.224	-4.619	6.488	-6.131***	2.330
Number of observations	459		459		459	
Number of countries	17		17		17	
Hausman Test			5.49a		20.83b	
p- Value			0.0643		0.000	

Note: ***, **, * indicate the significance level of 1%, 5% and 10%, respectively. The table reports results for pooled mean group (PMG), mean group (MG) and dynamic constant effects (DFE) estimators. The dependent variable is GDP. The first panel (LR) shows long-term effects, while the second panel shows both equilibrium velocity (Ø) and short-term effects (SR). Hausman:
a= PMG is a more effective estimator than MG under the null hypothesis.
b= DFE is a more effective estimator than PMG under the null hypothesis.

Table 14. PMG, MG, DFE Test Results for Model 5 (GDP TO BSI) (All Countries Group)

When the results obtained within the framework of the relevant models for the TUG countries group are evaluated in general, it is concluded that all the BSD variables have a significant long-term relationship with GDP. This clearly shows that in the sample of all countries with dual banking, the variables of the banking sector depth have a long-term relationship with economic growth. Especially in the third model where the BRM variable is one of the BSD variables, the fact that there is a significant relationship between GDP and BRM variables in the short term shows the importance of this variable in terms of its relationship to economic growth. In addition, as a result of the Hausman test, it was observed that the DFE estimator was the most effective model and, in these models, there is also a long-term relationship between the TO variable and GDP and no short-term relationship. In the third model, where the PMG estimator is the effective model, there is a long-term and significant relationship between TO variable and GDP, but no short-term relationship has been found. In this model, the BRM variable has a positive and significant relationship with GDP in the long term, but a negative relationship in the short term. However, the deviations that may occur in the short term show that the model will converge to equilibrium in the long term due to the negative and significant output of the model. In the composite index model, there is no significant difference, but it is observed that it gives similar results with the banking sector depth variables in other models.

6. Empirical Results and Discussion

The relationship between economic growth, trade openness and financial development has been and remains the focus of interest for many academic studies. In this study, firstly, it is aimed to define the concepts of banking sector depth, economic growth and trade openness, to examine them in a theoretical framework and to investigate the relationship between them. Then, as the main purpose of the study, it is aimed to examine the relationship between banking sector depth, economic growth and trade openness by panel data analysis method with using annual data covering 1990-2016 of 17 countries that are members of the Organization of Islamic Cooperation of which has dual banking (conventional and participation banking) system. In this context, selected variables that can represent economic growth, trade openness and banking sector depth have been tested within the framework of determined models. However, it is aimed to carry out the research in a much wider scope by considering the two dimensions of financial depth, banking sector depth and stock sector depth. However, due to the fact that the stock markets of some countries have been established very recently (for example the United Arab Emirates) and some countries do not have a sufficiently long time series (Naceur et al., 2014), the study was carried out only by taking into account the variables of banking sector depth. However, in the relevant sample, a significant part of the financial depth or development and the basis of the financial market is based on the banking sector compared to other countries (Aliyu et al., 2017; Hussain et al., 2015; Kammer et al., 2015). It is of great importance in terms of reflecting the overall financial system in the sample. As the methodology followed in the study, a variable called the banking sector depth composite index (BSI) was derived through the analysis of principal components by using four banking sector depth variables. Then, the first generation unit root tests Levin-Lin-Chu (LLC), Im-Pesaran-Shin (IPS), ADF – Fisher chi-square and PP – Fisher Chi-square tests were applied to determine whether they were stationary or not. Then, the CDLM1 test of Berusch-Pagan (B-P) (1980) and Pesaran (2004) CDLM2 tests are applied to determine whether there is a cross-sectional dependence among the data. Since the correlation between the units was determined as a result of the cross-sectional dependence test (there was a cross-sectional dependence), CADF and CIPS tests which are the second generation unit root tests considering the cross-sectional dependence is applied the data and models. As a result of both first generation unit root tests and second generation unit root tests, which are stronger than first generation tests and take into account cross-sectional dependence, some of the data were observed to be I (0) and some to I(1). Therefore, it is found appropriate to apply Westerlund (2007) error correction-based cointegration test and panel ARDL cointegration analysis to the models. After the determination of cointegration between the models established by Westerlund (2007) cointegration test, three estimators based on the panel ARDL model are used to calculate long-term coefficients and determine the long-and short-term cointegration relationship between variables. Thus, using a panel ARDL model based on the use of Pesaran and Smith's mean group estimator (MG), pooled mean group estimator (PMG) and dynamic fixed effects (DFE) estimator of the three alternative estimators, the long and short term relationships between the banking sector depth (BSD), economic growth and trade openness (TO) is examined. When the results are evaluated in general, it is concluded that all banking sector depth (BSD) variables have a significant long-term relationship with GDP. This clearly shows that the depth of the banking sector in the group of countries with dual banking has a long-term relationship with economic growth. particularly, in the third model, where there is a broad money supply (BRM) variable from BSD, the fact that there is a significant relationship between GDP and BRM variables in the short term shows the importance of this variable in terms of its relationship to economic growth. Moreover, as a result of the Hausman test, it was observed that the DFE estimator is the most effective model and, in these models, there is also a long-term relationship between the TO variable and GDP and no short-term relationship. In the third model, where the PMG estimator is the effective model, although there is a long-term and significant relationship between the TO variable and GDP, no significant short-term relationship has been found. In this model, it is concluded that BRM has a positive and significant relationship with GDP in the long term, but a negative relationship in the short term. However, it shows that the short-term deviations will converge to equilibrium in the long-term due to the negative and significant output of the model. In the composite index model, it is observed that there is no significant difference but that it gives similar results with the other banking sector depth variables in models. The positive correlation between DCP (Domestic credit to the private sector) and long-term economic growth is like the study result of Al-Moulani (2016). However, Barajas et al. (2013b) shows that there is a negative relationship between DCP and GDP. This may be due to the sample and other control variables discussed in our study. To summarize, the findings of the link between the depth of the banking sector variables and economic growth suggest that the banking sector generally encourages long-term economic growth in this group of countries. For this reason, it can be stated that a more competitive, efficient and stable banking sector in these countries may increase the economic growth by encouraging the deepening of the banking In future studies, especially when there is enough and healthy data range in participation banking, the relationship between participation and conventional banking with economic growth can be examined comparatively, which of these types of banking is superior to the other and whether this advantage differs from country to country. In this study, the lack of access to the data of twenty-two countries with all dual banking is one of the constraints that prevent the research from being more inclusive and more reflecting the finance-growth relationship.

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Appendix

Appendix 1. CADF test result in fixed model of first differenced data from all countries Group

	Fixed Model							Critical Values		
Bahrain	GDP	TO	DCB	DCP	BRM	CLP	BSI	0.01	0.05	0.10
Kuwait	-4.50a	-3.91b	-3.89b	-4.28a	-5.00a	-3.84b	-4.23a	-4.12	-3.36	-2.98
Saudi Arabia	-3.84b	-3.92b	-5.29a	-5.53a	-4.89a	-4.15a	-5.55a	-4.12	-3.36	-2.98
Arab Emirates.	-4.92a	-4.14a	-3.66b	-3.94b	-4.65a	-4.01b	-4.13a	-4.12	-3.36	-2.98
Qatar	-3.96b	-4.23a	-3.21c	-4.19a	-6.51a	-5.36a	-6.60a	-4.12	-3.36	-2.98
Turkey	-4.07b	-4.19a	-4.57a	-4.07b	-7.19a	-5.23a	-5.28a	-4.12	-3.36	-2.98
Algeria	-4.27a	-3.34c	-3.89b	-3.99b	-5.06a	-3.87b	-4.53a	-4.12	-3.36	-2.98
Lebanon	-4.48a	-3.35c	-3.85b	-3.92b	-3.95b	-4.13a	-3.98b	-4.12	-3.36	-2.98
Malaysia	-4.06b	-4.06b	-4.77a	-4.79a	-4.80a	-4.27a	-4.43a	-4.12	-3.36	-2.98
Bangladesh	-3.79b	-4.33a	-4.70a	-4.43a	-4.20a	-4.26a	-4.75a	-4.12	-3.36	-2.98
Egypt	-3.64b	-4.03b	-4.77a	-4.85a	-5.27a	-4.00b	-4.30a	-4.12	-3.36	-2.98
Indonesia	-4.35a	-5.31a	-3.93b	-3.62b	-3.63b	-5.25a	-4.84a	-4.12	-3.36	-2.98
Jordan	-4.41a	-4.60a	-5.08a	-5.72a	-5.14a	-5.03a	-4.80a	-4.12	-3.36	-2.98
Tunisia	-4.14a	-5.92a	-5.12a	-5.05a	-4.60a	-4.59a	-4.83a	-4.12	-3.36	-2.98
Pakistan	-5.67a	-4.36a	-4.24a	-5.34a	-4.91a	-4.58a	-6.63a	-4.12	-3.36	-2.98
Senegal	-4.59a	-4.29a	-4.14a	-5.21a	-4.59a	-4.57a	-4.54a	-4.12	-3.36	-2.98
Gambia	-4.52a	-4.81a	-4.76a	-4.66a	-4.60a	-3.83b	-5.80a	-4.12	-3.36	-2.98
Bahrain	-3.39b	-3.74b	-3.39b	-3.88b	-6.34a	-3.72b	-5.67a	-4.12	-3.36	-2.98
CIPS	-4.27a	-4.09a	-4.08a	-4.32a	-4.96a	-4.39a	-4.99a	-2.45	-2.25	-2.14

Note: In the test statistic results a, b, c shows statistical significance at 1%, 5% and 10% levels, respectively. In the table above, the individual critical value of each country is based on the Table I (b) mentioned in Pesaran (2007) 's survey on pages 275-276 and the nearest value for N = 17, t = 27 is obtained by taking the values corresponding to N=15, T = 30. In addition, critical values of the overall panel were obtained by looking at Table II (b) in the same study.

Appendix 2. PMG Estimator Results of Each Country for Model 3 (GDP TO BRM)(All Countries Group)

	TO		BRM		
	Coefficients	Std. Deviation	Coefficients	Std. Deviation	Error Correction Parametre
Algeria	2.908	3.211	0.814	1.176	-0.545 ***
Bahrain	-1.412	2.576	-0.683	1.758	-0.716***
Bangladesh	0.816**	0.392	-0.465	0.321	-1.194***
Egypt	-2.088	1.478	-0.356	1.357	-0.688***
Indonesia	-4.293***	1.083	-2.938	2.190	-0.259*
Jordan	2.185	3.588	-1.753	2.312	-0.477***
Kuwait	-1.927	4.217	-3.213***	1.071	-0.603***
Lebanon	2.460	2.249	-3.329	2.091	-0.494***
Malaysia	1.391	4.942	-0.728	1.765	-0.955***
Pakistan	-2.838	2.680	1.282	1.804	-0.729***
Qatar	5.018	5.392	-3.315***	1.273	-1.161***
Saudi Arabia	3.082	4.145	-4.263**	2.020	-0.845***
Senegal	-1.488	2.546	0.760	1.808	-0.890***
Gambia	-0.428	2.558	0.275	1.644	-1.018***
Tunisia	2.358	2.777	-3.701	3.516	-0.785***
Turkey	4.224	2.840	-5.970***	1.329	-1.000***
U. Arab Emirates	-1.640	5.435	-5.214***	1.844	-0.544***

Note: ***, ** and * represent significance levels of 1%, 5% and 10%, respectively.