The Islamic Banking and Economic Growth Nexus: A Panel VAR Analysis for Organization of Islamic Cooperation (OIC) Countries

Duygu Zirek[1], Fusun Celebi[2] and M. Kabir Hassan[3]

In this paper, we investigate the impact of Islamic banking variables on economic growth in a panel setting for 14 member countries of the Organization of Islamic Countries during 1999-2011 period. We examine the short-run effects as well as long-run effects by employing the Panel VAR method. We find a positive and significant relationship between Islamic finance and economic growth. This relationship is robust with regard to several macroeconomic control variables such as capital stock, unemployment, inflation, and government expenditure. We show that an increase in the share of Islamic deposits, assets, and loans in total banking instruments results in an increase in economic growth. The results also show that in the long run, economic growth responds positively to shocks in Islamic instruments, namely Islamic deposits, investments, and size. Shocks in Islamic banking contribute to more than 3% of the forecast error in economic growth in the next 10 year period.

1. Introduction

The relationship between financial development and economic growth has attracted a great deal of attention targeted at improving the banking industry and other financial intermediaries. One of the most important factors of economic growth is the financial market. When financial markets develop, individuals tend to save more, leading to increased capital accumulation. The increase of capital accumulation in turn stimulates investments. As a result of increased investment, more capital is allocated to the process of production, thereby contributing positively to economic growth. There are many different views related to the financial market and economic growth nexus. Levine (1997) indicated

---

[1] Finance Department of Economics and Finance University Email: dzirek@uno.edu
Email: dzirek@uno.edu
[2] Economics Department of Economics and Finance University of Bayburt Bayburt /TURKEY Email: fcelebi@bayburt.edu.tr
[3] Finance and Hibernia Professor of Economics and Finance Department of Economics and Finance University Email: mhassan@uno.edu

that financial intermediaries play an important role. Financial intermediaries are a part of financial markets that not only provide risk diversification services but also help to allocate resources for economic growth.

The role of Islamic finance has increased in importance over time in the financial markets. Although the modern history of Islamic finance began nearly forty years ago, massive improvements achieved after the 1980s, especially with regard to Islamic finance, have led to rapid growth in recent decades. While Islamic assets were approximately USD 150 million in the 1990s (Grewal, 2011), the market size of these assets is estimated to reach USD 2 trillion at the end of 2014 (Cummings, The City UK, 2013). With regard to the development of Islamic finance, Islamic banking, that is, interest-free banking, has been rapidly increasing in importance. The rules of Islamic banking are based on principles of Sharia. Money is used as a medium of exchange. Furthermore, these banks are prohibited from certain transactions such as any business concerning alcohol, gambling, excessive speculation. Apart from these, profit and loss sharing principles are the crux of Islamic finance. According to profit and loss sharing (PLS), the relationship between lender, borrower, and intermediary depend on financial trust and partnership (Yudistira, 2004). There are three basic components of Islamic financial institutions, especially Islamic banking, that can compete against other financial constructions. Meanwhile, these components help to promote socially and ethically responsible business practices. Business practices are crafted under Sharia supervision, screening, and community based investment (Zaher and Hassan, 2001).

Although the Islamic banking and economic growth nexus has garnered some attention in academic literature, to date there are limited studies about this subject. Furqani and Mulyany (2009) shows there is a relationship between Islamic finance and economic growth. While they found no causal relationship between Islamic banking and economic growth in the short term, they did find a uni-directional relationship between Islamic banking and investments. When investments increased by Islamic banking, real sectors developed in Malaysia. However, in the long term the increase in Islamic banking finance encouraged an entrepreneurial response in the productive sectors and increased investments, while at the same time increased investment supported the development of Islamic banking. On the other hand, financial

development follows economic growth. Economic growth causes Islamic banking institutions to change and develop. When an economy grows, it creates a demand for financial intermediation.

We aim to determine that the economic growth and Islamic banking nexus is significant and to describe the effects of Islamic banking on economic growth in the long run by using Panel VAR analysis for members of the Organization of Islamic Cooperation (OIC). First, we used panel fixed effect regressions to analyze the relationship between economic growth and Islamic banking sector variables, employing other determinants of economic growth. Second, to understand the long-run relationship between both of them, we apply a panel data vector-autoregressive model, which is followed by impulse response function and forecast error variance decomposition. Depending on impulse response function, changes in the variables are exhibited by shocks to error terms in the equations of the structural VAR form. We also compute forecast error variance decompositions of growth to interpret what proxy measures are the most important in economic growth and how much they contribute to economic growth apart from Islamic finance.

The distinction of this study is that we aim primarily to examine not only Malaysia or other selected countries but to also investigate other countries which have large communities of Muslims. Whereas other studies have employed panel cointegration analysis, we searched for the Islamic banking and economic growth link by using the Panel VAR method. In this way we tried to determine the contribution of Islamic finance and other control variables.

This paper is organized as follows. Section II provides a literature review. We explain data and proxy measures of financial development, economic growth, and various control variables in Section III. Section IV describes the panel fixed effects and panel VAR model. We analyze the empirical results in Section V, and Section VI provides the concluding remarks.

2. Literature Review

We looked at the finance and economic growth nexus in literature before we investigated the relationship between Islamic banking and economic growth. First, prior studies discussed how financial intermediaries

stimulate technological innovation and economic development. Financial development contributes to the mobilization of productive savings and improves risk management by evaluating projects (King and Levin, 1993a). Goldsmith (1969) states that the link between financial development and economic activity is positively correlated (Demirguc-Kunt and Levine, 2001). Efficient financial systems can promote economic growth while financial depressions cause a decline in investment through savings (Huang, 2010). When we examine contemporary theoretical and empirical studies about the relationship between economic growth and finance nexus, (Greenwood and Jovonavic (1990); Bencivenga and Smith (1991); Roubini and Sala-i-Martin (1992); King and Levine (1993a); Greenwood and Smith 1997) indicate that growth and financial structure are inevitably linked and that financial repression affects economic growth negatively. Therefore, financial markets and institutions become more efficient by evaluating and monitoring services. They influence the decision to either invest or to mitigate transaction cost frictions and the effects of information (Hassan, Sanchez & Yu, 2011). Such productivity improving mechanism contributes to economic growth positively.

Authors examine the direction of causality in the finance and economic growth nexus by evaluating empirical and theoretical models. Some authors find a causal direction from financial development to economic growth. Development of financial systems tend to affect economic growth [McKinnon (1973), King and Levin (1993a), Levine, Loayza & Beck (2000), Christopoulos and Tsionas (2004)]. Yet, other scholars find the causality runs from economic growth to financial development. As the economy grows, the demand for financial services increases which stimulates expansion in financial sector. Gurley and Shaw (1967), Goldsmith (1969) and Jung (1986) supported this opinion.

On the other hand, a few scholars show a bidirectional causality relationship between financial development and economic growth. Financial development and economic growth reinforce each other. Blackburn and Hung (1998) established a positive and two way causality relationships between financial development and economic growth. Luintel and Khan (1999) further outlined the bi-directional causality between financial development and economic growth. In credit-constrained economies, producers with access to financial intermediary loans obtain higher returns on their investments than other

producers. This creates incentives for others to undertake the technology adoption necessary to access investment loans. Therefore costs of financial intermediation decrease, while the rate of economic growth increases.

Patrick (1966) describes his hypothesis of the direction of causality between financial development and economic growth in relation to stages of economic development. In early stages of economic development, financial development stimulates growth and innovation. Resources are transferred from traditional to modern sectors of the economy and support the real sector. This situation indicates the supply-leading relationships. When the real sector develops in the stage of economic growth, demand for financial services increases. This increasing demand encourages an expansion in the financial sector as the real economy grows. Therefore, in this model, causality runs economic growth to financial development under the demand-following hypothesis (Banerjee and Ghosh, 2010).

Levine (2005) and King and Levine (1993a,b) state that there is a strong positive link between the functioning of the financial system and long run economic growth. Khan and Senhadji (2000, 2003) finds an effective financial market impact economic growth positively. Claessens and Laeven (2005) indicates that a higher competition between banks leads to faster growths in external financially dependent sectors. Demetriades and Hussein (1996) and Shan, Morris and Sun (2001) find bidirectional causality by using the time series technique in their samples. Calderon and Liu (2002) examines 109 developing and industrial countries from the years 1960-1994. They find that economic growth encouraged financial development, while financial development stimulates economic growth. Moreover, financial deepening contributes more to the causal relationship in developing countries than in industrial countries.

A question naturally arises as to whether the size of Islamic banking sector has anything to do in the finance-growth nexus. There are limited studies in this area. Furqani and Mulyany (2009) shows an empirical model the relationship between Islamic finance and economic growth. For Malaysia over the period (1997Q1 to 2005Q4), they find that in the long run Islamic banking is positively and significantly correlated with economic growth and capital accumulation in Malaysia. Furthermore, development of financial institutions contributes to real economic sectors and long run economic welfare.

Abduh and Chowdhury (2012) examines the causal relationship between Islamic banking and economic growth in Bangladesh by using quarterly data (2004Q1 to 2011Q2). Abduh and Omar (2012) shows the Islamic banking and economic growth nexus for Indonesia through quarterly time series data (2003Q1 to 2010Q2). Both find a bi-directional relationship. Yazdan and Sadr (2012, 2013) also find a bi-directional relationship between Islamic banking and economic growth both in short-run and long-run. On the other find, Tabash and Dhankar (2014) finds the bi-directional between Islamic banks' financing and economic growth only for Bahrain and Qatar. They also find the development of the financial system lead to economic growth, but no causality in the opposite direction in UAE. Tajgardoon et al. (2013) also finds that Islamic banking and Islamic activities impact economic growth positively.

3. Data and Proxy Measures

a. Structuring Panel Dataset

Our sample period is 1999-2011 and it covers members of the Organization of Islamic Cooperation. While we started with seventeen Islamic countries, our study depends on fourteen countries due to data limitation. These countries are Bahrain, Egypt, Indonesia, Iran, Jordan, Kuwait, Malaysia, Mauritania, Qatar, Saudi Arabia, Sudan, Tunisia, Turkey and Yemen. This study employs not only financial development but also the real sector and linked economic growth. Furthermore we exploited this dataset effectively to estimate panel fixed effects regressions and to analyze Panel VAR method. Although various measures have been used in the literature regarding the level of financial development, we applied proxy measures either for financial development or real sector and economic growth from the Penn World Table 8.0 database, the World Bank's World Development Indicators 2009 (WDI), and Bankscope for 1999-2011. In our analysis we used real GDP growth rates for as a proxy for economic growth. On the other hand we used other determinants of financial development to examine effects of Islamic banking (Islamic size, Islamic Investment, Islamic deposit, Capital). At the same time our analysis depends on variables of the real sector (Unemployment, Government, Export Value). Moreover to understand human development, proxy measures (Human capital, Agriculture and Cellphone) are used in our study. Finally we included the inflation rate to control for price distortions.

b. Data Descriptions for finance and economic growth

Islamic Size, Investment, and Deposit

We collected data about Islamic instruments from Bankscope. Whereas our data starts from 1998, we decided to use data beginning from 1999 because of missing 1998 data. Therefore our sample term includes 1999-2011.   The main goal of this study is to determine whether economic growth is affected by Islamic instruments (Islamic size, investment, and deposit).

Capital stock

Another important variable is capital stock to examine the impact of economic growth. De Long and Summers (1991) researched the relationship between equipment investment and GDP per worker growth for a sample of 61 countries from 1960 to 1985. They indicated that higher equipment investment increases economic growth. Also Mankiw, Romer, Weil (1992), Levine and Renelt (1992), Kormendi and Meguire (1985) showed that gross domestic investment has a significant positive effect on economic growth. According to Blomström, Lipsey and Zejan (1996) economic growth induces capital formation, not vice versa. Furthermore, Uneze (2013) found that higher economic growth causes higher capital formation, and increase of capital formation results in higher economic growth.

Inflation and Unemployment

Inflation and unemployment are other control variables in our study. Mallik and Chowdhury (2001) estimated the inflation and economic growth nexus for Pakistan, Sri Lanka, India, and Bangladesh. They found a positive relationship between inflation and economic growth. Whereas some studies indicated that inflation affects economic growth negatively, Hussain and Malik (2011) found for Pakistan that there is a positive relationship between inflation and economic growth. Tobin effect shows high inflation leads people to invest more in physical capital, depend on increase of capital accumulation, ıt promotes economic growth [Jayathileke and Rathnayake (2013)]. Okun's law suggests that the three percent growth in real GDP is related to one percent decrease in the rate of unemployment [Akram et. al (2014)]. Andrei et. al (2009) found that real GDP and unemployment are

negatively correlated. Madıto and Khumalo (2014) researched the economic growth and unemployment nexus in South Africa. They found that there is a negative strong relationship between economic growth and unemployment.

Population Growth

Population growth affects economic growth positively because of production, saving, and consumption. The larger populations are associated with higher population rates and faster technology improvement. It depends on population growth and causes an increase of labour productivity, per capita income, and improvement in living standards. Population growth could be beneficial or detrimental to economic growth and economic growth could have an impact on population growth. There is a one way granger causality running from population growth to economic growth for Finland, France, Portugal and Sweden. There is also bidirectional causality between population growth and economic growth for Japan [(Chang et al. 2014); Tsen and Furuoka (2005)]

Human Capital

Economic theory indicates that human capital is an important factor of economic growth. It affects physical investment positively. Barro (1992) and Awel (2013) found that human capital has a significant positive impact on economic growth in Sweden. Furthermore, there is a bidirectional causality running from human capital to output per worker. Chudárková and Verner (2012) finds a positive long-run relationship between economic growth and human capital for Austria.

Offshore banking

Offshore banking affects financial development and economic growth. Gordon (2011) found that for a sample of 15 Caribbean countries, the offshore banking sector has a positive effect on economic growth in host countries. The economic growth attributable to the offshore banking sector depends on the share of income used for domestic investment.

Export Value

The literature finds that there is a positive relationship between exports

and economic growth. When capacity utilization increases, productivity and greater product variety are gained, and the export of goods and services creates the opportunity to compete in the international markets (Stait, 2005). On the other hand, ıt facilitates technology transfer and improvement of managerial skills. The relationship between exports and economic growth is a dilemma for developing countries because of their economic politics. If they concentrate on export-led growth and access to technology via globalization, they will gain revenues dependent on new products (Mishra, 2011).

Agriculture

Agricultural growth has played an important role in the process of economic development. It provides raw materials for non-agricultural production or demand inputs from the modern sector. When productivity in agriculture increases, the income of the rural population increases and the agricultural sector creates demand for domestically produced industrial output. It increases employment opportunities in the rural non-farm sector and also generates rural income indirectly. Furthermore, agricultural products can be exported to earn foreign exchange. Thus capital products can be purchased (Dethier and Effenberger, 2012). On the other hand low agricultural productivity can dramatically delay industrialization. If agricultural productivity improves, then industrialization can jumpstart economic growth (Gollin, Parente and Rogerson, 2002).

Government Expenditure

Some studies indicate that the relationship between government expenditure and economic growth is negative. Barro (1990) analyzed the ratio of real government consumption to real GDP for 98 countries from 1960 to 1985 and found a negative and significant relationship. Alexiou (2009) finds a positive relationship between government expenditure and economic growth. Devarajan and Vinay (1996) showed that some government expenditures (health, communication, and transport) are positive and significant, but the relationship between the capital component of public expenditure and per capita income is negative. Gregoriou and Ghosh (2009) found that substantial government expenditure affects economic growth strongly, but Alexiou (2009) showed that government spending on capital formation, development

assistance, private investment, and trade-openness all have positive and significant effects on economic growth.

Cell Phone Usage

Mobile phones have a positive and significant impact on economic growth. Information technologies like cell phones can increase efficiencies in a country. It enables the exchange of information between a country's inhabitants and reduces the cost of acquiring information. In addition to decreasing search costs and increasing information availablity, cell phone usage makes markets function more effectively. When the the cell phone industry grows, it enables more jobs and creates more demand for products and services. This situation contributes to economic growth (Lum, 2011).

Interest rates

The relationship between interest rate and economic growth is ambiguous. For Nigeria during 1970-2010, the relationship was positive while others find the net effect of intereste rates on investment is negative [(Udoka and Roland, 2012); Warman and Thirwall (1994)] High real interest rates on economic growth must be achieved by increasing the productivity of investment.

4. Methodology

a. Panel Fixed Effect Estimations

We employ panel fixed effect regressions to analyze the relationship between the Islamic banking sector and economic growth, controlling for various determinants of growth. Following Hassan et. al. (2011), we define growth of real GDP as:

$$Growth_{i,t} = logGDP_{i,t} - logGDP_{i,t-1}, \quad i=\{1,2,..,N\}$$

where GDP is the real GDP and N is the number of countries. The first-order approximation of the neo-classical growth model implies that

$$Growth_{i,t} = -\lambda(Q_{i,t} - Q_{i,t}^*)$$

where λ is a positive convergent parameter. Let be the initial level of log (GDP) and the (long-run) steady state GDP. Therefore, a typical growth relationship can be written:

$$Growth_{i,t} = -\lambda Q_{i,t} + \gamma' X_{it} + \varepsilon_{it}$$

In our model,

$$Growth_{i,t} = \beta_0 Q_{i,1999} + \beta_1 ISLMC_{i,t} + \gamma' X_{it} + \varepsilon_{it}$$

Where $Q_{i,1999}$ is the log of real GDP and represents the initial real GDP proxy, which resets every 3 years. $={Inf, Unemp, CapStock, PopGrowth, IntRate, OffshoreBanking, HumanCap, AgrLand, GovExp, ExportValue, CellPhone}$ is a vector of variables controlling for long-run GDP across countries. We perform three separate regressions to study the impact of Islamic finance on economic growth and   present a different Islamic Banking variable in each panel of our tables.

The intercepts are estimated separately for each country *i*. Estimating intercepts separately is equivalent to demeaning the country-level data and ensures that each country's error term is orthogonal to the explanatory variables for that country. Thus, in a fixed-effects panel data regression setting, the results reflect the time-series relation between the dependent variable and the independent variables. We also use clustered standard errors by country.

b. Panel VAR Approach

In order to examine the long run interaction between economic growth and the Islamic banking sector, we employ panel-data vector autoregressive (panel VAR) method developed by Love and Ziccino (2006). Similar to the traditional VAR model, panel VAR approach also treats all the variables in the system as endogenous.

We use a first-order VAR model:

$$X_{it} = \Gamma_0 + \Gamma_1 X_{it-1} + f_i + d_{c,t} + \varepsilon_t$$

where X_{it} is a vector of six endogenous variables (*INF, UNEMP, ISLMC,*

GOVEXP, CAPSTOCK, GROWTH). f_i denotes the fixed effect and $d_{c,t}$ is the country specific time dummy. When VAR is applied to panel data, the restriction that the underlying structure is the same for each cross-sectional unit needs to be imposed. In order to apply this restriction practically, we need to allow for "individual heterogeneity" in the levels of the variables by introducing fixed effects, denoted by *fi* in the model.

As it is well known that the conventional mean-differencing approach to removing the fixed effects leads to biased coefficients, to overcome this problem we use forward mean differencing following what is also known as 'Helmert transformation' (Arellano and Bover, 1995). Hence the orthogonality between transformed variables and lagged independent variables is preserved and the system can be estimated using GMM (Love and Zicchino, 2006).

Later we compute the impulse response functions (IRFs) and the variance decompositions. Impulse response functions describe the response of an endogenous variable over time to a shock in another variable, whereas variance decompositions measure the contributions of each shock to the forecast error variance of each endogenous variable. Following Love and Zicchino (2006), the standard errors of the impulse response functions and hence the confidence intervals are generated with Monte Carlo simulations (1000 reps).

We use the Cholesky decomposition to compute impulse response functions. According to this decomposition, series listed earlier in the VAR order impact the other variables contemporaneously, whereas series listed later in the VAR order impact those listed earlier only with lag. Hence more exogenous variables are ordered earlier in the VAR according to this decomposition.

5. Empirical Results

5.a   Summary Statistics

Table 1 shows the summary statistics of the country-year observations for our panel data. In our full sample, average real GDP is 269 US million, where Mauritania is the poorest with the smallest time series average of 5.68 US million. The highest average real GDP in our sample belongs to

Indonesia with 748 US million, followed by Turkey (with 740 US millions) and Iran (with 713 US million). GDP growth rate averages 5.4% in the full sample. While Saudi Arabia has the lowest growth rate of 3.7%, Qatar has the highest average growth rate of 11.9% while experiencing 23.2% growth in 2006. The lowest country-year growth rate in our sample belongs to Yemen with -11.1% in 2011. This the lowest growth rate in the country's recent history.

One of our main interest variables, *Islamic Deposit*, which is defined as the total Islamic banking deposits over total banking deposit has an average of 23.73%, meaning that more than one fifth of the total deposits are Islamic deposits in these countries. Mauritania has the highest average of 100% meaning that all deposits are Islamic, whereas Indonesia (1.05%) and Turkey (1.16%) have the lowest average in our sample. Not surprisingly, similar statistics are obtained with *Islamic Size*, which is defined as the total Islamic banking assets over total banking assets, averaging 22.4% in overall sample. Mauritania has the highest average of 100% meaning that all assets are Islamic, whereas Indonesia (0.89%) and Turkey (1.03%) have the lowest average in our sample. *Islamic Investment,* which is defined as the total Islamic banking financing (loans) divided by overall bank financing, reveals comparable results, overall average being 19.65%, as before Mauritania having the highest average of 100%, and Turkey (0.2%) and Indonesia (0.25%) having the lowest statistics.

Among our control variables which are determinants of economic growth, *Capital Stock* averages 4.5 US million overall, whereas *Government Expenditure*, which is defined as the share of government consumption at current purchasing power parity has an average of 14% in our full country-year sample. *Population Growth,* is 2.92% on average in the total sample, the lowest rate being in Tunisia with an average of 0.42%, whereas highest in Qatar with an average rate of 9.6%.

One other determinant of economic growth, *Unemployment*, is 10.58% in overall, while it is highest in Mauritania with an average of 31.7% and lowest in Qatar with 0.68%. *Inflation* is 10.07% on average between 1999 and 2011 in these 14 countries. Turkey has the highest average of 21.8%, whereas Tunisia has the lowest average with 3.3%. Interestingly, Qatar experienced the lowest inflation of -24.22% in 2009, which is actually a deflation.

5.b   Panel Fixed Effects Regressions

Table 2 shows the panel fixed effects regressions, where the dependent variable is economic growth defined as the growth rate of real GDP. In Panel A, *Growth* is regressed on *Islamic Deposit*, controlling for other potential determinants of growth following the fixed effects method described in methodology. First row of Panel A reveals that *Islamic Deposit* is a positive and significant determinant of economic growth in these 14 countries after controlling for *Initial GDP, Population Growth, Capital Stock, Unemployment, Inflation, Offshore Banking, Export Value and Government Expenditure.* According to our results, if Islamic deposits share in total deposits (including conventional banking deposits) increases by 10%, GDP growth rate increases by 0.065%. (For instance *Growth* increases from 5% to 5.065%, with an increase in Islamic deposits share in total deposits only by 10%). Moreover, this increase is statistically significant at 1%. *Initial GDP* has the expected negative significant sign, meaning the lower the initial level of GDP, the higher the growth is. *Capital Stock* also affects economic growth positive and significantly, coherent with literature, as *Capital Stock* increases by 1% growth increases by 0.087%. In order to control for the increase in real GDP growth that is not a result of population growth, we also control for population growth. It is significantly and positively related with growth. On the other hand, *Unemployment* and *Government Expenditure* have a negative impact on economic growth. Row 2-8 of Panel A shows that the positive effect of *Islamic Deposit* on economic growth is robust to inclusion of *Agricultural Land, Human Capital, Cell Phone* and *Interest Rate.* None of these control variables have a significant relation with economic growth in our sample. Even in Row 8, after controlling for all possible determinants of growth, *Islamic Deposit* remains positive and highly significant at 1%.

Results in Panel B of Table 2 are in line with our results in Panel A. In Panel B, *Islamic Size* is employed as an explanatory variable of growth. As the share of Islamic assets in total assets increases in these countries, our results show that economic growth also increases and this is highly statistically significant at 1%. 10% increase in Islamic assets share raises the growth rate by 0.076%, after controlling for the same control variables as in Panel A. The explanatory power of control variables in Panel B is very similar to Panel A. And our main variable *Islamic Size*'s correlation with economic growth is robust to inclusion of other control variables. In

Panel C, we examine the relation between growth and *Islamic Investment,* which is mainly the share of Islamic loans to total loans in a country. Our results demonstrate that, in line with our other Islamic banking variables, an increase in the share of Islamic loans increases growth rates in the countries in our sample. A 10% increase in Islamic loans share in total loans raises the growth rate by 0.064% (from 5% to 5.064%). The significance of the results for control variables as well as the Islamic loans continues to be same as in Panel A and Panel C.

5.c   *Panel VAR*

The coefficients of the Panel VAR system given in Table 3 are estimated after the fixed effects and the country year dummy variables have been removed. Panel A of Table 3 shows that growth responds significantly and positively to a shock in Islamic Deposit.   It also responds significantly and positively to a shock in *Capital Stock* as well as its own. The responses to *Inflation*, *Unemployment* and *Government Expenditure* are not significant. Panel B and C demonstrate that growth also responds significantly and positively to a shock in *Islamic Size* and *Islamic Investment.*   To check the importance of changes in one variable in explaining changes in other variables, we perform a variance decomposition. Variance decompositions show how important shocks on one variable are in explaining fluctuations in other variables. Table 4 reports the variance decomposition analysis for 2 years, 5 years and 10 years ahead. Variance decompositions measure the contributions of each shock to the forecast error variance of each endogenous variable. Here, we focus on the forecast error variance decomposition of growth. A shock in *Islamic Deposit*, *Islamic Size* or *Islamic Investments*, contributes 2.65%, 2.59% and 1.13% of the forecast error variance of growth in the next 2 years. The contribution of a shock in Islamic banking variables in the forecast error decomposition of growth gets bigger in magnitude 5 years ahead and 10 years ahead after the shock, as they become 3.79%, 3.44%, 1.23% and 3.79%, 3.45, 1.24, respectively. Meanwhile the contribution of growth's own shock to its forecast error decreases over time. Shocks in *Capital Stock* and *Government Expenditure* have the most input in growth's forecast error in magnitude, even though *Government Expenditure* does not have a significant impact.

In Figure 1, the graphs of the impulse-response functions and the 5% error bands generated by Monte Carlo simulations are presented. Impulse

responses give information about the effect of changes in one variable on another. Each panel evidences response of growth (y6) to other variables in the system. Our main variables, Islamic banking variables, are y3 in each panel. We see that growth responds positively to shocks in Islamic banking variables. Growth also responds positively to shocks in *Capital Stock* and itself, whereas the response to *Unemployment* is negative. However the Table 3 results already show this is not significant.

6. Concluding Remarks

We examined the link between Islamic banking and economic growth by using panel fixed effects regressions and Panel VAR model with members of the Organization of Islamic Cooperation from 1999 to 2011. According to these results, the relationship between Islamic deposit, Islamic size, and Islamic investment is significant and positive. When Islamic banking activities increase, at the same time economic growth increases. On the other hand capital stock is an important indicator of economic growth. Together, increases of capital stock, investments, and also economic growth will rise. In our study, for every one of these three regressions, the link between capital stock and economic growth is significant and positive. Moreover, another variable which effects economic growth positively is population growth. The relationship between economic growth and unemployment is negative and significant. While economic growth increases, unemployment diminishes depending on new employment opportunities. For government expenditure, in the same way there is a negative and significant relationship in relation to economic growth. It can be said that when the share of government decreases, the share of the private sector increases depending on short-run.

At the same time inflation is positive and significant in relation to economic growth in our study. It can be about the Phıllıps curve approach depending on the Keynesian model in the short term; with an increase of inflation, unemployment decreases. When we looked at the other control variables (human capital, agriculture, and cell phones) about human development, agriculture is significant and positive in Panel B. For the other two regressions, there is no relationship between economic growth and other indicators of human development. According to each of the three regressions lending interest rate is not significant in the sense of economic growth.

In our analysis, we applied the Panel VAR method; a positive shock on Islamic instruments (Islamic size, Islamic investment and Islamıc deposit) causes economic growth to increase in the first few years for organization of Islamic cooperation countries. After 10 years, Islamic deposit explains 3.79%, Islamic investment 1.24%, and Islamic size 3.45% of the variation in growth rate. Capital stock is also an important variable for economic growth. Whereas ıt explains 12.21% for Islamic deposit, ıt indicates, respectively 12.33% and 13.81% for Islamic size and investment. And also while capital stock increases, economic growth is affected positively.   In the long term initially a positive shock on government expenditure increases economic growth; however, a few years later, by diminishing the efficiency of government expenditure, economic growth becomes stationary. After 10 years while government expenditure explains 11.38% for Islamic deposit, whereas Islamic size and Islamic investment, in turn,   explains 10.70% and 10.61% respectively.

Finally, Islamic finance is important to draw foreign investment into Muslim countries that has a financial services industry. Particularly, while Islamic instruments are commonly used in Malaysia, the share in other Muslim countries gradually increases. In other words Islamic banking or Islamic finance tools have shown to be effective as financial intermediaries that facilitate the transmission of funds from surplus households to deficit households. Islamic banking affects economic growth positively in short and long term for our countries. Capital stock is also an important variable in determining economic growth. While capital stock increases, investments increase. Increase of investments causes economic growth. On the other hand, the Organization of Islamic Cooperation countries stimulate especially Islamic instruments to gain capital stock; in this way, they provide resources for their physical investments. However, we can say that Islamic finance   alone is not enough for economic growth. Technology and human capital indicators that help develop the economies of these countries should be emphasized as well simultaneously.

References

Abduh M. & Omar M. A. (2012), Islamic banking and economic growth: The Indonesian experience International Journal of Islamic and Middle Eastern Finance and Management, Vol. 5, No. 1, 35-47

Abduh M. & Chowdhury N. T.(2012), Does Islamic Banking Matter for Economic Growth in Bangladesh?, IIUM Institute of Islamic Banking and Finance

Ahmad N. & Tul Shafi J. U. (2012), The relationship between inflation and economic growth in Pakistan: An econometric approach Asian Journal of Research in Business Economics and Management Volume: 2, Issue: 9

Akram M., Hussain S. & Raza H., (2014) An Empirical Estimation of Okun's Law in Context of Pakistan, Developing Country Studies, Vol.4, No.14,

Alexiou C. (2009), Government Spending and Economic Growth: Econometric Evidence from the South Eastern Europe, Journal of Economic and Social Research 11(1), 1-16

Andrei D. B., Vasile D., & Adrian E., (2009) The Correlation Between Unemployment And Real Gdp Growth. A Study Case On Romania, http://core.ac.uk/download/pdf/6304085.pdf

Arellano, M. & Bover, O. (1995). Another Look at the Instrumental Variable Estimation of Error-Components Models. Journal of Econometrics, 68(1), 29-51.

Awel A. M. (2013), The long-run Relationship between Human Capital and Economic Growth in Sweden, MPRA Munich Personal RePEc Archive Paper No. 45183

Banerjee S. S. & Ghosh S. (2010), Demand following and supply leading relationships: An empirical analysis for India, MunichPersonal RePEc Archive, Paper No. 22443

Barro R.J. (1992), Human capital and Economic Growth, http://www.kansascityfed.org/Publicat/Sympos/1992/s92barro.pdf

Barro, R. J. (1990), Government spending in a simple model of endogeneous growth, Journal of Political Economy, 98(S5): 103-125

Bencıvenga V. & Smıth B. D.R. (1991), Financial Intermediation and Endogenous Growth, The Review of Economic Studies, Vol. 58, No. 2, 195-209

Blackburn K. & Hung T.Y. Victor (1998), A theory of growth, financial development and trade, Economica 65, 107-124

Blomström M., Lıpsey R.E., & Zejan M., (1996) Is Fixed Investment the Key to Economic Growth? The Quarterly Journal of Economics 111 (1): 269-276.

Calderón C. &Liu L. (2002), The Direction Of Causality Between Financial Development and Economic Growth, Central Bank of Chile Working PapersNo.184

Chang T., Ping Chu H., Deale F.W. & Gupta R., (2014) The Relationship between Population Growth and Economic Growth Over 1870-2013: Evidence from a Bootstrapped Panel-Granger Causality Test, University of Pretoria Working Paper: 2014-31

Christopoulos D. K. &Tsionas E. G. (2004), Financial development and Economic Growth: Evidence from panel unitroot and cointegrationtests, Journal of Development Economics 73, 55-74

Chudárková S. Verner T. (2012), Relationship between human capital and economic growth: The case of Austria, Proceedings of 30th International Conference Mathematical Methods in Economics

Claessens S. & Laeven L. (2005), Dependence, Banking Sector Competition and Economic Growth, World Bank

Cummings C. (2013), The Leading Western Centre For Islamic Finance,The City UK, Financial Market Series

De Long J. B., Summers L. H. (1991), Equipment Investment and Economic Growth, The Quarterly Journal of Economics, Vol. 106, No:2

Demetriades P. O. & Hussein K. (1996), Does financial development cause economic growth? Time-series evidence from 16 countries, Journal of Development Economies, Volume 51, Issue 2, 387-411

Demirgüç-Kunt A. &Levine R. (2001), Financial Structure and Economic Growth: Perspectives and Lessons, The MIT Press,

Dethier J. J. & Effenberger A. (2012), Agriculture and Development: A Brief Review of the Literature, The World Bank Development Economics Research Support Unit

Devarajan S., Swaroop V.& ZouHeng-fu (1996),The Composition of Public Expenditure and Economic Growth, Journal of Monetary Economics 37, 313-344

Fasih F. (2012), Inclusive growth in India through Islamic Banking, Social and Behavioral Sciences 37, 97-110

Furqani H. & Mulyany R. (2009), Islamic Banking and Economic Growth: Empirical evidence from Malaysia, Journal of Economic Cooperation and Development, 30, 2, 59-74

Goldsmith, R. W. (1969), Financial structure and development. New Haven, CT: Yale University Press.

Gollin D., Stephen P. & Rogersen R. (2002), The Role of Agriculture in Development, American Economic Review: Vol. 92 No. 2 I

Gordon, Leo-Rey C. (2011), An estimation of the economic growth effect of offshore banking in Caribbean Islands, University Of Delaware,167 pages; 3465782

Greenwood J. & Jovanovich B., (1990),Financial Development, Growth, and the Distribution of Income, The Journal of Political Economy, Vol. 98, No. 5, Part 1., 1076-1107,

Greenwood J. & Smith B. D.R., (1997), Financial markets in development, and the development of financial markets, Journal of Economic Dynamics and Control 21, 145-181

Gregoriou A. & Ghosh S. (2009),The Impact of Government Expenditure on Growth: Empirical Evidence from a Heterogeneous Panel, Bulletin of Economic Research Volume 61, Issue 1, pages 95

Grewal B. K. (2011), Constraints on Growth in Islamic Finance, IFSB, 4th Publıc Lecture On Financial Policy and Stability

Gurley J. G. & Shaw E. S.(1967), Financial Structure and Economic Development, Economic Development and Cultural Change Volume 15, 3, 257-268

Hassan M. K. , Sanchez B. & YuJung- Suk, Financial Development and Economic Growth: New Evidence from panel data, The Quarterly Review of Economics and Finance 51, 88-104

Huang Y. & Wang X.b (2010),Financial repression and economic growth in China, CGC Discussion Paper Series No. 5

Hussain S. & Malik S. (2011), Inflation and Economic Growth: Evidence from Pakistan, International Journal of Economics and Finance Vol. 3, No. 5

Jayathileke P. M. B. & Rathnayake R. M. K. T., Testing the Link between Inflation and Economic Growth: Evidence from Asia, Modern Economy, 2013, 4, 87-92

Jung W. S. (1986), Financial Development and Economic Growth: International Evidence, Economic Development and Cultural Change, 34,336-346

Khan M. S. A. (2000), Financial Development and Economic Growth: An Overview, IMF Working Paper,

Khan M.S. A.(2003), Financial Development and Economic Growth: A Review and New Evidence, Journal of African Economies, Volume 12, 89-110

King R. and Levine R. (1993b), Finance, entrepreneurship, and growth, Theory and evidence, Journal of Monetary Economics 32, 513-542. North-Holland

King, R. and Levine R. (1993a). Finance and growth: Schumpeter might be right. Quarterly Journal of Economics, 108, 717–738.

Kormendi R.C. and Meguire P. G., (1985) Macroeconomic determinants of growth: Cross-country evidence, Journal of Monetary Economics Volume 16, Issue 2, Pages 141–163

Levine R. & Renelt D., (1992) A Sensitivity Analysis of Cross Country Growth Regressions, The American Economic Review, Volume 82, Issue 4, 942-963

Levine R. (1997), Financial Development and Economic Growth: Views and Agenda, Journal of Economic Literature, Vol. XXXV, 688-726

Levine R., Loayza N. & Beck T. (2000), Financial intermediation and growth: Causality and causes, Journal of monetaryeconomics 46, 31-77

Levine, R. (2005), Finance and growth: Theory and evidence. In P. Aghion,& S. Durlauf(Eds.), Handbook of economic growth. The Netherlands: Elsevier Science.

Love I. and Zicchino L. (2006), Financial development and dynamic investment behavior: Evidence from panel VAR, The Quarterly Review of Economics and Finance 46 190–210

Lucas, R. E. Jr. (1988), On the Mechanics of Economic Development, Journal of Monetary Economics 22, 3-42, North-Holland

Luintel K. B. and Khan M. (1999), A quantitative reassessment of the finance–growth nexus: evidence from a multivariate VAR, Journal of Development Economics, 60, 381-405

Lum T. (2011),   Mobile goes global: The effect of cellphones on economic growth and development, Bucknell University Bucknell Digital Commons Honor's Theses

Madito O. & Khumalo J. (2014), Economic Growth - Unemployment Nexus in South Africa: VECM Approach, Mediterranean Journal of Social Sciences MCSER Publishing, Rome- Italy Vol 5 No 20

Mallik G. and Chowdhury A. (2001),   Inflation And Economic Growth: Evidence From Four South Asian Countries, Asia-Pacific Development Journal Vol. 8, No. 1.

Mankiw N. G., Romer D. & Weil D. N., (1992), A Contribution to the Empirics of Economic Growth, The Quarterly Journal of Economics 107 (2): 407-437.

McKinnon, R. I. (1973), Money and capital in economic development. Washington, DC: Brookings Institution.

Mishra P.K. (2011), The dynamics of relationship between exports and economic growth in India, International Journal of Economic Sciences and Applied Research,,Vol. 4, Iss. 2, 53-70

Patrick, H. T. (1966), Financial Development and Economic Growth in Underdeveloped Countries, Economic Development and Cultural Change, 14 (1966): 174-189

Roubini N. and Sala-i Martin X. (1992), A Growth Model of Inflation, Tax Evasion And Financial Repression, Economic Growth Center, Center Discussion Paper, No.658

Shan J. Z., Morris A. G. & Sun F. (2001), Financial Development and Economic Growth: An Egg-and-Chicken Problem?, Review of International Economics, Volume 9, Issue 3,443-454, SL

Stait A. F. (2005), Are Exports the Engine of Economic Growth? An Application of Cointegration and Causality Analysis for Egypt, 1977-2003, African Development Bank Economic Research Working Paper Series, No 76

Tabash M. I. & Dhankar R. S. (2014), The flow of Islamic finance and economic growth: An empirical evidence of Middle East ,Journal of Finance and Accounting, 2014; 2(1): 11-19

Tajgardoon G., Behname M. & Noormohamadi K. (2013), Islamic Banking and Economic Growth: Evidence FromAsia, Journal of Modern Accounting and Auditing Vol. 9, No.4, 542-546

Thiel M. (2001), Finance and economic growth– a review of theory and the available evidence, Economic Paper No.158,

Tsen W.H. & Furuoka F., (2005) The Relationship between Population and Economic Growth in Asian Economies, ASEAN Economic Bulletin Volume 22, Number 3, December 2005 pp. 314-330

Udoka C. O. & Roland A.(2012),The Effect of Interest Rate Fluctuation on the Economic Growth of Nigeria, 1970-2010,International Journal of Business and Social Science Vol. 3 No. 20

Uneze Eberechukwu, (2013),   The relation between capital formation and economic growth: evidence from sub-Saharan African countries, Journal of Economic Policy Reform, 16:3, 272-28 Uuukmuinancial Markets Series

Warman F. & Thirwall A.P. (1994), Interest rates, saving, investment and growth in mexico 1960–90: Tests of the financial liberalisation hypothesis, Journal of Development Studies Volume 30 Issue 3

Yazdan F.G. & Sadr, H. S. M. (2012), Analysis of Islamic Bank's Financing and Economic Growth: Case Study Iran and Indonesia,Journal of Economic Cooperation and Development, 33, 4, 1-24

Yazdan F.G. & Sadr, H. S. M. (2013), Analysis of Islamic banks' financing and economic growth: a panel cointegration approach, International Journal of Islamic and Middle Eastern Finance and Management Vol. 6 No. 2, 156-172

Yudistira D. (2004), Efficiency in Islamic Banking: An Empirical Analysis of Eighteen Banks, Islamic Economic Studies, Vol.12, No.1

Zaher T. S. & Hassan. K. (2001), A Comparative Literature Survey of Islamic Finance and Banking, Financial Markets Instutions& Instruments, Volume 10, Issue 4, 155-199

Table 1: Summary of Statistics (1999-2011)

	Mean	St. Dev	Min	Max	Obs
Economic Growth					
Real GDP (US $ in millions)	269	289	4.39	1020	182
GDP Growth (%)	0.05	0.04	-0.11	0.23	168
Financial Development					
Islamic Size (%)	22.40	32.23	0	100	182
Islamic Deposit (%)	23.73	32.34	0	100	182
Islamic Investment (%)	19.65	32.70	0	100	182
Offshore Banking (%)	21.96	20.73	1.97	103.66	176
Capital Stock (US$ in millions)	4.50	13.70	0.01	67.60	182
Real Sector					
Pop. Growth (%)	2.92	2.74	0.18	17.48	182
Human Cap. (Per Person)	2.22	0.43	1.33	2.97	182
Unemp. (%)	10.58	7.61	0.30	32.50	182
Inf. (%)	10.07	10.66	-24.22	54.18	180
Gov. Exp. (Current PPPs)	0.14	0.05	0.04	0.31	182
Export Value (2000=100)	228.11	158.41	43.17	985.84	182
Cell Phone (Per 100 People)	52.42	42.99	0.04	193.45	182
Agr. Land (%)	33.95	23.22	3.31	80.85	182
Int. Rate	14.05	11.98	4.70	95.00	180

Table 1 shows the summary statistics of the full panel data. *Growth* is the difference between natural logarithm of real GDP minus its lagged value. *Islamic Deposit* is the total Islamic banking deposit over total banking deposit. *Islamic Size* is the total Islamic banking assets over total banking assets. *Islamic Investment is* the total Islamic banking financing (loans) divided by overall bank financing. *Capital Stock* is the capital stock at 2005 constant prices. *Pop. Growth* is the population growth rate (%). *Unemp* is the unemployment rate (% total labor force). *Inf.* is the inflation rate calculated using GDP deflator (annual %). *Offshore Banking* is the offshore bank deposits to domestic bank deposits (%). *Export Value* is the current value of exports (f.o.b.) converted to U.S. dollars and expressed as a percentage of the average for the base period (2000). *Gov. Exp* is the share of government consumption at current PPPs. *Agr. Land* is the agricultural land area divided by total land (%). *Human Cap.* is the index of human capital per person based on years of schooling and returns to education. *Cell Phone* is the mobile cellular subscriptions (per 100 people). *Int. rate* is the lending interest rate (%).

The Islamic Banking and Economic Growth Nexus: A Panel VAR
Analysis for Organization of Islamic Cooperation (OIC) Countries

94

Table 2: Panel Fixed Effect Regressions

Panel A. Islamic Deposit and Economic Growth
Dependent Variable: Growth

	Constant	Islamic Deposit	Initial GDP	Capital Stock	Pop. Growth	Unemp.	Inf.	Offshore Banking	Export Value	Gov. Exp	Agr. Land	Human Cap.	Cell Phone	Int. Rate
(1)	0.8805	0.0065	-0.0952	0.0873	0.0080	-0.0079	0.0012	0.0004	-0.0248	-0.3593				
	[1.57]	[3.79***]	[-3.31***]	[3.02***]	[7.85***]	[-2.53**]	[2.01*]	[1.17]	[-1.07]	[-2.23**]				
(2)	0.9220	0.0067	-0.1036	0.0902	0.0078	-0.0076	0.0012	0.0004	-0.0225	-0.4095	0.0022			
	[1.66]	[3.92***]	[-3.77***]	[3.12***]	[7.42***]	[-2.38**]	[1.91*]	[1.04]	[-0.96]	[-2.54**]	[1.2]			
(3)	0.8814	0.0065	-0.0951	0.0873	0.0080	-0.0079	0.0012	0.0004	-0.0247	-0.3592		-0.0005		
	[1.5]	[3.42***]	[-3.37***]	[2.98***]	[8.66***]	[-2.47**]	[1.85*]	[1.2]	[-0.95]	[-2.17**]		[-0.01]		
(4)	0.8800	0.0065	-0.0927	0.0851	0.0084	-0.0079	0.0013	0.0005	-0.0311	-0.3634			0.0038	
	[1.64]	[4.45***]	[-3.12***]	[2.74***]	[11.39***]	[-2.53**]	[1.97*]	[1.37]	[-1.27]	[-2.3**]			[0.98]	
(5)	0.8838	0.0064	-0.1053	0.0930	0.0079	-0.0075	0.0012	0.0004	-0.0255	-0.4167	0.0023	0.0207		
	[1.53]	[3.4***]	[-4.04***]	[3.24***]	[8.7***]	[-2.24**]	[1.84*]	[1.13]	[-0.99]	[-2.45**]	[1.27]	[0.34]		
(6)	0.9215	0.0067	-0.1011	0.0880	0.0082	-0.0076	0.0012	0.0005	-0.0287	-0.4135	0.0022		0.0038	
	[1.73*]	[4.11***]	[-3.58***]	[2.91***]	[10.82***]	[-2.36**]	[1.89*]	[1.23]	[-1.17]	[-2.57**]	[1.23]		[0.96]	
Table 2 A continued														
(7)	0.9674	0.0071	-0.0888	0.0785	0.0084	-0.0081	0.0012	0.0005	-0.0266	-0.3533		-0.0456	0.0052	
	[1.74*]	[3.81***]	[-2.93***]	[2.4**]	[10.76***]	[-2.62**]	[1.87*]	[1.27]	[-1.03]	[-2.19**]		[-0.72]	[1.11]	
(8)	0.9749	0.0061	-0.0968	0.0771	0.0084	-0.0074	0.0012	0.0005	-0.0252	-0.3649	0.0027	-0.0018	0.0032	-0.0020
	[1.69]	[3.07***]	[-3.34***]	[2.77***]	[11.52***]	[-2.58**]	[1.73*]	[1.35]	[-0.96]	[-2.28**]	[1.53]	[-0.03]	[0.69]	[-0.84]

Table 2-Panel A presents results from panel fixed effects regressions of the *Growth* on *Islamic Deposit* and other control variables. The sample period is 1999-–2011. *Growth* is the difference between natural logarithm of real GDP minus its lagged value. *Islamic Deposit* is the natural logarithm of total Islamic banking deposit over total banking deposit. *Initial GDP* is the logarithm of initial real GDP reset at 3 years intervals. *Capital Stock* is the natural logarithm of capital stock at 2005 constant prices. *Pop. Growth* is the population growth rate (%). *Unemp* is the unemployment rate (% total labor force). *Inf.* is the inflation rate calculated using GDP deflator (annual %). *Offshore Banking* is the offshore bank deposits to domestic bank deposits (%). *Export Value* is the natural logarithm of export values are the current value of exports (f.o.b). *Gov. Exp* is the share of government consumption at current PPPs. *Agr. Land* is the agricultural land area divided by total land (%). *Human Cap.* is the index of human capital per person. *Cell Phone* is the natural logarithm mobile cellular subscriptions (per 100 people). *Int. rate* is the lending interest rate (%).In all regressions observation number is 146 and adjusted R-square ranges between 0.255 and 0.277. The t-stats in brackets are calculated using clustered standard errors. The signs ***, ** and * denote significance level at 1%, 5% and 10%, respectively.

Panel B. Islamic Size and Economic Growth
Dependent Variable: Growth

	Constant	Islamic Size	Initial GDP	Capital Stock	Pop. Growth	Unemp.	Inf.	Offshore Banking	Export Value	Gov. Exp	Agr. Land	Human Cap.	Cell Phone	Int. Rate
(1)	1.2227	0.0076	-0.1070	0.0722	0.0077	-0.0068	0.0012	0.0001	-0.0122	-0.3434				
	[2.43**]	[3.94***]	[-4.16***]	[2.64**]	[7.12***]	[-2.16**]	[1.96*]	[0.21]	[-0.61]	[-2.61**]				
(2)	1.2470	0.0079	-0.1159	0.0766	0.0075	-0.0065	0.0011	0.0001	-0.0104	-0.4019	0.0025			
	[2.55**]	[3.39***]	[-4.74***]	[2.88***]	[6.74***]	[-2.01*]	[1.87*]	[0.15]	[-0.52]	[-2.95***]	[1.43]			
(3)	1.2080	0.0075	-0.1073	0.0731	0.0077	-0.0068	0.0012	0.0001	-0.0133	-0.3450		0.0068		
	[2.34**]	[3.55***]	[-4.20***]	[2.67**]	[8.28***]	[-2.09**]	[1.80*]	[0.24]	[-0.58]	[-2.56**]		[0.12]		
(4)	1.2331	0.0078	-0.1053	0.0700	0.0080	-0.0068	0.0012	0.0001	-0.0173	-0.3456			0.0033	
	[2.48**]	[4.18***]	[-3.94***]	[2.33**]	[9.66***]	[-2.14**]	[1.90*]	[0.38]	[-0.77]	[-2.67**]			[0.72]	
(5)	1.1847	0.0074	-0.1179	0.0805	0.0076	-0.0064	0.0012	0.0001	-0.0149	-0.4114	0.0026	0.0296		
	[2.33**]	[3.00***]	[-4.97***]	[3.10***]	[8.33***]	[-1.88*]	[1.79*]	[0.27]	[-0.66]	[-2.83***]	[1.54]	[0.44]		
(6)	1.2576	0.0080	-0.1142	0.0743	0.0079	-0.0065	0.0012	0.0001	-0.0155	-0.4043	0.0025		0.0033	
	[2.59**]	[3.37***]	[-4.51***]	[2.62**]	[9.23***]	[-1.99*]	[1.82*]	[0.33]	[-0.70]	[-2.95***]	[1.47]		[0.73]	
(7)	1.3041	0.0083	-0.1031	0.0652	0.0080	-0.0069	0.0012	0.0001	-0.0139	-0.3390		-0.0316	0.0043	
	[2.62**]	[3.79***]	[-3.70***]	[2.10**]	[9.32***]	[-2.18**]	[1.81*]	[0.34]	[-0.61]	[-2.60**]		[-0.48]	[0.80]	
(8)	1.2712	0.0074	-0.1119	0.0670	0.0078	-0.0064	0.0011	0.0002	-0.0137	-0.3570	0.0030	0.0152	0.0023	-0.0018
	[2.54**]	[2.75***]	[-4.15***]	[2.70**]	[8.26***]	[-2.15**]	[1.69]	[0.54]	[-0.60]	[-2.65**]	[1.86*]	[0.23]	[0.45]	[-0.72]

Table 2-Panel B presents results from panel fixed effects regressions of the *Growth* on *Islamic Size* and other control variables. The sample period is 1999-–2011. *Growth* is the difference between natural logarithm of GDP minus its lagged value. *Islamic Size* the natural logarithm of total Islamic banking assets over total banking assets. *Initial GDP* is the logarithm of initial real GDP reset at 3 years intervals. *Capital Stock* is the natural logarithm of capital stock at 2005 constant prices. *Pop. Growth* is the population growth rate (%). *Unemp* is the unemployment rate (% total labor force). *Inf.* is the inflation rate calculated using GDP deflator (annual %). *Offshore Banking* is the offshore bank deposits to domestic bank deposits (%). *Export Value* is the natural logarithm of export values are the current value of exports (f.o.b). *Gov. Exp* is share of government consumption at current PPPs. *Agr. Land* is the agricultural land area divided by total land (%). *Human Cap.* is the index of human capital per person. *Cell Phone* is the natural logarithm mobile cellular subscriptions (per 100 people). *Int. rate* is the lending interest rate (%).In all regressions observation number is 150 and adjusted R-square ranges between 0.238 to 0.258. The t-stats in brackets are calculated using clustered standard errors. The signs ***, ** and * denote significance level at 1%, 5% and 10%, respectively.

The Islamic Banking and Economic Growth Nexus: A Panel VAR
Analysis for Organization of Islamic Cooperation (OIC) Countries

96

Panel C. Islamic Investment and Economic Growth
Dependent Variable: Growth

	Constant	Islamic Inv.	Initial GDP	Capital Stock	Pop. Growth	Unemp.	Inf.	Offshore Banking	Export Value	Gov. Exp	Agr. Land	Human Cap.	Cell Phone	Int. Rate
(1)	1.3354	0.0064	-0.1133	0.0726	0.0081	-0.0068	0.0012	0.0000	-0.0131	-0.2963				
	[3.24***]	[2.96***]	[-4.86***]	[2.91***]	[8.05***]	[-2.40**]	[2.06*]	[0.05]	[-0.85]	[-2.29**]				
(2)	1.3596	0.0064	-0.1210	0.0760	0.0079	-0.0065	0.0012	0.0000	-0.0113	-0.3376	0.0021			
	[3.41***]	[2.71**]	[-5.54***]	[3.13***]	[7.69***]	[-2.26**]	[1.97*]	[-0.01]	[-0.72]	[-2.28**]	[1.17]			
(3)	1.3948	0.0068	-0.1108	0.0684	0.0079	-0.0069	0.0011	0.0000	-0.0086	-0.3013		-0.0325		
	[3.43***]	[2.85***]	[-4.57***]	[2.95***]	[8.60***]	[-2.40**]	[1.80]	[-0.08]	[-0.53]	[-2.53**]		[-0.53]		
(4)	1.3278	0.0064	-0.1135	0.0733	0.0080	-0.0068	0.0012	0.0000	-0.0120	-0.3018			-0.0009	
	[3.17***]	[2.98***]	[-4.77***]	[2.71**]	[9.23***]	[-2.35**]	[1.89*]	[-0.01]	[-0.72]	[-2.63**]			[-0.18]	
(5)	1.3917	0.0067	-0.1194	0.0736	0.0079	-0.0065	0.0011	0.0000	-0.0089	-0.3391	0.0020	-0.0179		
	[3.53***]	[2.60**]	[-5.39***]	[3.47***]	[8.72***]	[-2.21**]	[1.77*]	[-0.08]	[-0.55]	[-2.42**]	[1.14]	[-0.26]		
(6)	1.3503	0.0065	-0.1212	0.0769	0.0078	-0.0065	0.0012	0.0000	-0.0099	-0.3447	0.0021		-0.0011	
	[3.30***]	[2.74**]	[-5.39***]	[2.86**]	[8.87***]	[-2.21**]	[1.80*]	[-0.08]	[-0.59]	[-2.69**]	[1.16]		[-0.22]	
(7)	1.4010	0.0069	-0.1106	0.0679	0.0079	-0.0069	0.0011	0.0000	-0.0086	-0.3002		-0.0348	0.0002	
	[3.49***]	[2.63**]	[-4.16***]	[2.34**]	[8.89***]	[-2.41**]	[1.82*]	[-0.07]	[-0.53]	[-2.66**]		[-0.51]	[0.04]	
(8)	1.3826	0.0058	-0.1160	0.0653	0.0078	-0.0063	0.0011	0.0000	-0.0073	-0.3057	0.0027	0.0056	-0.0014	-0.0023
	[3.23***]	[2.17**]	[-4.64***]	[2.68**]	[8.14***]	[-2.34**]	[1.67]	[0.15]	[-0.41]	[-2.55**]	[1.66]	[0.08]	[-0.27]	[-0.98]

Table 2-Panel C presents results from panel fixed effects regressions of the *Growth* on *Islamic Investment* and other control variables. The sample period is 1999-–2011. *Growth* is the difference between natural logarithm of GDP minus its lagged value. *Islamic Investment is* the natural logarithm of total Islamic banking financing (loans) over overall bank financing. *Initial GDP* is the logarithm of initial real GDP reset at 3 years intervals. *Capital Stock* is the natural logarithm of capital stock at 2005 constant prices. *Pop. Growth* is the population growth rate (%). *Unemp* is the unemployment rate (% total labor force). *Inf.* is the inflation rate calculated using GDP deflator (annual %). *Offshore Banking* is the offshore bank deposits to domestic bank deposits (%). *Export Value* is the natural logarithm of export values are the current value of exports (f.o.b). *Gov. Exp* is share of government consumption at current PPPs. *Agr. Land* is the agricultural land area divided by total land (%). *Human Cap.* is the index of human capital per person. *Cell Phone* is the natural logarithm mobile cellular subscriptions (per 100 people). *Int. rate* is the lending interest rate (%).In all regressions observation number is 152 and adjusted R-square ranges between 0.235 to 0.252. The t-stats in brackets are calculated using clustered standard errors. The signs ***, ** and * denote significance level at 1%, 5% and 10%, respectively.

Table 3: Panel VAR Results

Response of	Response to					
	INF *(t-1)*	**UNEMP** *(t-1)*	**ISLMC** *(t-1)*	**GOVEXP** *(t-1)*	**CAPSTOCK** *(t-1)*	**GROWTH** *(t-1)*
Panel A: Effect of Islamic Deposit on Growth						
GROWTH (*t*)	0.0003	0.0028	-0.0077	0.1256	0.4772	0.2600
	[-0.53]	[-0.90]	[2.45**]	[0.44]	[3.47***]	[2.66**]
N of Obs	110					
N of Countries	14					
Panel B: Effect of Islamic Size on Growth						
GROWTH (*t*)	-0.0003	-0.0025	0.008	0.0977	0.4730	0.2490
	[-0.46]	[-0.83]	[3.03***]	[0.34]	[3.45***]	[2.55**]
N of Obs	114					
N of Countries	14					
Panel C: Effect of Islamic Investment on Growth						
GROWTH (*t*)	-0.0003	-0.0028	0.0054	0.0874	0.4914	0.2520
	[-0.53]	[-0.95]	[2.36**]	[0.31]	[3.61***]	[2.63**]
N of Obs	116					
N of Countries	14					

Panel VAR model is estimated by using GMM and country-time and fixed effects are removed prior to estimation. Panel A shows the results where ISLMC variable is Islamic Deposit. Panel B shows the results where ISLMC variable is Islamic Size. Panel C shows the results where ISLMC variable is Islamic Investment. *Growth* is the difference between natural logarithm of real GDP minus its lagged value. *Islamic Deposit* is the natural logarithm of total Islamic banking deposit over total banking deposit. *Islamic Size* the natural logarithm of total Islamic banking assets over total banking assets. *Islamic Investment is* the natural logarithm of total Islamic banking financing (loans) over overall bank financing. *Inf.* is the inflation rate calculated using GDP deflator (annual %). *Unemp* is the unemployment rate (% total labor force). *Gov. Exp* is share of government consumption at current PPPs. *Capital Stock* is the natural logarithm of capital stock at 2005 constant prices. Heteroskedasticity adjusted *t*-statistics are in parentheses. *** and ** indicates significance at 1% and 5% level, respectively.

Table 4: Forecast error variance decompositions of growth in Panel VAR

Panel A. Islamic Deposit

Period	INF	UNEMP	ISLMC	GOVEXP	CAPSTOCK	GROWTH
2 years ahead	1.85	2.95	2.65	10.21	9.80	72.53
5 years ahead	1.92	2.98	3.79	11.36	12.22	67.73
10 years ahead	1.94	2.98	3.79	11.38	12.21	67.70

Panel B. Islamic Size

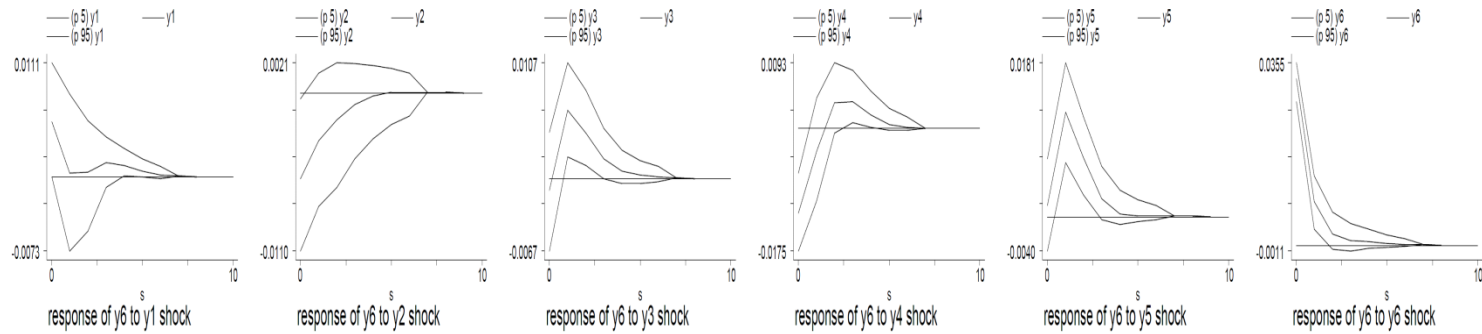| Period	INF	UNEMP	ISLMC	GOVEXP	CAPSTOCK	GROWTH
2 years ahead	1.88	2.71	2.59	9.64	9.93	73.24
5 years ahead	1.98	2.70	3.44	10.69	12.34	68.84
10 years ahead	1.99	2.70	3.45	10.70	12.33	68.81

Panel C. Islamic Investment

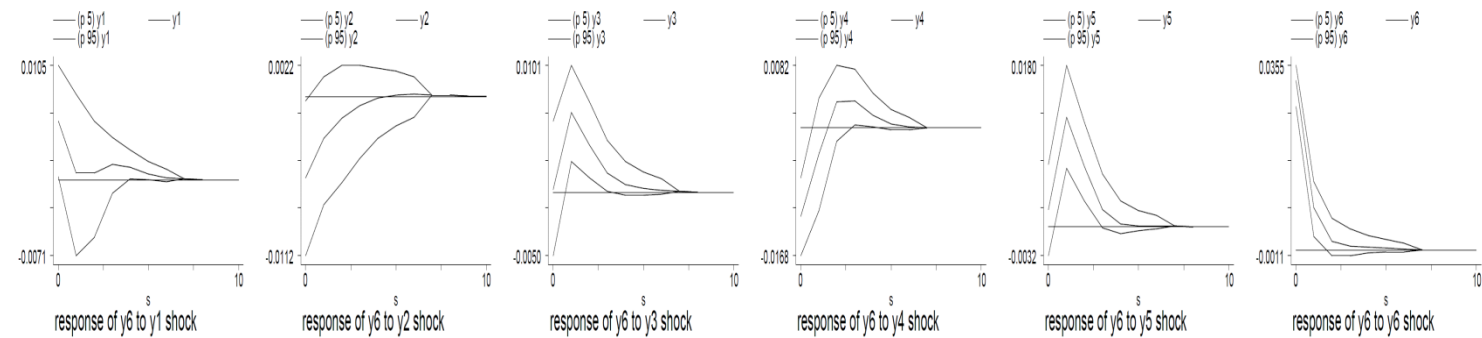| Period	INF	UNEMP	ISLMC	GOVEXP	CAPSTOCK	GROWTH
2 years ahead	1.92	2.62	1.13	9.82	10.93	73.58
5 years ahead	1.96	2.71	1.23	10.60	13.81	69.68
10 years ahead	1.98	2.71	1.24	10.61	13.81	69.66

This table summarizes error variance decompositions of economic growth. Panel A shows the results where ISLMC variable is Islamic Deposit. Panel B shows the results where ISLMC variable is Islamic Size. Panel C shows the results where ISLMC variable is Islamic Investment. *Growth* is the difference between natural logarithm of real GDP minus its lagged value. *Islamic Deposit* is the natural logarithm of total Islamic banking deposit over total banking deposit. *Islamic Size* the natural logarithm of total Islamic banking assets over total banking assets. *Islamic Investment is* the natural logarithm of total Islamic banking financing (loans) over overall bank financing. *Inf.* is the inflation rate calculated using GDP deflator (annual %). *Unemp* is the unemployment rate (% total labor force). *Gov. Exp* is share of government consumption at current PPPs. *Capital Stock* is the natural logarithm of capital stock at 2005 constant prices. All the numbers are in percentages.

Figure 1: Impulse response functions of growth

Panel A. Islamic Deposit

response of y6 to y1 shock	response of y6 to y2 shock	response of y6 to y3 shock	response of y6 to y4 shock	response of y6 to y5 shock	response of y6 to y6 shock

Panel B. Islamic Size

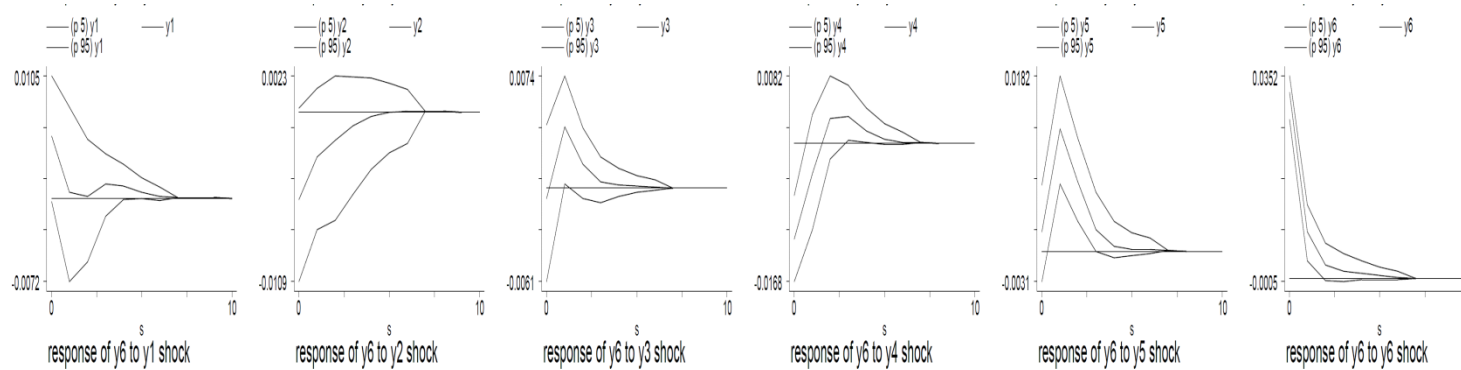|					
response of y6 to y1 shock	response of y6 to y2 shock	response of y6 to y3 shock	response of y6 to y4 shock	response of y6 to y5 shock	response of y6 to y6 shock

Figure 1: Continued

Panel C. Islamic Investment

Figure 1 presents the impulse response functions of growth. Errors are 5% on each side generated by Monte-Carlo simulation with 1000 reps.y1 stands for *Inf*, y2 stands for *Unemp*, y3 stands for *Islmc*, y4 stands for *Govexp*, y5 stands for *Capstock* and y6 stands for *Growth*. Panel A shows the results where y3 is Islamic Deposit. Panel B shows the results where y3 is Islamic Size. Panel C shows the results where y3 is Islamic Investment. *Growth* is the difference between natural logarithm of real GDP minus its lagged value. *Islamic Deposit* is the natural logarithm of total Islamic banking deposit over total banking deposit. *Islamic Size* the natural logarithm of total Islamic banking assets over total banking assets. *Islamic Investment is* the natural logarithm of total Islamic banking financing (loans) over overall bank financing. *Inf.* is the inflation rate calculated using GDP deflator (annual %). *Unemp* is the unemployment rate (% total labor force). *Gov. Exp* is share of government consumption at current PPPs. *Capital Stock* is the natural logarithm of capital stock at 2005 constant prices.