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Chapter 26: Are Finance and Human Development Important for Economic Growth? International Evidence from Dynamic GMM Approach

1 Introduction

A great number of theoretical and empirical studies have been carried out to identify the determinants of economic growth in developing countries. While many nations have emerged as developed economies since the end of World War II, most of the Muslim majority countries entangled in wars, foreign invasions, coups, ethnic rivalries and sectarian violence. In spite of showing tremendous economic performance, many emerging Muslim countries have lost their growth trajectory in the last two decades or so. At one end of the spectrum, there is extreme poverty, poor healthcare, illiteracy and low levels of human capital accumulation. There is also political instability, rampant corruption, underdeveloped financial sector, absence of property rights, lack of rule of law and resource curse restrain sustainable growth in most of the OIC countries. Are these countries poor because of their religious affiliation? The reality is that most Muslim societies do not embrace efficient institutions, rules and rule-compliance to promote development (Askari and Rehman 2013). Thus, a humble attempt is made here to find some answers to the following questions: Are human development and financial development important for economic growth in member countries of the Organization for Islamic Conference (OIC)? How are they different from other developing countries? In addition to that we investigate how financial development affects growth indirectly.

The OIC countries represent one of the world's largest markets with around 1.3 billion consumers who roughly constitute 25% of the world population. The OIC was established in 1969 with the purpose of promoting closer cooperation among Islamic countries in the economic, political and cultural fields. Currently, there are 57 member countries throughout the world with great diversity in terms of economic structure, political system, development level, ethnic background as well as social and cultural environment.

To the best of our knowledge, this study is the first attempt to fill the gap in the existing growth literature by integrating human, institutional, environmental factors in determination of in real income for OIC countries with other developing countries. Five adjusted indicators of human and financial development are used in a large panel of OIC and non-OIC countries with observations spanning the sample

period from 1996 to 2014. The two-step Dynamic System Generalized Method of Moments (GMM) is used in the analysis of this empirical relationship.

The study finds that in general human development affects economic growth positively in developing countries. The effect of health spending on economic growth is significantly higher in OIC countries. The average years of schooling, a proxy for human capital accumulation, contributes toward economic growth more significantly at higher level in Asian OIC countries. Primary school enrollment affects economic growth in Asian and African OIC countries less significantly than other developing countries. For lower and middle-income OIC countries the effect of schooling is significantly less than developing countries. The opposite effect is found for upper income countries, oil dependent countries and countries with the strong presence of Islamic finance. At the same time, there is evidence of significant negative and non-linear negative relationships between financial development, as well as, various measures of financial depth. A positive relationship between bank cost to income and growth is also identified. Financial development affects economic growth significantly at lower level in all OIC countries and country groups than developing countries except countries with a strong presence of Islamic finance, where the relationship remains positive and significant. Moreover, financial development affects economic growth in developing countries through capital formation and the macroeconomic environment, the combined effects of which are found to be negative. Also, higher unemployment is found to be detrimental to economic growth for developing countries. The CO₂ emissions used a proxy for industrialization, affects economic positively. Economic institutions are also found to have a significant impact on economic growth in developing countries. In line with that we recommend some policy measures for developing countries in general and OIC countries in particular.

The remainder of this chapter is organized as follows: In the next section, an overview of related studies. Section 3 introduces the empirical model and methodology. Section 4, describes the data. The estimation results and discussion in the fifth section and the final section presents the conclusion of the study.

2 Literature Review

2.1 Human Development and Growth

The theory of endogenous growth argues that economic growth is generated from within the economic system as a direct result of internal processes (Romer 1994; Aghion et al. 1998; Solow 2000). More specifically, the theory argues that an enhancement of human capital will lead to economic growth by means of the development of new forms of technology as well as efficient and effective means of production. According to the United Nations Development Programme (UNDP),

human development can be defined as enlarging people's choices in ways that enable them to lead longer, healthier and fuller lives. This chapter refers to the human development with respect to the health and education albeit this is arguably a reductionist interpretation. There are two approaches in the examination of this nexus. The standard approach is to treat human capital, or the average years of schooling for the labor force, as an ordinary input in the production function (Mankiw, Romer and Weil 1992). Another approach is associated with the endogenous growth theory, which is to treat the growth of total factor productivity as a function of the level of education, human capital, and life expectancy. The underlying assumption is that an educated and healthy labor force is better at creating, implementing, and adopting new technologies, thereby generating high economic growth.

The role of human capital in economic development is examined in the seminal work by Benhabib and Spiegel (1994). The significance of this growth model is better understood in terms of its empirical implications and the notion that human capital is assured the levels rather than growth rates now play a role in the determination of the growth rate of per capita income. A number of empirical studies support the strong linkage between human development and economic growth (Pischke 1997; Sianesi and Van Reenen 2003; Gennaioli et al. 2011; Lee and Hong 2011; Suri et al. 2011). The direction of the relationship is important and there is evidence from Mustafa et al. (2017), for instance, that human development contributes positively to economic growth. In the case of our Asian sample, economic growth does not appear to have, however, a positive influence on human development.

On the other hand, a negative albeit statistically insignificant relationship between human capital and economic growth is also reported (Pritchett 2001). Holmes (2013) also does not find a significant relationship between higher education and GDP growth using a range of cross-country regression models. It is also argued that the results of cross-country regression estimates, such as those pointed in Gemmell (1996), should be viewed with caution, as the results are sensitive to the sample period and country coverage. In another study, using continuously-updated fully modified panel estimation, Chen and Zhang (2017) found that industrial electricity consumption has a significantly larger impact on economic prosperity than physical and human capital investment.

It is noted, however, that with respect to OIC countries, there are almost no empirical studies on the relationship between human development and economic growth. Thus, the objective of this study is to fill the literature gap by examining 118 developing countries, with the focus on 54 OIC member countries.

2.2 Financial Development and Growth

The finance-growth nexus is a complex phenomenon and many theories have been developed to explain this dynamic relationship after the seminal theoretical work of

Schumpeter (1934) and empirical work by Goldsmith (1969). The following studies found a significant positive relationship between finance and growth at the both macro and micro levels (King and Levine 1993; Demirguc-Kunt and Levine 2004; Beck et al. 2000, 2014). On the other hand, many economists argue that finance is a relatively unimportant factor in economic development. Particularly, Robinson (1952) contends that financial development simply follows economic growth and later, Lucas (1988) terms the relationship between financial and economic development is “overstressed” (as cited in King and Levine 1993). A number of studies find a negative relationship between finance and growth at the macro and micro levels for developing countries (De Gregorio and Guidotti 1995; Shan 2005; Hao 2006; Djalilov and Piesse 2011; Hasan et al. 2009; and Xu 2016). Cecchetti and Kharroubi (2012) outlines that there is a negative link between the finance and growth, after a certain point. They further argue that when an economy is immature and the financial sector is small, an incremental growth in the latter is useful (Cecchetti and Kharroubi 2012). Arcand et al. (2012) suggests that finance starts having a negative effect on growth when credit to private sector reaches the threshold of 100% of GDP. Narayan and Narayan (2013) find that the banking sector variable (domestic credit) has a negative and statistically significant impact effect on economic growth in the sample of 65 developing countries except for the Middle Eastern countries. Using dynamic panel threshold technique on 87 developed and developing countries, Law and Singh (2014) find that more finance is not necessarily good for economic growth, and highlight that an optimal level of financial development is more crucial in facilitating growth.

More recently, the evidence from Batuo et al. (2018) suggests that financial development and financial liberalization have positive effects on financial stability. The findings also reveal that economic growth reduces financial instability in the pre-liberalization period compared to post-liberalization period. In another study, Lim (2017) suggests that economic growth during housing booms is greater in countries with less developed financial systems. Ruiz (2017) argues that countries below the finance threshold grow less and those above the threshold grow faster.

There are few empirical studies that examine financial development and economic growth by focusing on regional country groups like the Middle East and North Africa (Darrat et al. 2006), Commonwealth of Independent States and Central Asian Countries (Cojocararu et al. 2016; Djalilov and Piesse, 2011), Sub-Saharan Africa (Inoue and Hamori 2016; Ahmed 2016). Therefore, it can be argued that the finance-growth relationship remains an open empirical question despite the vast literature that contributed toward a better understanding of this dynamic relationship.

2.3 Theoretical Foundation of Growth in Islam

It is important to understand economic development in Islam in terms of raising the absolute income levels of the poor to eradicate poverty, meeting material or

non-material human needs, the conservation of natural resources, protection of property rights, wildlife, and ecological environment (Mannan 1989; Mirakhor and Askari 2010). In other words, the principal foundational elements of development in Islam reflect individual self-development, physical earth development including natural resources, and collective human development (Askari and Rehman 2013; Mirakhor and Askari 2010). In addition, the goals that derived the Islamic concept of development must be expressed in terms of the preservation of moral and spiritual values, as reflected in the notion of *tazkiyah* (moral purification).

Despite the conceptual clarity, the evidence from Askari and Rehman (2013) suggests that in most Muslim societies, efficient institutions, rules and rule-compliance to promote development are not embraced and practiced. Therefore, many countries that profess Islam and are labeled as Islamic today rather represent clear examples of injustice and underdevelopment. It is further argued that despite the fact that the Islamic basis for development is multidimensional with its moral, social, political and economic dimensions. There is still a need to integrate the elements of moral and spiritual development into the very concept of economic development right from the beginning.

The establishment of an Islamic financial system is one of the most pressing needs to reform all economic institutions in accordance with the principles of Islamic Economics. Anwar (1987) argues that the advantages of financial markets include greater portfolio diversification, alteration in risk-tolerance levels, and the transfer of resources from savers to investors, all of which permit increased investment opportunities and higher levels of economic development. The importance of finance for economic growth in Muslim countries is also emphasized by Bacha and Mirakhor (2014), and Çizakça (2014), and empirically supported by Imam and Kpodar (2016).

In such context, it is imperative to analyze the relationship among finance, human development and economic growth in the case of OIC countries, which include many Muslim countries. The empirical model follows Goldsmith (1969), Mankiw et al. (1992), Beck et al. (2000), Demirguc-Kunt and Levine (2004) and integrates Islamic development principles explained by Anwar (1987), Mannan (1989), and Mirakhor (1993).

3 Empirical Model and Methodology

In order to examine empirical relationship among finance, economic growth and human development, it is possible to consider the following growth equation:

$$Y_{it} = \alpha_i Y_{it-1} + \beta_i \text{Initial GDP per capita}_{it} + \gamma_i X_{it} + \delta_{it} FD_{it} + \lambda_{it} HD_{it} + v_i + \varepsilon_{it} \quad (1)$$

where i indicates the country ($i = 1, \dots, N$) and t indicates the time period ($t = 1 \dots T_i$).

The dependent variable Y_{it} stands for the economic growth of country i at the end of period t . FD_{it} represents financial development and HD_{it} does human

development. The coefficients α , β , γ , δ , and λ are the parameters and vectors of parameters to be estimated. The country-specific effects are represented by v_i and, ε_{it} is the error term. The main control variables comprise the log of initial GDP per capita, and X_{it} is a vector of control variables hypothesized to affect output growth including capital investment to GDP, savings to GDP, CO₂ emission per capita (metric tons), and unemployment rate.

Aisen and Veiga (2013) thoroughly discussed the limitations of estimating the dynamic model (Equation (1)) by using OLS. As our sample has only 6 non-overlapping 3-year periods, the dynamic panel bias may remain. Arellano and Bond (1991) suggest the recourse to first differences of the variables to eliminate the fixed effects. This approach which is also referred to the Standard or Difference GMM. The first difference formulation of Equation (1) can be rewritten as follows:

$$\Delta Y_{it} = \alpha_i Y_{it-1} + \beta_i \text{Initial GDP per capita}_{it} + \gamma_i \Delta X_{it} + \delta_{it} \Delta FD_{it} + \lambda_{it} \Delta HD_{it} + \Delta v_i + \varepsilon_{it} \quad (2)$$

However, the problem of correlation between the lagged dependent variable and the error term remains and this requires the use of instruments. As remedy to this problem, Arellano and Bond (1991) advocate the use of appropriate lags of dependent and independent variables as instruments. The lagged levels of regressors may be however weak instruments for the differenced variables. More specifically, first difference GMM estimators may behave poorly and lead to large sample biases when the independent variables are persistent over time (Blundell and Bond 1998). Finally, it is noted that the absence of information about the variables of interest in the level form may result in the loss of substantial parts of total variance (Arellano and Bover 1995).

To solve the above problems with Difference GMM models, Arellano and Bover (1995) and Blundell and Bond (1998) propose System GMM estimator. This is a combination of system with the regression in first differences and with the regression in levels. To estimate the GMM system, variables in differences are instrumented with lags of their own levels, while variables in levels are instrumented with lags of their own differences (Bond et al. 2009). In other words, the first differenced moment conditions in Difference GMM are augmented by level moment conditions in System GMM estimates for more efficiency in estimation (Blundell and Bond, 1998). In the System GMM modeling, even though the levels of the explanatory variables are essentially correlated with the country-specific fixed effects, the differences are not serially correlated. In addition, time dummies may be included to control for the time-specific effects and to eliminate cross-sectional dependence. Country or unit dummies may be also used to control for country-specific or unit effects. One more argument in favor of using System GMM is that for unbalanced panel data, as in the proposed case, it is better to use System GMM rather than Difference GMM estimation, which is associated with the potential of magnifying gaps (Roodman 2009b).

While System GMM may be appropriate in unbalanced panel data, it suffers also from its own weaknesses. Though asymptotically more efficient, the two-step GMM is

based on the estimation of standard errors that tend to be critically downward biased. However, it is possible to overcome this estimator problem using the finite-sample correction to the two-step covariance matrix developed by Windmeijer (2005). This two-step robust GMM estimates more efficiently than one-step robust estimates especially for the System GMM (Roodman 2009b).²⁴¹ The second weakness of system GMM estimation is the possibility of having too many instruments. Roodman (2009b) develops a detailed analysis of this issue and emphasizes the symptoms of an excessive use of instruments. The idea is that as time dimension increases, the number of instruments can be too large compared to the sample size, therefore invalidating some asymptotic results and specification tests. Too many instruments can overfit endogenous variables and fail to wipe out their endogenous components, resulting in biased coefficients (Roodman 2009a, 2009b). Another argument is that the Hansen J-test and difference-in-Hansen test can be weak in the presence of over-identification. It is possible to proceed with the system GMM estimation following two empirical strategies that deal with the issue of too many instruments (Roodman 2009b). The first one is to use the ‘collapse’ sub-option for the *xtabond2* command in STATA. The second empirical strategy (lag limits) forces the use of only certain lags instead of all available lags as instruments. Both empirical choices have something in common, which is the reduction of the number of instruments and linearity in *t* (Vieira et al. 2013). It is the second strategy that is followed in this study.

As noted above, the *xtabond2* command (Roodman 2009a) is used to run System GMM estimation in Stata 13. With respect to post-estimation specification tests, it is the Hansen J-test test for over-identifying restrictions that is used after applying Windmeijer correction to correct the issue of standard deviation. This is achieved by using syntax *robust* in STATA and the Arellano and Bond (1991) test, AR(2), for no autocorrelation in the second-differenced errors.

4 Data and Empirical Results

Based on the empirical model Equation (2), the dynamic linkages among finance, economic growth, and human development are estimated using two-step system GMM methodology for an unbalanced panel data of 118 countries of which 54 belong to the OIC countries over the sample period from 1996 to 2014 (for the full list of countries, please refer to Appendix 2). The variables are averaged over 3-year non-overlapping intervals, to smooth out business cycle fluctuations, a measurement approach that is common in current growth literature (Imam and Kpodar

²⁴¹ After specifying the Windmeijer corrected standard errors (WC-robust) it is Hansen J-test rather than Sargan test that is applied for validating the instruments, particularly in the presence of heteroscedasticity.

2016; Slesman et al. 2015). It is noted that the sample size is constrained by data availability, in particular with regard to the variables capturing human development, and that the natural logarithm is taken for all financial development indicators. CO₂ emissions and all human development indicators are expressed in their original units for better and clear interpretation of the results. The data used in the analysis were collected from The World Development Indicators (WDI), Barro and Lee (2013), UNESCO Institute for Statistics, Global Financial Development Database (GFDD), and The Heritage Foundation (see Appendix 1 for variable definitions, sources and their expected signs based on the existing literature). First, line graphs are plotted for only selected key variables in Figure 26.1 to give a broad view about different patterns over time. It is clear that OIC countries are lagging behind in terms of human development and financial development. No significant difference between OIC and non-OIC countries is observed in terms of growth, however, OIC countries have lower levels of GDP per capita.²⁴²

The first set of results from the dynamic System-GMM estimations on financial development, human development and economic growth are presented in 45 models in 8 different Tables. The diagnostic tests performed with respect to the dynamic System-GMM models display the following: i) Only variables statistically significant at the conventional level are included in the final models. ii) All the models passed the AR (2) tests, as indicated by *p*-value showing that the serial correlation in the error terms is not second order. The number of instruments remain below the number of groups (i.e., countries). On the whole, the validity of the instruments is confirmed using Hansen J test as a necessary condition for the estimation of System-GMM models. Accordingly, in consideration of these test statistics, it can be concluded that all estimated models are adequately specified.

For the available sample of developing countries and sample time period, the evidence suggests that human development significantly affects economic growth positively (Table 26.1) at the conventional level. It can be further argued that investment in human capital (primary school enrollment) and health care spending Granger-causes economic growth. This result is strongly supported by the existing literature (Gennaioli et al., 2011; Pischke 2017; Abubakar et al., 2015). Financial development is found to have significant negative effects on economic growth for developing countries, and this evidence is consistent for all four financial development variables as evidenced in Table 26.2. Similar results have been reported in previous studies (De Greogorio and Guidotti, 1995; Shan, 2005; Djalilov and Piesse, 2011; Xu, 2016). However, the efficiency of the financial sector, as measured by bank cost to income, is positively correlated with economic growth, and it is found

242 To calculate the average GDP per capita, the high-income OIC countries (Bahrain, Brunei, Oman, Qatar, Kuwait, Saudi Arabia, UAE) are excluded to avoid biased average GDP numbers for the OIC group. For descriptive statistics and correlation analysis please refer to the Appendix 3.

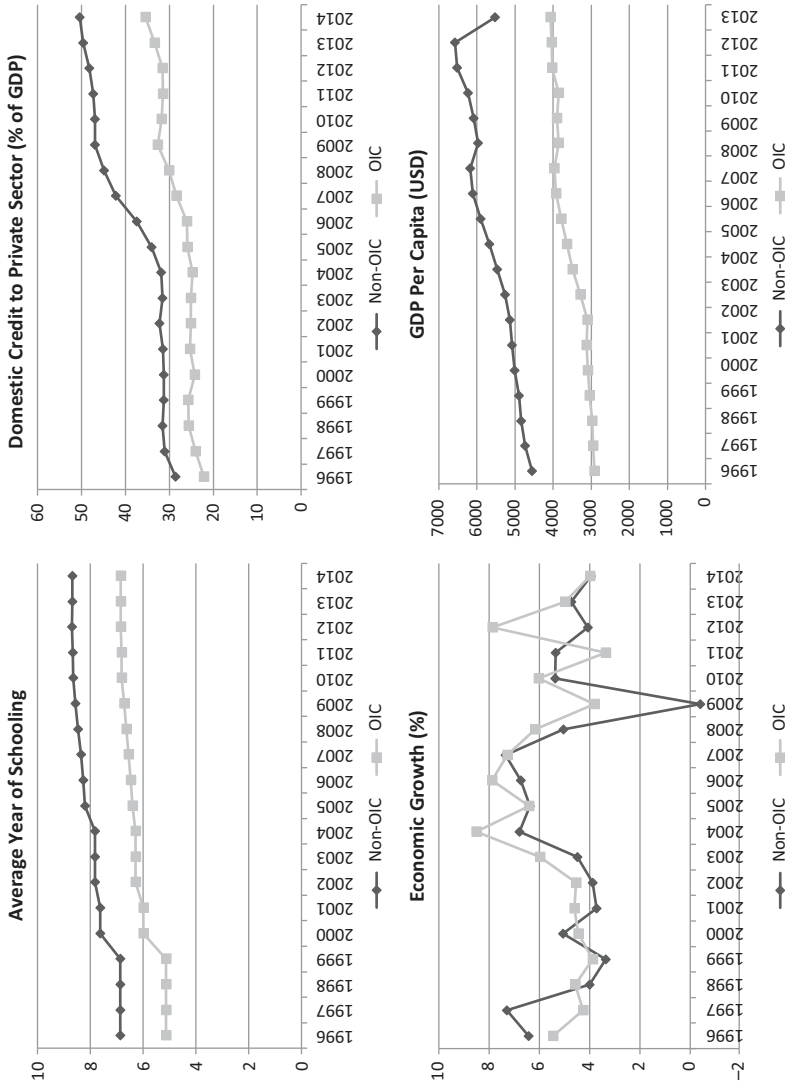


Figure 26.1: Human Development, Finance and Economic Growth in OIC and Non-OIC Countries.
 Source: Authors' calculations.
 Note: Variables are expressed as yearly averages for each of the 55 OIC and 65 non-OIC countries.

Table 26.1: Human Development and Economic Growth: Developing Countries 1996–2014.

	(1)	(2)	(3)	(4)	(5)	(6)
Economic Growth (t-1)	0.156*** [0.04]	0.254*** [0.04]	0.202*** [0.05]	0.166*** [0.04]	0.216*** [0.04]	0.144*** [0.04]
GDP per capita	-1.637*** [0.44]	-3.088*** [0.69]	-2.091*** [0.54]	-2.499*** [0.45]	-1.559*** [0.48]	-1.299*** [0.38]
Capital investment (% of GDP)		4.622*** [1.69]	6.206*** [1.67]	6.229*** [1.77]	4.850*** [1.47]	6.812*** [1.59]
CO ₂ emissions per capita (m.ton)	0.163*** [0.06]	0.175*** [0.06]	0.192*** [0.08]	0.183*** [0.05]	0.132*** [0.06]	0.127*** [0.04]
Savings (% of GDP)	10.690*** [4.05]	8.962* [4.74]	10.003 [6.41]	11.246** [4.34]	10.045* [6.00]	13.091*** [4.61]
Unemployment rate (%)	-1.521* [0.83]	-0.864 [0.81]	-1.077 [0.93]	-0.571 [0.64]	-0.662 [1.07]	-1.492** [0.62]
Capital investment (% of GDP) (t-1)	3.376* [1.75]					
Institutional Quality						
Economic Freedom (t-1)	2.995** [1.38]					
Human Development						
Secondary School Enrollment		0.085*** [0.03]				
Tertiary School Enrollment			0.037* [0.02]			
Average Year of Schooling				0.460*** [0.13]		

Primary School Enrollment (t-1)									
Health spending (% of GDP) (t-1)									0.044** [0.02]
									0.577*** [0.19]
Observations	525	445	420	467	489	526			
Instruments	94	94	94	94	94	94			
Number of Groups	107	104	104	100	106	108			
Arellano-Bond: AR(1)	0.00	0.002	0.006	0.001	0.002	0.001			
Arellano-Bond: AR(2)	0.14	0.268	0.073	0.138	0.319	0.417			
Hansen test (p-val)	0.225	0.13	0.172	0.156	0.24	0.258			

Notes:

- The System-GMM estimation for dynamic panel-data observations based on three-year non-overlapping averages from the sample period 1996 to 2014.
- All explanatory variables are treated as endogenous. The two-period lagged values are used as instruments in the first-difference equations and the one-period lagged first-differences are used in the levels equations.
- Two-step estimations are based on robust standard errors corrected for finite samples. Windmeijer correction and Hansen J tests support the validity of over-identifying restrictions.
- Second order autocorrelation of residuals is rejected for all estimation models.
- Standard errors are in brackets.: ***, 1%; **, 5%, and *, 10%.

Table 26.2: Financial Development and Economic Growth: Developing Countries 1996–2014.

	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Economic Growth (t-1)	0.145*** [0.03]	0.140*** [0.03]	0.127*** [0.04]	0.128*** [0.04]	0.128*** [0.03]	0.145*** [0.03]	0.142*** [0.03]
GDP per capita	-1.042** [0.44]	-0.820* [0.43]	-1.185*** [0.40]	-1.171*** [0.40]	-1.632*** [0.39]	-0.907** [0.44]	-0.948** [0.42]
Capital investment (% of GDP)	5.902*** [1.30]	5.744*** [1.52]	5.741*** [1.57]	5.859*** [1.56]	7.094*** [1.51]	6.172*** [1.26]	5.369*** [1.54]
CO ₂ emissions per capita (m.ton)	0.110** [0.05]	0.049 [0.05]	0.095* [0.05]	0.093* [0.05]	0.175*** [0.05]	0.106** [0.05]	0.059 [0.05]
Savings (% of GDP)	8.129** [3.63]	9.756** [4.29]	10.287*** [3.84]	10.247*** [3.80]	10.264* [5.77]	6.966* [3.75]	9.911** [4.29]
Unemployment rate (%)	-1.708** [0.72]	-2.323*** [0.82]	-2.019*** [0.76]	-2.011*** [0.75]	-1.104 [0.68]	-1.727** [0.71]	-2.446*** [0.86]
Financial Development							
Domestic Credit to Private Sector	-1.472** [0.74]						
M3 (% of GDP)		-1.831** [0.72]					
Financial System Deposit (% of GDP) (t-1)			-1.303** [0.65]				
Bank Deposit (% of GDP) (t-1)				-1.254* [0.64]			
Bank Cost to Income					8.073** [3.90]		

Non-linearity of Financial Development

Domestic Credit to Private Sector (Squared)

M3 (% GDP) (Squared)	-0.257** [0.11]			-0.254** [0.10]		
Observations	528	523	518	518	528	523
Instruments	94	94	94	94	94	94
Number of Groups	108	107	106	106	108	107
Arellano-Bond: AR(1)	0.001	0.001	0.001	0	0.001	0.001
Arellano-Bond: AR(2)	0.371	0.231	0.156	0.203	0.416	0.221
Hansen test (p-val)	0.256	0.12	0.192	0.194	0.277	0.148

Notes:

- The System-GMM estimation for dynamic panel-data observations based on three-year non-overlapping averages from the sample period 1996 to 2014.
- All explanatory variables are treated as endogenous. The two-period lagged values are used as instruments in the first-difference equations and the one-period lagged first-differences are used in the levels equations.
- Two-step estimations are based on robust standard errors corrected for finite samples. Windmeijer correction and Hansen J tests support the validity of over-identifying restrictions.
- Second order autocorrelation of residuals is rejected for all estimation models.
- Standard errors are in brackets.: ***, 1%; **, 5%, and *, 10%.

to be statistically significant. In addition, a non-linear negative relationship between financial sector development, (namely domestic credit to private sector and M3 to GDP) and economic growth for developing countries. These findings are also supported by the existing literature (Huang and Lin 2009; Cecchetti and Kharroubi 2012; Law and Singh 2014).

As discussed earlier, there are two major views and findings in empirical literature on the finance-growth nexus. The first one is the positive contribution of financial development toward economic growth (Demirguc-Kunt and Levine 2004; Beck et al. 2000; Beck et al. 2014) and the second one is the negative and non-linear effect of financial development on growth (Deidda and Fattough 2002; Huang and Lin 2009; Arcand 2012; Narayan and Narayan 2013; Law and Singh 2014). Interestingly, Adu et al. (2013) argue whether financial development is good or bad for growth depends on the choice of indicator used to proxy for financial development. Using four financial development indicators, there is either a significantly negative or non-linear negative relationship between finance and growth. There is a convergence among the sample developing countries, for which a negative and significant relationship between economic growth and GDP per capita (Barro 1991). There is also evidence economic freedom, a proxy for economic institutional quality, affects economic growth positively for all developing countries (Aisen and Veiga 2013).

The empirical analysis is extended to address the question of whether human development and financial development are important for OIC countries. If so, how do they differ from non-OIC countries and whether the effect differs across OIC countries? In applying System-GMM on unbalanced panel estimation, there is concern about number of missing values. Moreover, it is very critical to maintain a sufficient number of cross-section observations. If there is an insufficient number of cross-section observations, the estimation may suffer from consistency problems and the coefficients of the independent variables may become critically downward biased. Therefore, it is important to introduce interaction terms rather than running separate regressions with a small number of countries or only OIC countries.²⁴³ Although Figure 26.1 provides no evidence for the significant differences, System-GMM estimation reported in Table 26.3 shows that economic growth is significantly lower in OIC countries compared to non-OIC countries. As expected, upper-income OIC countries are associated with higher growth rates than other developing countries.²⁴⁴ Asian OIC countries tend to have significantly higher growth rates while African OIC countries suffer from lower growth compared to other developing countries. Interestingly, countries with an Islamic banking sector grow significantly

243 For robustness tests, we have extensively use categorical by continuous and continuous by continuous interaction terms by dividing OIC countries into: Asian, African, lower income, lower middle-income, upper income, oil-dependent, presence of Islamic banking groupings.

244 The graph of other developing countries include rest of the developing OIC and non-OIC countries

Table 26.3: Economic Growth: OIC Countries 1996–2014.

	(14)	(15)	(16)	(17)	(18)
Economic Growth (t-1)	0.121*** [0.04]	0.138*** [0.03]	0.147*** [0.03]	0.102*** [0.03]	0.136*** [0.03]
GDP per capita	-1.433*** [0.39]	-1.822*** [0.44]	-1.793*** [0.52]	-2.779*** [0.66]	-1.725*** [0.45]
Capital investment (% of GDP)	5.839*** [1.69]	6.707*** [1.23]	7.592*** [1.47]	5.963*** [2.02]	5.756*** [1.77]
CO ₂ emissions per capita (m.ton)	0.153*** [0.06]	0.187*** [0.05]	0.118** [0.06]	0.250*** [0.07]	0.212*** [0.07]
Savings (% of GDP)	10.955** [4.22]	8.133** [3.15]	9.307** [4.26]	11.072** [4.98]	10.162** [4.82]
Unemployment rate (%)	-1.568* [0.85]	-1.273* [0.77]	-1.283 [1.02]	-0.508 [0.90]	-1.164 [0.79]
Economic Freedom (t-1)	2.796* [1.48]				
OIC Dummies					
OIC Dummy	-1.500* [0.90]				
Upper Income OIC Dummy		2.990*** [0.91]			
Asian OIC Dummy			2.355** [1.07]		
African OIC Dummy				-4.714** [2.03]	
Countries with Islamic Bank Presence Dummy					-2.039* [1.17]
Observations	525	528	528	528	528
Instruments	98	85	85	85	85
Number of Groups	107	108	108	108	108
Arellano-Bond: AR(1)	0.001	0.001	0.001	0.001	0.001
Arellano-Bond: AR(2)	0.186	0.312	0.362	0.202	0.281
Hansen test (p-val)	0.249	0.343	0.208	0.079	0.164

Notes:

- The System-GMM estimation for dynamic panel-data observations based on three-year non-overlapping averages from the sample period 1996 to 2014.
- All explanatory variables are treated as endogenous. The two-period lagged values are used as instruments in the first-difference equations and the one-period lagged first-differences are used in the levels equations.
- Two-step estimations are based on robust standard errors corrected for finite samples. Windmeijer correction and Hansen J tests support the validity of over-identifying restrictions.
- Second order autocorrelation of residuals is rejected for all estimation models.
- Standard errors are in brackets.: ***, 1%; **, 5%, and *, 10%.

lower than other developing nations. It is not clear whether the lower growth rates are achieved despite or because of the presence of Islamic banking sector.

To examine how the relationship between human development and economic growth in OIC regions differs from other developing countries, it is possible to include categorical-by-continuous interaction terms as presented in Tables 26.4 and 26.5.²⁴⁵ Health spending has significant effects on economic growth in OIC countries (Model 19 Table 26.4). Judging from Models 20 to 23 (Table 26.4), there is evidence that human capital accumulation, measured by the average number of years of schooling, affects economic growth significantly in Asian OIC countries than other developing countries. It is also found that tertiary school enrollment matters less for economic growth. It can be argued with respect to Asian OIC countries with lower levels of schooling, increase in one additional year of schooling can contribute greatly toward economic growth in the long run through an improvement in labor productivity. Sianesi and Van Reenen (2003) find similar results in their empirical study. Primary school enrollment has small but significant effect on economic growth in African countries while tertiary school enrollment affects economic growth with greater extent in African countries than other developing countries. The results reported in Table 26.5 (Models 24 to 27) suggest that an increase in primary school enrollment has significantly less effects on economic growth for lower and lower-middle-income OIC countries. As expected, secondary school enrollment affects economic growth more significantly in upper-income OIC countries than in other developing countries.

The evidence suggests also that an increase in health spending has significantly higher effects on economic growth in oil-dependent OIC countries and those associated with Islamic financial sector (Table 26.6). Similarly, primary and secondary school enrollment has lesser effect on economic growth for oil dependent countries and those associated with Islamic banking. Thus, it can be argued that undeveloped economies cannot absorb large number of graduates due to the lack of weak infrastructure, which cause brain drain, migration of qualified personnel from developing to developed countries. This has been a problem for many Muslim countries and it may be more acute for Asian and African Muslim countries. As education increases the quality of labor, higher education leads to higher productivity, thus higher growth. Therefore, in addition to the need to increase health spending, most developing OIC countries should focus on increasing average years of schooling and create employment opportunities to avoid brain drain.

The impact of how financial development affects economic growth in OIC countries compared to non-OIC developing countries is assessed with the estimation

²⁴⁵ To get the interaction term we multiply the variables originally included in the models. So interaction terms with human development variables are in their original form while financial development variables are in log form.

Table 26.4: Human Development and Economic Growth: OIC Regional Difference 1996–2014.

	(19)	(20)	(21)	(22)	(23)
Economic Growth (t-1)	0.250*** [0.07]	0.163*** [0.03]	0.296*** [0.09]	0.361*** [0.05]	0.260*** [0.09]
GDP per capita	-1.975*** [0.61]	-2.060*** [0.38]	-3.181*** [0.56]	-2.799*** [0.67]	-3.326*** [0.61]
Capital investment (% of GDP)	7.412*** [1.93]	5.926*** [1.52]	6.684*** [1.89]	4.240** [1.66]	6.901*** [2.34]
CO ₂ emissions per capita (m.ton)	0.283*** [0.07]	0.134*** [0.05]	0.210** [0.09]	0.202** [0.08]	0.226*** [0.07]
Savings (% of GDP)	14.218*** [3.94]	10.642*** [3.88]	14.875** [7.40]	14.079** [5.67]	14.596** [6.22]
Average Year of Schooling		0.175 [0.16]			
Primary School Enrollment (t-1)				0.117*** [0.03]	
Tertiary School Enrollment			0.087*** [0.03]		0.027 [0.03]
Health Spending (% of GDP)	-0.29 [0.35]				
OIC Dummy	-8.868*** [2.53]				
Asian OIC Dummy		-3.374 [2.47]	4.960*** [1.61]		
African OIC Dummy				6.843* [3.57]	-6.232*** [1.99]
OIC Dummy and Human Development Interactions					
OIC x Health Spending	1.152*** [0.39]				
OIC Regional Dummies and Human Development Interactions					
Asian OIC Dummy x Average Year of Schooling		0.576* [0.33]			
Asian OIC Dummy x Tertiary School Enrollment			-0.117** [0.05]		
African OIC Dummy x Primary School Enrollment				-0.085** [0.04]	
African OIC Dummy x Tertiary School Enrollment					0.207** [0.09]
Observations	532	470	425	480	425
Instruments	71	98	71	71	71
Number of Groups	109	101	105	106	105

Table 26.4 (continued)

	(19)	(20)	(21)	(22)	(23)
Arellano-Bond: AR(1)	0.002	0.001	0.006	0.005	0.009
Arellano-Bond: AR(2)	0.833	0.151	0.133	0.445	0.16
Hansen test (p-val)	0.092	0.198	0.11	0.209	0.125

Notes:

- The System-GMM estimation for dynamic panel-data observations based on three-year non-overlapping averages from the sample period 1996 to 2014.
- All explanatory variables are treated as endogenous. The two-period lagged values are used as instruments in the first-difference equations and the one-period lagged first-differences are used in the levels equations.
- Two-step estimations are based on robust standard errors corrected for finite samples. Windmeijer correction and Hansen J tests support the validity of over-identifying restrictions.
- Second order autocorrelation of residuals is rejected for all estimation models.
- Standard errors are in brackets.: ***, 1%; **, 5%, and *, 10%.

results in Models (33) to (39), which are reported in Table 26.7. It appears that the effect of M3 to GDP ratio has become insignificant but the interaction term is significant. This implies that financial development has significantly lesser effect on OIC countries than on non-OIC countries with the inclusion of the significant negative effects of M3 to GDP ratio in sample countries. At the same time, the ratios of domestic credit to private sector, bank deposit to GDP, and financial system deposits to GDP have significantly lesser effects on Asian OIC countries. However, for countries with Islamic finance sector, financial development brings significantly higher growth than for other developing countries (Model 39 Table 26.7). As argued earlier, the theoretical and empirical relationship between finance and growth is controversial with many studies confirm significant negative and negative non-linear relationship. In other words, the impact of finance on growth may be reversed after reaching a certain threshold. However, it can be also argued that financial development based on the genuine application of Islamic principles can stimulate economic growth as it encourages real sector connectivity and risk-sharing principles (Anwar 1987; Mirakhor 1993; Bacha and Mirakhor 2014).

4.1 Robustness Tests and Financial Development Transmission Channel

To further the analysis through robustness tests it is necessary to perform separate regressions by excluding high income OIC countries and Global Financial Crisis period 2008–2009. The results are consistent with previous evidence, especially when

Table 26.5: Human Development and Economic Growth: OIC Country Groups 1996–2014.

	(24)	(25)	(26)	(27)
Economic Growth (t-1)	0.344*** [0.05]	0.374*** [0.05]	0.340*** [0.03]	0.328*** [0.05]
GDP per capita	-3.011*** [0.70]	-3.105*** [0.88]	-2.800*** [0.75]	-3.102*** [0.73]
Capital investment (% of GDP)	4.988** [2.22]	5.294** [2.22]	3.487 [2.18]	4.052** [1.79]
CO ₂ emissions per capita (m.ton)	0.244*** [0.09]	0.128 [0.09]	0.260*** [0.08]	0.180** [0.09]
Savings (% of GDP)	12.485* [6.41]	9.02 [6.18]	12.489*** [4.65]	8.385* [4.92]
Unemployment rate (%)		-0.391 [0.94]		-0.657 [0.87]
Secondary School Enrollment		0.097*** [0.03]		0.064** [0.03]
Primary School Enrollment (t-1)	0.114*** [0.03]		0.113*** [0.03]	
Lower Income OIC	7.623* [4.45]			
Lower Middle Income OIC		6.830* [3.61]		
Upper Income OIC			37.656** [17.18]	-6.38 [4.42]
OIC Country Dummies and Human Development Interactions				
Lower Income OIC x Primary School Enrollment	-0.101** [0.05]			

(continued)

Table 26.5 (continued)

	(24)	(25)	(26)	(27)
Lower Middle Income OIC x Secondary School Enrollment		-0.109** [0.05]		
Upper Income OIC x Primary School Enrollment			-0.337* [0.17]	
Upper Income OIC x Secondary School Enrollment				0.097* [0.06]
Observations	480	445	480	445
Instruments	71	80	71	80
Number of Groups	106	104	106	104
Arellano-Bond: AR(1)	0.006	0.002	0.004	0.002
Arellano-Bond: AR(2)	0.478	0.415	0.447	0.394
Hansen test (p-val)	0.255	0.073	0.126	0.061

Notes:

- The System-GMM estimation for dynamic panel-data observations based on three-year non-overlapping averages from the sample period 1996 to 2014.
- All explanatory variables are treated as endogenous. The two-period lagged values are used as instruments in the first-difference equations and the one-period lagged first-differences are used in the levels equations.
- Two-step estimations are based on robust standard errors corrected for finite samples. Windmeijer correction and Hansen J tests support the validity of over-identifying restrictions.
- Second order autocorrelation of residuals is rejected for all estimation models.
- Standard errors are in brackets.: ***, 1%; **, 5%, and *, 10%.

Table 26.6: Human Development and Economic Growth: OIC Oil Dependent and Islamic Finance Presence 1996–2014.

	(28)	(29)	(30)	(31)	(32)
Economic Growth (t-1)	0.152*** [0.04]	0.388*** [0.04]	0.286*** [0.07]	0.375*** [0.05]	0.268*** [0.06]
GDP per capita	-2.424*** [0.44]	-2.457*** [0.67]	-1.369** [0.60]	-2.971*** [0.72]	-1.461** [0.66]
Capital investment (% of GDP)	5.748*** [1.70]	4.516** [2.21]	9.402*** [1.79]	6.008*** [2.20]	8.319*** [2.54]
CO ₂ emissions per capita (m.ton)	0.165*** [0.05]	0.166*** [0.05]	0.203*** [0.07]	0.219*** [0.07]	0.258*** [0.08]
Savings (% of GDP)	12.143*** [4.08]	18.485*** [6.37]	12.202*** [3.47]	7.506* [4.36]	12.279** [4.84]
Average Year of Schooling	0.25 [0.17]				
Unemployment rate (%)				-0.9 [1.03]	
Primary School Enrollment (t-1)		0.115*** [0.03]			
Secondary School Enrollment				0.098*** [0.03]	
Health spending (% of GDP)			-0.01 [0.32]		-0.32 [0.29]
Oil-dependent OIC Dummy	-4.866* [2.83]	17.959* [9.27]	-6.468* [3.34]		
Islamic Bank Presence OIC				6.345** [2.97]	-10.210*** [3.53]
Human development and oil dependent and Islamic finance presence OIC					
Oil dependent OIC Dummy x Average Year of Schooling	0.713* [0.37]				
Oil dependent OIC Dummy x Primary School Enrollment		-0.178* [0.10]			
Oil dependent OIC Dummy x Health spending			1.189* [0.64]		
Islamic Bank Presence OIC x Secondary School Enrollment				-0.086** [0.04]	
Islamic Bank Presence OIC x Health spending					1.015* [0.59]
Observations	470	480	532	445	532
Instruments	98	71	71	80	71
Number of Groups	101	106	109	104	109

Table 26.6 (continued)

	(28)	(29)	(30)	(31)	(32)
Arellano-Bond: AR(1)	0.001	0.004	0.001	0.002	0.001
Arellano-Bond: AR(2)	0.123	0.527	0.904	0.365	0.747
Hansen test (p-val)	0.18	0.067	0.078	0.058	0.052

Notes:

- The System-GMM estimation for dynamic panel-data observations based on three-year non-overlapping averages from the sample period 1996 to 2014.
- All explanatory variables are treated as endogenous. The two-period lagged values are used as instruments in the first-difference equations and the one-period lagged first-differences are used in the levels equations.
- Two-step estimations are based on robust standard errors corrected for finite samples. Windmeijer correction and Hansen J tests support the validity of over-identifying restrictions.
- Second order autocorrelation of residuals is rejected for all estimation models.
- Standard errors are in brackets.: ***, 1%; **, 5%, and *, 10%.

the observations related to the Global Financial Crisis. Moreover, interaction terms between financial developments with control variables such as M3 \times unemployment rate as additional explanatory variables apart from the standard variables used in the growth equation.²⁴⁶ The financial development and macroeconomic indicators are included independently in the regression for two primary reasons. First, the significance of the interaction terms may be the result of the omission of these variables. It is possible to test jointly whether these variables affect growth directly or through the interaction terms. Second, these variables ensure that the interaction term do not proxy for financial development indicators or macro variables. These variables are included in the estimation models independently. From the model specifications 40 to 45, reported in Table 26.8, it is clear that upon including interaction terms, all indicators of financial development change sign and become statistically significant at the conventional level, except for domestic credit to the private sector (model 40) and the ratio of bank deposits to GDP (model 44). The coefficient of the interaction term between M3 and Unemployment rate (model 40) is found to be statistically significant and negative, but the individual coefficients are associated with positive sign and are significant at the conventional levels. In other words, the effects of financial development and unemployment rate are not weakened when the interaction terms are included in the model.

²⁴⁶ Given the evidence of significantly negative relationship between financial development and economic growth in sample developing countries, it is important to investigate how financial development could affect economic growth indirectly.

Table 26.7: Financial Development and Economic Growth: OIC Countries 1996–2014.

	(33)	(34)	(35)	(36)	(37)	(38)	(39)
Economic Growth (t-1)	0.263*** [0.07]	0.235*** [0.06]	0.255*** [0.06]	0.254*** [0.06]	0.271*** [0.07]	0.233*** [0.07]	0.221*** [0.07]
GDP per capita	-1.378** [0.61]	-2.926*** [0.68]	-2.252*** [0.56]	-2.225*** [0.56]	-1.209** [0.59]	-1.254** [0.56]	-1.199** [0.51]
Capital investment (% of GDP)	7.805*** [2.08]	5.114** [2.04]	6.427*** [2.16]	6.468*** [2.14]	8.556*** [2.14]	8.280*** [2.18]	7.912*** [1.95]
CO ₂ emissions per capita (m.ton)	0.113 [0.08]	0.243*** [0.07]	0.171*** [0.06]	0.167*** [0.06]	0.045 [0.09]	0.064 [0.08]	0.057 [0.07]
Savings (% of GDP)	12.501*** [4.24]	14.244*** [4.13]	12.995*** [3.45]	12.991*** [3.43]	11.797** [4.77]	12.521** [4.77]	13.050*** [3.83]
Lag M3 (% of GDP) (t-1)	0.63 [0.85]				0.558 [0.82]		
Domestic Credit to Private Sector		1.569* [0.82]					
Bank Deposit (% of GDP) (-1)			1.136 [1.04]				
Bank Deposit (% of GDP)				1.087 [1.04]		-0.655 [1.38]	-2.514* [1.51]
Financial System Deposit (% of GDP)							
OIC Dummy	8.286* [4.95]						
Asian OIC Dummy		14.249**	15.813**	15.748**			

(continued)

Table 26.7 (continued)

	(33)	(34)	(35)	(36)	(37)	(38)	(39)
Lower Middle Income OIC		[7.18]	[7.05]	[7.13]		15.639** [7.20]	12.111* [7.09]
Islamic Bank Presence OIC							-10.109** [4.71]
Financial Development and growth in OIC							
OIC Dummy x	-2.570*						
M3 (% of GDP)	[1.35]						
Asian OIC Dummy x		-3.758*					
Domestic Credit to Private Sector		[2.18]					
Asian OIC Dummy x			-3.984*				
Bank Deposit (% of GDP)			[2.21]				
Asian OIC Dummy x				-3.949*			
Financial System Deposit (% of GDP)				[2.23]			
Lower Middle Income OIC x					-5.028** [2.12]		
M3 (% of GDP)							
Lower Middle Income OIC x						-4.022* [2.11]	
Bank Deposit (% of GDP)							
Islamic Bank Presence OIC x							3.028** [1.46]
Bank Deposit (% of GDP)							
Observations	528	533	523	523	528	523	523
Instruments	71	71	71	71	71	71	71
Number of Groups	108	109	107	107	108	107	107

Arellano-Bond: AR(1)	0.002	0.001	0.001	0.001	0.002	0.002	0.002
Arellano-Bond: AR(2)	0.921	0.558	0.733	0.723	0.986	0.779	0.566
Hansen test (p-val)	0.091	0.275	0.078	0.078	0.06	0.092	0.067

Notes:

- The System-GMM estimation for dynamic panel-data observations based on three-year non-overlapping averages from the sample period 1996 to 2014.
- All explanatory variables are treated as endogenous. The two-period lagged values are used as instruments in the first-difference equations and the one-period lagged first-differences are used in the levels equations.
- Two-step estimations are based on robust standard errors corrected for finite samples. Windmeijer correction and Hansen J tests support the validity of over-identifying restrictions.
- Second order autocorrelation of residuals is rejected for all estimation models.
- Standard errors are in brackets.: ***, 1%; **, 5%, and *, 10%.

Table 26.8: Transmission Channels Financial Development and Economic Growth: Developing Countries 1996–2014.

	(40)	(41)	(42)	(43)	(44)	(45)
Economic Growth (t-1)	0.238*** [0.06]	0.280*** [0.07]	0.200*** [0.06]	0.201*** [0.06]	0.216*** [0.07]	0.221*** [0.06]
GDP per capita	-1.092** [0.48]	-2.053** [0.80]	-1.030* [0.54]	-1.070* [0.55]	-1.091** [0.47]	-0.917 [0.61]
Capital investment (% of GDP)	8.092*** [1.72]	6.585*** [2.15]	9.966*** [2.20]	9.907*** [2.16]	8.381*** [2.04]	20.215*** [7.44]
CO ₂ emissions per capita (m.ton)	0.021 [0.08]	1.204* [0.65]	0.048 [0.06]	0.05 [0.06]	0.031 [0.07]	0.032 [0.07]
Savings (% of GDP)	12.640*** [3.89]	13.752*** [4.89]	21.302*** [5.49]	20.889*** [5.51]	11.963*** [4.02]	9.495* [4.93]
Unemployment rate (%)	8.741*** [3.29]	-0.619 [0.95]	-1.145 [0.97]	-1.147 [0.96]	6.911** [3.48]	-1.811* [1.00]
M3 (% of GDP)	0.656* [0.37]					
Domestic Credit to Private Sector		0.235 [0.20]				
Financial System Deposit (% of GDP)			1.553*** [0.53]			
Bank Deposit (% of GDP)				1.469*** [0.51]	0.522 [0.39]	1.455* [0.83]
Transmission Channels						
M3 x Unemployment rate	-2.709*** [0.88]					
Domestic Credit to Private Sector x CO ₂		-0.287* [0.17]				
Financial System Deposit x Savings (% of GDP)			-2.547*** [0.81]			

In contrary, the evidence suggests that we observed that when the interaction terms between domestic credit to private sector and CO2 emissions are included, the coefficient is negative and significant at 10% level. The positive coefficient on domestic credit to private sector is insignificant. In other words, the direct effects of financial development on growth seems to be suppressed or weakened when the interaction terms are included, whereas industrialization still plays a significant role in economic development. The interaction terms between financial system deposit and savings are found to be negative and statistically significant whereas the coefficients on financial system deposit and savings to GDP remain statistically significant. Moreover, the effects of savings to GDP increase in association with the inclusion of the interaction term. In other words, financial development has positive effects on economic growth with the inclusion of the interaction terms.

Therefore, it can be argued that though the indirect effects of financial development, macroeconomic stability, industrialization, and capital formation are negative, the direct contribution of financial development on growth is positive and significant and magnitude of macroeconomic stability, industrialization, and capital formation increases significantly. It is often argued in the related literature that a developed financial system contributes toward channeling savings from surplus units to deficit units, which increases efficiency and ensures the allocation of resources for securing economic growth. However, most developing countries have low levels of financial development in terms of depth and access to finance. Thus, without therefore without macroeconomic stability, a mere increase in labor productivity through human capital accumulation, technological innovation, industrialization and strong capital base these countries may not be effective. Financial development alone may not be enough to spur economic growth in the long run.

5 Conclusions

The principal factors that deter economic growth in Muslim countries may not be different from those undermining development in non-Muslim countries. But most OIC countries have long been suffering from extreme poverty, rampant corruption, high political instability, civil wars and foreign invasions and they are naturally lagging behind other developing countries in terms of economic growth.²⁴⁷ At the same time, many Muslim countries have failed to develop human capital, one of the most fundamental Islamic development indicators. Lower levels of financial development in OIC countries are also evident from the evidence presented in this study. The results indicate also that the development of Islamic finance contributes

²⁴⁷ Many Muslim countries are suffering from political turmoil and rise of extremism, greatly affected and somewhat lost their growth trajectory.

positively to economic growth (Imam and Kpodar 2016). Financial development seems to affect economic growth more significantly at higher level in countries with the stronger presence of Islamic finance. It is difficult, however, to draw strong claims from weak inferences limited to a small number of countries and still very insignificant compared to its conventional counterpart.

By estimating dynamic system-GMM on 118 countries including 54 OIC countries between 1996 and 2014, this study empirically analyzed whether human development and financial development have contributed to economic growth in developing countries in general and OIC countries in particular. The estimation results indicated that there is a positive relationship between human development indicators (average year of schooling, primary, secondary and tertiary school enrollment and health spending to GDP) and economic growth. Most importantly, from the beginning of the twenty-first century, the per capita real GDP growth rates in OIC Asian countries have been rising significantly but still at slower rates than other developing countries. On the other hand, financial development (domestic credit to private sector, M3, banking deposit and financial system deposits to GDP) and economic growth are found to be negatively correlated but bank cost to income, which is a measure of financial system efficiency, is found to be positively correlated with economic growth. Our empirical evidence is consistent with the results of Hao (2006), Hasan et al. (2009) and Xu (2016). Furthermore, there is evidence that non-linear negative relationships between domestic credit to private sector and economic growth, and M3 and economic growth. As most of the OIC countries, besides oil rich GCC,²⁴⁸ Malaysia and Turkey, have rather weak financial sector and relatively weaker capital markets in terms of depth, access and efficiency (Beck et al. 2000; Demirguc-Kunt and Levine 2004). Beck et al. (2007) argue that if financial development increases average growth only by increasing the incomes of the rich and hence by increasing income inequality, then financial development will not help those with lower incomes.

Therefore, in addition to an increase in health spending, most developing OIC countries should focus on increasing investment in human capital accumulation. They should also develop production and services industry to create employment opportunities for graduates to avoid brain drain. At the same time, OIC countries should develop the Islamic finance industry based on the principles of risk-sharing and close relationship with the real economy instead of pursuing rent-seeking activities similar to conventional finance. The focus should be made also on institutional development, macroeconomic stability, capital formation, and industrialization, which are crucial for growth in Muslim countries.

248 GCC stands for Gulf Cooperation Council and consists of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and UAE.

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Appendices

Appendix 1: Variable definition, source and expected coefficient sign

	Definition and Source	Expected sign
Dependent Variable		
Economic Growth	Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. Source: The World Bank	(+)
Independent Control Variable		
Log GDP Per Capita	GDP per capita is gross domestic product divided by midyear population. Data are in constant 2010 U.S. dollars. Source: The World Bank	(+/-)
Log Capital Investment to GDP	Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Source: The World Bank	(+)
CO ₂ Emission Per Capita	Carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring. Source: The World Bank	(+/-)
Log Savings (% of GDP)	Gross savings are calculated as gross national income less total consumption, plus net transfers. Source: The World Bank	(+)
Unemployment rate (%)	Unemployment refers to the share of the labor force that is without work but available for and seeking employment.	(-)
Log Economic Freedom Index	The Overall index of economic freedom has ten components grouped into four broad categories: Rule of Law; Limited Government; Regulatory Efficiency and Open Markets. The overall economic freedom is scored on a scale of 0 to 100, where 100 represents the maximum freedom. Source: The Heritage Foundation	(+)
Financial development indicators (Financial depth)		
Log Domestic credit to private sector (% of GDP)	Domestic credit to private sector refers to financial resources provided to the private sector. Source: Global Financial Development Database (GFDD)	(+/-)

Appendix 1 (continued)

	Definition and Source	Expected sign
Log M3 (% of GDP)	Ratio of liquid liabilities to GDP. They are the sum of currency and deposits in the central bank (M0), plus transferable deposits and electronic currency (M1), plus time and savings deposits, foreign currency transferable deposits, certificates of deposit, and securities repurchase agreements (M2), plus travelers checks, foreign currency time deposits, commercial paper, and shares of mutual funds or market funds held by residents. Source: GFDD	(+/-)
Log Bank deposits (% of GDP)	The total value of demand, time and saving deposits at domestic deposit money banks as a share of GDP. Deposit money banks comprise commercial banks and other financial institutions that accept transferable deposits, such as demand deposits. Source: GFDD	(+/-)
Log Financial system deposits (% of GDP)	Demand, time and saving deposits in deposit money banks and other financial institutions as a share of GDP. Source: GFDD	(+/-)
Financial development indicators (Financial System Efficiency)		
Log Bank cost to income ratio (%)	Operating expenses of a bank as a share of sum of net-interest revenue and other operating income. Source: GFDD	(+/-)
Human development indicators		
Average Year of Schooling ²⁴⁹	Average number of years of education received by people ages 25 and older, converted from education attainment levels using official durations of each level. Source: Barro and Lee (2013).	(+)
Primary School Enrollment	Gross enrolment ratio (GER). Primary. Total is the total enrollment in primary education, regardless of age, expressed as a percentage of the population of official primary education age. GER can exceed 100% due to the inclusion of over-aged and under-aged students because of early or late school entrance and grade repetition. Source: UNESCO	(+)

²⁴⁹ Average Year of Schooling data is available from 1980 but with an interval of 5 years till 2005 after that yearly data are available. When calculating 3 year average, for the period of 1996 and 2002, we take the average of 1990 and 2000, 2000 and 2005, respectively.

Appendix 1 (continued)

	Definition and Source	Expected sign
Secondary School Enrollment	Gross enrolment ratio. Secondary. All programmes. Total is the total enrollment in secondary education, regardless of age, expressed as a percentage of the population of official secondary education age. GER can exceed 100% due to the inclusion of over-aged and under-aged students because of early or late school entrance and grade repetition. Source: UNESCO	(+)
Tertiary School Enrollment	Total enrollment in tertiary education (ISCED 5 to 8), regardless of age, expressed as a percentage of the total population of the five-year age group following on from secondary school leaving. Source: UNESCO	(+)
Health spending (% of GDP)	Total health expenditure is the sum of public and private health expenditure. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation. Source: The World Bank	(+)

Appendix 2: List of countries in the study

Non-OIC		OIC	
Andorra	Lesotho	Afghanistan	Libya
Angola	Liberia	Albania	Malaysia
Argentina	Macedonia	Algeria	Maldives
Armenia	Malawi	Azerbaijan	Mali
Bahamas	Malta	Bahrain	Mauritania
Barbados	Mexico	Bangladesh	Morocco
Belarus	Moldova	Benin	Mozambique
Belize	Mongolia	Brunei	Niger
Bhutan	Montenegro	Burkina Faso	Nigeria
Bolivia	Namibia	Cameroon	Oman
Bosnia and Herzegovina	Nepal	Chad	Pakistan
Botswana	Nicaragua	Comoros	Qatar
Brazil	Panama	Djibouti	Saudi Arabia
Burma (Myanmar)	Papua New Guinea	Egypt	Senegal
Cambodia	Paraguay	Gabon	Sierra Leone
Chile	Peru	Gambia	Sudan
China	Philippines	Guinea	Suriname
Colombia	Puerto Rico	Guyana	Syria
Croatia	Romania	Indonesia	Tajikistan

Appendix 2 (continued)

Non-OIC		OIC	
Dominican Republic	Russia	Iran	Togo
Ecuador	Rwanda	Iraq	Tunisia
El Salvador	Samoa	Ivory Coast	Turkey
Eritrea	Serbia	Jordan	Turkmenistan
Fiji	South Africa	Kazakhstan	Uganda
Ghana	Sri Lanka	Kuwait	United Arab
Honduras	Tanzania	Kyrgyzstan	Emirates
Hungary	Thailand	Lebanon	Uzbekistan
India	Ukraine		Yemen
Jamaica	Uruguay		
Kenya	Venezuela		
Kiribati	Vietnam		
Laos	Zambia		
Oil Dependent OIC		OIC Islamic Bank Presence	
Albania	Libya	Bahrain	Maldives
Algeria	Malaysia	Bangladesh	Mauritania
Azerbaijan	Mauritania	Brunei	Nigeria
Bahrain	Nigeria	Egypt	Oman
Brunei	Oman	Gambia	Pakistan
Cameroon	Qatar	Indonesia	Qatar
Chad	Saudi Arabia	Iran	Saudi Arabia
Egypt	Sudan	Iraq	Senegal
Gabon	Suriname	Ivory Coast	Sudan
Indonesia	Syria	Jordan	Syria
Iran	Tunisia	Kuwait	Tunisia
Iraq	Turkmenistan	Lebanon	Turkey
Ivory Coast	United Arab Emirates	Malaysia	United Arab Emirates
Kazakhstan	Uzbekistan		Yemen
Kuwait	Yemen		

Appendix 3: Descriptive statistics and correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
OIC																	
Mean	4.95	6887.70	22.82	5.04	20.42	9.20	55.00	5.84	95.19	58.38	17.77	5.09	27.77	44.44	36.10	36.18	51.76
Std. Dev.	6.47	12830.83	8.66	9.53	14.77	6.16	8.99	2.79	20.43	29.80	14.52	2.07	24.53	35.42	34.09	34.09	16.56
Minimum	-62.08	207.78	-2.42	0.01	-24.92	0.30	16.00	0.70	22.20	5.13	0.21	1.87	0.56	6.06	1.84	1.84	0.00
Maximum	104.49	74632.24	60.16	68.70	73.91	32.50	78.00	11.20	144.10	111.15	78.98	13.73	158.51	252.72	245.43	245.43	120.14
Observations	996	988	958	876	767	1026	912	595	828	679	628	1013	950	921	925	925	897
Non-OIC																	
Mean	4.44	5561.17	23.62	2.50	19.89	9.54	57.62	7.44	105.70	72.91	29.66	6.11	38.64	44.09	35.62	35.84	56.18
Std. Dev.	5.85	6954.61	8.27	2.48	10.46	7.43	9.41	2.43	14.37	23.51	21.77	1.98	32.50	29.80	23.40	23.37	16.94
Minimum	-30.15	122.49	1.53	0.06	-37.34	0.10	21.00	2.05	45.43	5.22	0.30	1.56	1.39	7.24	1.94	1.94	0.00
Maximum	106.28	48195.41	74.82	12.65	60.27	39.30	79.00	11.70	165.65	110.76	91.03	14.39	268.05	182.73	140.61	140.61	218.09
Observations	1200	1209	1101	996	1018	1159	1093	657	993	840	728	1210	1127	1114	1104	1104	1103
Economic Growth (1)																	
GDP per capita (2)	-0.121	1.000															
Capital Investment (3)	0.135	0.108	1.000														
CO ₂ (4)	0.028	0.629	0.109	1.000													
Savings (5)	0.052	0.410	0.366	0.420	1.000												
Unemployment rate (6)	-0.076	0.136	0.058	-0.195	-0.067	1.000											
Economic freedom (7)	0.125	-0.457	-0.053	-0.267	-0.105	0.084	1.000										
Average Year of Schooling (8)	-0.086	0.662	0.161	0.334	0.207	0.233	-0.357	1.000									

(continued)

Appendix 3 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Primary School Enrollment (9)	0.005	0.283	0.115	0.086	0.079	0.003	-0.161	0.225	1.000								
Secondary School Enrollment (10)	-0.136	0.773	0.052	0.422	0.207	0.132	-0.389	0.851	0.377	1.000							
Tertiary School Enrollment (11)	-0.161	0.574	0.015	0.191	0.062	0.169	-0.239	0.706	0.205	0.724	1.000						
Health spending (12)	-0.050	-0.079	-0.015	-0.220	-0.397	0.197	-0.040	0.020	0.138	0.144	0.273	1.000					
Domestic Credit to Private Sector (12)	-0.115	0.515	0.156	0.247	0.187	-0.023	-0.506	0.459	0.230	0.530	0.392	0.134	1.000				
M3 (13)	-0.143	0.447	0.204	0.243	0.251	-0.045	-0.345	0.259	0.138	0.358	0.202	0.050	0.762	1.000			
Bank Deposits (14)	-0.174	0.532	0.180	0.278	0.227	-0.019	-0.481	0.343	0.227	0.444	0.271	0.082	0.788	0.927	1.000		
Financial System Deposits (15)	-0.176	0.529	0.175	0.276	0.227	-0.018	-0.476	0.341	0.230	0.442	0.269	0.083	0.790	0.926	0.999	1.000	
Bank Cost to Income Ratio (16)	0.048	-0.248	-0.181	-0.258	-0.347	0.044	0.006	-0.037	-0.003	-0.022	0.097	0.195	-0.107	-0.255	-0.179	-0.180	1.000