Nonlinear Relationship between Financial Development and Economic Growth: Evidence from Post Global Financial Crisis Panel Data

(Hubungan Tidak Linear antara Pembangunan Kewangan dengan Pertumbuhan Ekonomi: Bukti Data Panel Selepas Krisis Kewangan Global)

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ABSTRACT

Existing studies find that the nonlinear relationship between financial development and economic growth is inverted U-shaped or there exist Kuznets curve, where financial development harm growth after surpassed the threshold point. The objective of this study is to re-estimate the existing relationship between financial development and economic growth for 65 developing countries for the period post 2007-2008 Global Financial Crisis starts from 2009-2015 using Generalized Method-of-Moment (GMM). Three financial development indicators namely, domestic credit to private sector (DCPS), liquid liabilities (LL) and private credit to deposit money (PCDM) are used in this study. However, our findings are contrary to the previous study. Interestingly, our result shows that the nonlinear relationship between financial development and economic growth is U-shaped for all indicators. In other words, financial development accelerated economic growth after reaching the turning point. The results of U-test of Lind and Mehlum (2010) confirms that the U-shaped relationship exist. It shows that the higher financial development enhance the performance of economic growth. Thus, our results challenge the previous findings and recommend for policy review.

Keywords: Financial development; economic growth; nonlinear; U-shaped

ABSTRAK

Kajian lepas telah membuktikan bahawa hubungan tidak linear antara pembangunan kewangan dan pertumbuhan ekonomi adalah berbentuk-U terbalik atau wujud keluk Kuznets, yang mana pembangunan kewangan akan menjejaskan pertumbuhan ekonomi apabila ia melepasi suatu tahap ambang. Objektif kajian ini adalah untuk menganggar semula hubungan antara pembangunan kewangan dan pertumbuhan ekonomi bagi 65 buah negara membangun bagi tempoh selepas Krisis Kewangan Dunia 2007-2008 bermula dari tahun 2009-2015 dengan menggunakan Kaedah Momen Teritlak (GMM). Tiga penunjuk pembangunan kewangan iaitu kredit domestik kepada sektor swasta (DCPS), liabiliti kecairan (LL) dan kredit swasta kepada wang deposit (PCDM) digunakan dalam kajian ini. Namun begitu, dapatan kajian ini adalah bercanggah dengan kajian yang lepas. Menariknya, dapatan kajian ini menunjukkan hubungan tidak linear antara pembangunan kewangan dengan pertumbuhan ekonomi adalah secara tidak linear dan keluknya berbentuk-U bagi semua penunjuk pembangunan kewangan. Dalam erti kata lain, pembangunan kewangan mempercepatkan pertumbuhan ekonomi apabila ia melepasi suatu titik ambang. Keputusan daripada ujian-U daripada Lind dan Mehlum (2010) juga mengesahkan wujud hubungan berbentuk-U. Ia menunjukkan bahawa tahap pembangunan kewangan yang tinggi akan meningkatkan prestasi pertumbuhan ekonomi. Ini bermakna penemuan dalam kajian ini mencabar dapatan kajian yang lepas dan mencadangkan agar dasar sedia ada dikaji semula.

Kata kunci: Pembangunan kewangan; pertumbuhan ekonomi; tidak linear; bentuk-U

INTRODUCTION

It is a fact that financial development is a key determinant of economic growth (Al-Yousif 2002; Beck & Levine 2004; Bertocco 2008; Demetriades & Hussein 1996; Hassan et al. 2011; Jalil et al. 2010; Kemal et al. 2008; King & Levine 1993a, 1993b; Levine 1997, 2003; Levine et al. 2000; McKinnon 1993; Rajan

& Zingales 1998; Rahaman 2011) in accordance with the pioneering work of Schumpeter (1911) and the later proposition of 'more finance, more growth' by Levine (2003). These studies however assumed the link between the persistence of finance-growth along time or linear relationship.

A number of studies have however shown that the effect of financial development on economic growth is also conditional on many other factors rather than by itself alone. These included the thresholds of other variables such as inflation (Rousseau & Wachtel 2002; Yilmazkuday 2011), government size, trade openness and income per capita (Yilmazkuday 2011), financial sector policies (Abiad & Mody 2005; Ang 2008), legal systems (Porta et al. 1997, 1998), government ownership of bank (Andrianova et al. 2008; Porta et al. 2002), culture (Stulz & Williamson 2003), trade and financial openness (Law 2009; Rajan & Zingales 2003), remittances (Demirguc-Kunt et al. 2011), political institutions (Girma & Shortland 2008; Huang et al. 2010; Roe & Siegel 2011;), and institutional quality (Law & Azman-Saini 2012; Law, et al. 2013; Law, et al. 2017). The influence of these mediating variables indicate that the role of financial development is subjected to the prevailing economic condition. The sensitive and fragile nature of financial development on economic growth was pointed out by Ibrahim (2007) and Loayza and Ranciere (2006).

The 2007-2008 Global Financial Crisis has however led both academics and policymakers to reassess their prior conclusions (Law & Singh 2014). According to Calomiris (2009), the increase in subprime felony rates in the spring of 2007 cause the ensuing liquidity crunch in late 2007. The developing countries were impacted by the consequent collapse in open economies from the crisis. The impact was mediated mainly through rapid financial spillovers and others through the subsequent collapse in global trade. The crisis had demonstrated the risks that malfunctioning financial systems can directly and indirectly waste resources, dampen saving and encourage speculation, resulting in underinvestment and a misallocation of scarce resources (Law & Singh 2014). The drastic falls in real sector activity during the crisis, due to negative impact of financial turmoil, but contemporaneous with rapid financial spillovers highlighted the need of analysis in nonlinearity of finance-growth relationship in this study. By assuming that the relationship between financial development and growth is a positive and linear relationship, the rapid financial spillovers during the 2007-2008 Global Financial Crisis may reflected that the policy makers have taken the wrong decisions.

Ang (2008) emphasized that an appropriate specification of the functional form is critical in understanding the relationship between financial development and growth since several studies have shown that the finance-growth nexus may be nonlinear, thus necessitating more research to be conducted in this area. A non-linear relationship is more realistic than a linear one since economic conditions seldom remain constant and may change abruptly thus impacting financial development's performance. If the relationship between finance and growth is assumed linear while in fact the relationship has regime-switching trigger, then the linear model may not be reliable. By using nonlinear properties, the relationship between finance and growth may have a threshold point, which is important to policy makers in order to control the amount of finance to be expanded. An adequate measurement is necessary to ensure the validity and reliability of estimation in nonlinearity of finance-growth relationship to serve as a reference for policy makers. A clear understanding of the relationship will enable policy makers to elucidate particular issues and make an adequate decisions on regulation, control and monitoring on activities of the financial intermediaries.

In recent literature by Arcand et al. (2015) and Cechetti and Kharroubi (2012), financial development was found to dampen economic growth if it surpassed the threshold point due to the 'vanishing effect'. The nonlinear relationship between finance and economic growth was shown as inverted U-shaped or Kuznets curve. This phenomena was due to the inefficiency of derivative market where the financial flow was not channelled in productive manner. Subsequently, the resultant high liquidity without adequate control and monitoring may cause the 'finance curse' or chains to the 'too much finance harm growth' propositions (Law & Singh 2014; Samargandi et al. 2015). In addition, Aghion et al. (2005) argued that the reason for the nonlinearity of the relationship between financial development and growth may cause the limitation of growth effect. The study by Asongu (2011) however, in a meta-analysis of financial development on economic growth, contradicted the relevancy of Schumpeter's (1911) pioneering work.

There are several causes of nonlinearity in finance-growth relationship of inverted U-shaped curve as highlighted in recent literature. An increase in financial development may not cause better growth due to corruption in the banking system, fragile rule enforcement, or political interference that may divert finance to unproductive or even wasteful activities (Law et al. 2017). In addition, business credit tends to facilitate investment loans, while household loans are used for personal consumption and non-productive activities (Hung 2009). In term of human capital, further development of finance tends to damage economic growth due to the financial sector not being able to absorb too many workers when the financial sector accounted for more than 3.9% of total employment (Cecchetti & Kharroubi 2012). De Gregorio and Guidotti (1995) pointed out that higher financial intermediation may have negative effects on growth

performance if the financial system was liberalized and allowed to operate under a poor regulatory environment. At a glance, these reasons indicated less control and monitoring of financial activities in a proper manner before an economic crisis occur. This led to the question of whether financial regulation was inefficient and whether policy makers did not take appropriate actions to address these issues prior to the 2007-2008 Global Financial Crisis?

The aftermath of the 2007-2008 Global Financial Crisis, the implications of finance and economic growth came under close scrutiny (Batuo & Asongu 2017). Financial activities were subjected to tighter control and monitoring following the 2007-2008 Global Financial Crisis. For example, Basel III implementation was associated with banking regulatory framework in June 2011 (Basel Committee and Banking Supervision 2010) and global capital and liquidity regulations in June 2013. To recover the financial health in developing countries the World Bank released the Global Trade Liquidity to address the shortage of finance in 2009 and the International Finance Corporation presented multilateral financing for the private sector in 2011. As a consequence no major financial crisis occurred since the 2007-2008 Global Financial Crisis. The present economic condition thus epitomises the financial-growth improvement following the 2007-2008 Global Financial Crisis and the nonlinearity in finance-growth as postulated may change due to occurrence in structural changes. In addition, Rahman and Shahari (2017) found financial integration was positively influenced the real sectors of ASEAN+3 economies after the financial cooperation agreement period from 1997 to 2015, but negatively affected during the pre-agreement period from 1992 to 1997. The sample of countries used by Rahman and Shahari (2017) included developing countries Philippines, Indonesia, Malaysia, China, and Thailand.

Since the hypotheses of 'more finance, more growth' (Levine 2003) and the recent 'too much finance harm economic growth' (Arcand et al. 2015; Law & Singh 2014) are contradictory, some doubts are created from previous findings (see Arcand et al. 2015; Cechetti & Kharroubi 2012; Law & Singh 2014; Samargandi et al. 2015). Law and Singh (2014) queried whether too much finance harm growth permanently or is mainly transitory? Thus, we extend the existing literature to examine the consistency of the 'too much finance harm growth' hypothesis by using the recent panel data for the period after the 2007-2008 Global Financial Crisis that covers the 2009-2015 period for developing countries. This analyses focuses on for developing countries where financial development provides key explanation of the economic growth determinant which may assist in attaining developed country status. The study hypothesises that if the nonlinearity in finance-growth relationship is consistent with the inverted U-shaped curve after the 2007-2008 Global Financial Crisis

then the 'too much finance harm growth' proposition permanently effect developing countries thus indicating that financial activities are not efficiently controlled and monitored. But if the nonlinearity in finance-growth relationship changes to U-shaped curve after the 2007-2008 Global Financial Crisis, then the 'too much finance harm growth' proposition is basically temporary in developing countries, indicating that the financial system is better in recent economies with contemporaneous economic growth. The global financial crisis in 2007-2008 was chosen as defining moment in this study for two reasons; because of the recent economic crisis and the 2007-2008 Global Financial Crisis which affected developing countries more relative to that of the Asian financial crisis. The objective of this study is to examine the consistency of nonlinear relationship between financial development and economic growth of inverted U-shaped curve as found from the previous studies (see Arcand et al. 2015; Cechetti & Kharroubi 2012; Law & Singh 2014; Samargandi et al. 2015) by using recent data after the 2007-2008 Global Financial Crisis, spanning 2009 to 2015, a latest period not being covered by previous studies. This study postulated the temporary effect of 'too much finance harm economic growth' hypothesis on the possibility of the result being U-shaped following 2007-2008 Global Financial Crisis, which may thus contrast with those from previous studies.

This paper provides new evidence that shed light on the impact of finance on growth nonlinearly after the 2007-2008 Global Financial Crisis period. Specifically, we examine the consistency of inverted U-shaped curve as discovered in previous studies. This relationship may be reliant on a country's level of financial development, where finance boost economic growth after a country's financial development reach a certain threshold level. The findings of the study may have important policy implications. If there is clear evidence that more financial development significantly dampens economic growth after exceeding the threshold level, then policy makers should suggest measures that strengthen the quality of finance rather than merely expanding the finance sector in promote economic growth. But if the evidence proved that financial development significantly enhance economic growth after surpassing a certain threshold level, then policy makers should advise for expanding the financial depth through tightening financial control sustaining quality of finance.

To achieve its objective the study was organized as follows: Section 1 addressed the research issue and the problem statement in an introduction. Section 2 discussed the relevant past studies and identified knowledge gap in the literature. Section 3 presents the data, empirical model and the econometric methods applied in this study. The empirical results and discussions are enclosed in Section 4. The last section provides a summary and conclusions.

LITERATURE REVIEW

The development of endogenous growth theory during the 1980s and 1990s (Bencivenga & Smith 1991; Blackburn & Hung 1998; Greenwood & Jovanovic 1990; King & Levine 1993) led to the construction of several models that incorporated financial institutions and described the mechanisms through which financial development could affect growth. Capital accumulation channel and total factor productivity channel has been identified as to how well-functioning financial systems would affect savings and allocation decisions. The capital accumulation was channelled to the local and foreign entrepreneurs who needed funds in order to invest leading to broader financial liberalisation. In addition, Goldsmith (1969) presented a positive correlation between the size of the financial system and long-run economic growth. While, King and Levine (1993) showed that financial depth was determinant of economic growth with positive relationship where the liquid liabilities was highly correlated with economic growth over the next 30 years. Goldsmith (1969) and King and Levine (1993), among others studied the chains of 'supply-leading' hypothesis as defined by Patrick (1966), that theorised a causal relationship from financial development to economic growth that indicates deliberate creation of financial institutions and markets that increase the supply of financial services and accordingly lead to real economic growth. In addition, financial development can reduce the volatility of the economy (Beck et al. 2013).

Calderón and Liu (2003), Luintel and Khan (1999) and Shan, et al. (2001) found bi-directional causality between financial development and economic growth. On the other hand, Ang and McKibbin (2007) with focus on the case of Malaysia, found that economic growth led to financial development that chains the 'demand-following' hypothesis. In contrast, Neusser and Kugler (1998), Rousseau and Wachtel (2000), and Choe and Moosa (1999) provided evidence that financial development led economic growth, that supported the 'supply-leading' hypothesis. Graff (2005) underlined the possibility of a causal relationship between financial development and economic growth and proposed three distinguishing perspectives. First, the provision of an inexpensive and reliable means of payment such as coins and later banking money, which historically came as a by-product of fractional reserve banking (Kindleberger 1993). Second, a volume effect, where financial activity increased savings where the resources can be channelled into investment and third, an allocation effect which improved the allocation of resources devoted to investment (Gurley & Shaw 1960). Based on the findings, all these studies suggested increase in well-developed financial development and supported the 'more finance, more growth' proposition. However, these studies also assumed a linear relationship between financial development and economic growth which persisted over time.

However, the study by Deidda and Fattouh (2002) found evidence of a nonlinear finance-growth relationship. Financial development has a positively significant impact on economic growth following specific threshold in economies with high initial per capita income. However, whereas in countries with low initial per capita income there seems to be no statistical significance. Rioja and Valev (2004a) found that the relationship between financial development and growth was not significant in low-income countries, but showed large positive and significant impact in intermediate-income countries. The impact was positive but rather small in high-income countries. Rioja and Valev (2004b) also highlighted that the impact of financial development on economic growth was positive but varied according to different levels of financial development. Furthermore, Graff (2005) showed that countries gain less from a given level of financial activity if it failed to keep up with balanced growth path. Meanwhile, Huang and Lin (2009) found a positive linkage between financial development and economic growth by using threshold regression with the instrumental variables as proposed by Caner and Hansen (2004). The positive effect was found larger in low-income countries compared with the high-income ones. Even though these studies indicated nonlinearity in the financial-growth relationship, but they used the interaction models rather than quadratic models.

The literature recorded contradictory evidence between empirical results that showed positive and negative effects of financial development on economic growth (e.g., Kaminsky & Reinhart 1999; Schularick & Taylor 2012). Loayza and Ranciere (2006) reconciled two contradictory findings where they found a positive long-run relationship but negative short-run relationship between financial depth and economic growth. Broner and Ventura (2010) argued that the financial liberalisation did not sustain the boost in economic growth due to the pro-cyclicality of the financial system which emerged as one of the main factors behind the Global Financial Crisis in 2007-2008. Rousseau and Wachtel (2011) found that the occurrence of the financial crises was related to the dampening of the effect of financial deepening on growth. Excessive financial deepening or too rapid growth of credit may lead to both inflation and weakened banking systems which in turn gave rise to financial crises. Hence, the positive externalities of financial development on economic growth seemed unworkable during financial crisis.

Based on these contradictory results on the effect of financial development on economic growth during the 2007-2008 Global Financial Crisis, academicians and policy makers were motivated to reconsider their prior conclusion on the 'more finance, more growth' proposition in order to identify the optimum level of financial development to spur economic growth. The study by Shen and Lee (2006) discovered patterns

on nonlinearity in the relationship between financial development and growth in the inverted U-shaped curve. Recent studies by Arcand et al. (2015), Cechetti and Kharroubi (2012), Law and Singh (2014), and Samargandi et al. (2015) showed that the relationship between finance and growth was nonlinear with inverted U-shaped or Kuznets curve, indicating that financial development can enhance economic growth up to a certain point. But if it surpassed the threshold level economic growth was dampened. The negative effect of nonlinearity in the finance-growth relationship beyond the threshold value was due to the 'vanishing effect' (Arcand et al. 2015). Law and Singh (2014) suggested the proposition of 'too much finance harm economic growth' based on the inverted U-shaped relationship in finance-growth. Arcand et al. (2015) estimated the cross-section and panel data for more than 100 developed and developing countries covering the period from 1960 to 2010 by using semi-parametric estimation to investigate the nonlinear relationship between finance and economic growth. While, Cechetti and Kharroubi (2012), Law and Singh (2014) and Sarmargandi et al. (2015) used panel data to examine the nonlinearity in financial development. Checetti and Kharroubi (2012) used pooled Ordinary Least Square with robust standard errors to estimate the nonlinear relationship in finance-growth in panel data for 50 developed and emerging countries over a non-overlapping 5-year period from 1980 to 2009. In an advanced econometric technique, Law and Singh (2014) used dynamic panel threshold of Kremer, Bick and Nautz (2013) to solve the endogeneity problem, and employed dynamic system generalized methods-of-moments (GMM) estimator for quadratic model to robust the results. The study by Law and Singh (2014) used panel data from 87 developed and developing countries. Recent study by Sarmargandi et al. (2015) examined the nonlinear relationship in finance and growth by using quadratic model. Panel data from 52 middle income countries were used cover the period from 1980-2008. However, these studies cover the duration of sample period from 1960 until the latest data in 2010 grouping together both developed and developing countries.

By considering the financial evolution after the 2007-2008 Global Financial Crisis, this paper foresees changes in finance-growth relationship in a nonlinear approach. Our study should thus fill up the gap in existing literature on three main aspects. First, the use of recent data of the period following the 2007-2008 Global Financial Crisis may elucidate further the recent economic condition and analyse the efficiency of financial development after the crisis. Second, we will investigate the consistency of the inverted U-shaped relationship recorded in previous literature for the period of the economic crisis in comparison with the period after the 2007-2008 Global Financial Crisis. The study will use the two-step system GMM estimator to estimate

the quadratic model and employ the U-test of Sasabuchi (1980) and Lind and Mehlum (2010) of to confirm the nonlinearity pattern in finance-growth relationship. Third, we will focus only on developing countries since financial development is as one of the determinant factors of economic growth that is necessary for these countries to attain the developed status.

MODEL SPECIFICATION AND DATA

MODEL SPECIFICATION

An endogenous growth theory emphasized the capital concept in growth models. The importance of capital in the production function of Y such as AK model adopted in Aghion and Howitt (1998) is given by

$$Y_t = AK_t \qquad (1)$$

where Y denotes the output, A is a constant that reflects the level of technology in the economy and is assumed to vary with time and K is capital. According to Hicks (1937) following AK model as applied by Jalil et al. (2010), a certain proportion of savings, the size of $(1 - \lambda)$ with $0 < \lambda < 1$, is the cost of financial intermediation per unit of savings. Therefore, the smaller the λ, the more efficient is the financial system. To indicate the changes of capital stock changes by $\dot{K}$ from dK/dt explain by $\dot{K} = \lambda sY - \delta K$. From Eq. (1), the growth rate of output per capita can be expressed as:

$$g_y = g_A + g_k \qquad (2)$$

where the growth rate of capital is

$$g_k = \frac{\dot{K}}{K} = \frac{\lambda S}{K} - \delta$$

by given $s = \frac{s}{Y} = \frac{s}{AK}$, therefore AK model can be written as:

$$\frac{\dot{K}}{K} = A\lambda s - \delta \qquad (3)$$

Eq. (2)-(3) expresses that economic growth per capita depends on the total factor productivity (A), the efficiency of financial intermediation (δ), and the rate of savings (s). When depreciation rate δ is assumed to be constant, economic growth depends on financial development. The level of be λ is determined by the level of financial development while g_k can be articulated as financial intermediation.

Translating the endogenous growth theory into baseline model by referring to Beck and Levine (2004), the impact of financial development on economic growth can be expressed as follows:

$$GROWTH_{it} = \beta_0 + \beta_1 FINDEV_{it} + \varphi_2 FDI_{it} +$$

$$\varphi_3 GFCF_{it} + \varphi_4 CPI_{it} + \varphi_5 HC_{it} + \varepsilon_{it} \qquad (4)$$

where, *GROWTH* indicates GDP per capita growth. *FINDEV* indicates the financial development proxy by three indicators namely, domestic credit to private sector by banks as a percentage share of GDP (DCPS), liquid liabilities as a percentage share of GDP (LL) and private sector credit to deposit money by banks and other financial institutions as a percentage share of GDP (PCDM), following Law and Singh (2014). All proxies DCPS, LL and PCDM are tested by a separated model, namely Model 1a, 1b and 1c, respectively, while the control variables, *FDI* indicates foreign direct investment inflows as a percentage to GDP; *GFCF* indicates gross fixed capital formation; *CPI* indicates consumer price index; and average years of schooling as a proxy for human capital, *HC*. All data is in natural logarithm except *GROWTH* and *HC*. Panel data is used to estimate Eq. (1), cross-sections are denoted by subscript $i(i = 1, 2, …, N)$ and time period by subscript $t(t = 1, 2, …, T)$. This study modifies the baseline model as proposed by Beck and Levine (2004) by augmenting the proxies of financial indicators of liquid liabilities and private credit by deposit money but eliminate the turnover ratio. We substitute the trade openness to foreign direct investment to represent the open economy as well as technological progress. We eliminate government consumption and black market premium and change to gross fixed capital formation to represent the domestic investment, which is more suitable to represent the capital stock. The reason for modification also due to data constraints among the sample countries in this study.

In addition, the dynamic effect of economic growth has to be considered where the growth in the current year depends on the growth in the previous year. Thus, the model can be written in a dynamic panel data form as follows:

$$GROWTH_{i,t} - GROWTH_{i,t-1} = (1 - \alpha)\ GROWTH_{i,t-1} + \beta_1 \ln FINDEV_{it} + \beta'X_{it} + \eta_i + \varepsilon_{it} \quad (5)$$

Equivalently, equation (5) can be written as follows:

$$GROWTH_{i,t} = \alpha GROWTH_{i,t-1} + \beta_1 \ln FINDEV_{it} + \beta'X_{it} + \eta_i + \varepsilon_{it} \quad (6)$$

where is a coefficient for lagged dependent that indicates the dynamic effect, *X* is a vector of control variables which comprises FDI, GFCF, CPI and HC as in Eq. (4). In the model using the semi log-linear specification in Eq. (6), η is the country specific effect and ε is the stochastic random term. The impacts of β_1 is expected to have a positive sign on the economic growth.

To investigate the 'too much finance' hypothesis, we employ the quadratic polynomial model. The model specification which is broadly similar to the existing studies (e.g., Checetti & Kharraoubi 2012; Arcand et al. 2015; Law & Singh 2014; Law et al. 2017) by using financial development squared () to capture the nonlinear effect of finance on economic growth and determine the U-shaped or inverted U-shaped relationship. By using

semi-log model and quadratic polynomial model, the study further tailored the Eq. (6) with respect to the hypothesis of 'too much finance' which can be written as:

$$GROWTH_{i,t} = \alpha GROWTH_{i,t-1} + \beta_1 \ln FINDEV_{it} + \beta_2 \ln FINDEV_{it}^2 + \beta'X_{it} + \eta_i + \varepsilon_{it} \quad (7)$$

If the conjecture of Kuznets (1955) is correct, which is the inverted-U-shaped association between financial development and economic growth, then the signs of the parameter β_1 and β_2 coefficients are positive and negative, respectively, and both are statistically significant, thus the 'too much finance' or 'finance curse' hypothesis is supported as proposed by Arcand et al. (2015) and Law and Singh (2017), respectively. On the other hand, if β_1 and β_2 coefficients are negative and positive, respectively, and both are statistically significant, which indicates a U-shaped relationship or anti-Kuznets, then the 'finance curse' hypothesis is not supported, but it upholds the proposition of 'more finance, more growth' by Levine (2003). If the true relationship between financial development and economic growth is non-monotone, the models that do not allow for non-monotonicity will lead to a downward bias in the estimated relationship between financial development and economic growth.

DATA DESCRIPTION

To estimate the model in Eq. (7) using the two-step system GMM estimator, this study employs panel data of 65 developing countries (as listed in Table 1) which covers a 7-year period following the 2007-2008 Global Financial Crisis, from 2009 until 2015. The choice of sample countries was based on availability of the data especially those on financial development for developing countries. The short period of the dataset was valid in the use of GMM estimator which required a large number of cross-section units (*N*) with a small number of time periods (*T*). This study therefore used a sample of 65 countries with a dataset sufficiently large (more than 50 countries) and suitable for GMM estimator and enabling robust conclusions to be elicited. The dependent variable was per capita GDP growth as measured by GDP per capita growth (US$ 2010 constant prices), and obtained from the 2017 version of World Development Indicators.

To measure financial development, the selection of finance indicators was crucial and subjected to the purpose of the study. One of the reasons for financial development having positive impact on growth is the financial resource allocation to productive use as generated by private sector rather than household sector. In addition, the economic activity in real sector encompassed more transactions that require the liquidity of finance in economy. Domestic credit to private sector provides the financial resources to channel funds to generate economic activities in a productive manner. This proxy is used by Hassan et al. (2011) and Law and Singh (2014) among others,

TABLE 1. The list of selected developing countries

No.	Country	No.	Country	No.	Country	No.	Country
1	Albania	18	Dominican Rep.	35	Mauritius	52	Senegal
2	Algeria	19	Ecuador	36	Mexico	53	Serbia
3	Armenia	20	Egypt	37	Moldova	54	Sierra Leone
4	Bangladesh	21	El Salvador	38	Mongolia	55	South Africa
5	Belize	22	Ghana	39	Morocco	56	Sri Lanka
6	Benin	23	Guatemala	40	Mozambique	57	Sudan
7	Bolivia	24	Guyana	41	Namibia	58	Tanzania
8	Botswana	25	Honduras	42	Nepal	59	Thailand
9	Brazil	26	India	43	Nicaragua	60	Togo
10	Burundi	27	Indonesia	44	Niger	61	Tunisia
11	Cambodia	28	Jordan	45	Pakistan	62	Turkey
12	Cameroon	29	Kazakhstan	46	Panama	63	Uganda
13	China	30	Kenya	47	Paraguay	64	Ukraine
14	Colombia	31	Lesotho	48	Peru	65	Vietnam
15	Congo, Dem. Rep.	32	Malawi	49	Philippines		
16	Costa Rica	33	Malaysia	50	Romania		
17	Cote d'Ivoire	34	Mali	51	Russia		

to measure financial development. While, the liquid liabilities comprise the amount of liquid liabilities of the financial system, including the liabilities of banks, central banks and other financial intermediaries, that reflect the financial services (Demetriades & Hussein 1996; Favara 2003; King & Levine 1993a, 1993b; among others). The higher liquid liabilities indicate more transactions in the financial system that leads to high velocity in money movement expressing better economic condition. Lastly, private credit by deposit money indicates the ability of the financial system to channel funds from depositors to investors. This measure accounts for credit granted to the private sector that exerts the funds and their allocation in productive activities and are more efficient (see Arcand et al. 2015; Favara 2003; King & Levine, 1993a; among others). As such the financial indicator of domestic credit to private sector (% of GDP), liquid liabilities (% of GDP) and private credit by deposit money through banks and other financial institution (% of GDP) were used in this study as common measures from the previous studies. These financial indicators data are obtained from 2016 version of Global Financial Structure Dataset. Based on panel data from 65 developing countries, the summary

on statistics of the variables are shown in Table 2. The highest median for financial indicators was liquid liabilities at 3.46, followed by DCPS and PCDM at 3.20 and 3.17, respectively.

The control variables comprised gross fixed capital formation, consumer price index and average years of schooling (to present the human capital). Gross fixed capital formation as a percentage of GDP and consumer price index was sourced from the 2017 version World Development Indicators. While data on average years of secondary schooling, following Law and Singh (2014), were gathered from the 2016 version of Barro and Lee dataset.

METHODOLOGY

DYNAMIC PANEL MODEL: GENERALIZED METHOD-OF-MOMENT (GMM)

We estimated the quadratic polynomial model by using Generalized Method-of-Moment (GMM). GMM was used to estimate the dynamic panel data model and also

TABLE 2. Summary statistics

	Mean	Minimum	10 % quantile	25% quantile	50% quantile	75% quantile	90% quantile	Maximum
GROWTH	1.78	−12.16	−1.96	0.28	2.05	3.61	5.10	10.65
DCPS	3.13	−0.68	1.98	2.67	3.20	3.68	4.18	4.99
LL	3.45	−9.57	2.73	3.09	3.46	3.87	4.34	5.17
PCDM	3.03	−10.65	1.97	2.57	3.17	3.67	4.20	4.98
FDI	0.29	−5.05	−1.52	−0.40	0.55	1.31	1.79	3.32
GFCF	3.01	1.67	2.58	2.82	3.03	3.23	3.42	4.22
CPI	3.28	−25.09	1.74	3.22	4.05	4.44	4.73	5.34
HC	1.83	0.06	0.42	0.88	1.56	2.42	3.69	6.76

allows for the lagged level of economic growth. GMMs panel estimator was first proposed by Holtz-Eakin, Newey and Rosen (1988) and subsequently extended by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). There were two reasons for choosing this estimator. Firstly, to control for the country-specific effects, since country-specific dummies cannot be used due to the dynamic structure of the regression equation. Secondly, the estimator controls for a simultaneity bias were caused by the possibility that some of the explanatory variables may be endogenous. This method used a set of instrumental variables to solve the endogeneity problem of the regressors.

There were two types of GMM estimators (difference and system), they can be alternatively considered in their one-step and two-step versions. However, only the system-GMM as proposed by Arellano and Bover (1995) was used in this study. The system-GMM estimator (system-GMM) included both the previous instruments and the lagged values of the dependent variable (Blundell & Bond 1998). It helped solve the endogeneity problem arising from the potential correlation between the independent variable and the error term in dynamic panel data models. It was also able to deal with omitted dynamics in static panel data models, owing to the ignorance of the impacts of lagged values of the dependent variable (Bond 2002). Following Arellano and Bover (1995), the moment conditions for the system-GMM are set as follows:

$$E[(GROWTH_{i,t-s} - GROWTH_{i,t-s-1}).(\eta_i + \varepsilon_{i,t})] = 0$$
$$\text{for } s = 1 \tag{8}$$

$$E[(FINDEV_{i,t-s} - FINDEV_{i,t-s-1}).(\eta_i + \varepsilon_{i,t})] =$$
$$0 \text{ for } s = 1 \tag{9}$$

$$E[(X_{i,t-s} - X_{i,t-s-1}).(\eta_i + \varepsilon_{i,t})] = 0 \text{ for } s = 1 \tag{10}$$

The consistency of the GMM estimator diagnosis was based on two specification tests. The first was Hansen's (1982) *J*-test of over-identifying restrictions. Under the null of joint validity of all instruments, the empirical moments had zero expectation, so the *J* statistic was distributed and χ^2 with degrees of freedom equal to the degree of over-identification. The second test examined the hypothesis of no second-order serial correlation in the error term (Arellano & Bond 1991) of AR(2). The failure to reject the null of both tests provided support to the estimated model.

The GMM estimator were typically applied in one-step and two-step variants (Arellano & Bond 1991). The one-step estimator used weighting matrices that were independent of estimated parameters, whereas the two-step GMM estimator used the so-called optimal weighting matrices in which the moment conditions were weighted by a consistent estimate of their covariance matrix. This made the two-step estimator asymptotically more efficient than the one-step estimator. As such we used only the two-step estimator of system-GMM in this study. The two-step system GMM estimator was employed in several

studies, such as Karim et al. (2013), Ibrahim and Law (2014) and Sarmidi et al. (2015), among others. However, the use of the two-step estimator in small samples bore several problems in terms of the estimation and diagnostic tests. These problems emanated from the instruments' proliferation. If the number of instruments' proliferation was more than the number of groups, the estimation of parameter was inaccurate. To overcome this problem, we used the collapse of lag length technique as proposed by Roodman (2009) to obtain better results and achieve the desired goodness of fit in the model. This technique was used by previous researchers, including Beck and Levine (2004), Azman-Saini et al. (2010), Karim et al. (2013) among others. In addition, only certain lags are used in this study as instruments instead of all available lags to control the number of instruments as applied by Karim et al. (2013) and Karim and Azman-Saini (2013).

SASABUCHI-LIND-MEHLUM OF U TEST

Even though most of the existing empirical studies claimed that a U-shaped profile was identified if the nonlinear term in quadratic model was significant, Lind and Mehlum (2010) demonstrated that the true relationship was convex but monotone over relevant data values. It may however spuriously identify an extreme value and U-shaped properties.

To test for the presence of a U-shaped profile in a more appropriate way, this study was required to provide sufficiently strong evidence that the slope of the curve was positive at low values of *FINDEV* and negative at high values of *FINDEV* to examine the existence of Kuznets (1955) curve in the 'too much finance' hypothesis. On the other hand, to investigate the existence of U-shaped or anti-Kuznets curves, the slope of the curve should be negative at low values of *FINDEV* and positive at high values of *FINDEV* to support the 'more finance, more growth' hypothesis. To confirm our finding of an inverted U-shaped or U-shaped relationship between financial development and economic growth, we conduct the U test of Sasabuchi (1980) which was extended by Lind and Mehlum (2010). In the quadratic case in Eq. (7), the composite null with the joint hypothesis based on the first order derivation $\left(\dfrac{\partial_{GROWTH}}{\partial_{FINDEV}}\right)$ was tested as follows:

$$H_0 : (\beta_1 + \beta_2 2FINDEV_{min} \leqslant 0) \cup$$
$$(\beta_1 + \beta_2 2FINDEV_{max} \geqslant 0) \tag{11}$$

against the alternative hypothesis:

$$H_1 : (\beta_1 + \beta_2 2FINDEV_{min} > 0) \cup$$
$$(\beta_1 + \beta_2 2FINDEV_{max} < 0) \tag{12}$$

where $FINDEV_{min}$ and $FINDEV_{max}$ represent the minimum and maximum values of financial development,

respectively. If the null hypothesis is rejected, this confirms the existence of an inverted U-shaped.

Particularly, the corresponding rejection is the convex cone:

$$R_\alpha = (\beta_1, \beta_2)$$

$$\frac{\beta_1 + \beta_2 f'(FINDEV_{min})}{\sqrt{s_{11} + 2f'(FINDEV_{min})s_{12} + f'(FINDEV_{min})^2 s_{22}}} < -t_\alpha$$

and

$$\frac{\beta_1 = \beta_2 f'(FINDEV_{max})}{\sqrt{s_{11} + 2f'(FINDEV_{max})s_{12} + f'(FINDEV_{max})^2 s_{22}}} > t_\alpha$$

$$(13)$$

where s_{11}, s_{22} and s_{22} denote the estimated variances of β_1 and β_2 and the covariance between β_1 and β_2, respectively, and t_α is the critical value with the appropriate degrees of freedom and significance level α. Following Fieller (1954), Lind and Mehlum (2010) also provided the $(1-2\alpha)$ confidence interval for the estimated extreme point, that is, $-\beta_1/2\beta_2$ in the quadratic case. Hence, the extreme point must be in a range on Fieller's of 90% confidence interval.

From the equation (7), the presence of a U-shaped profile indicates that $\beta_1 + \beta_2 2FINDEV_{min} < 0$ and $\beta_1 + \beta_2 2FINDEV_{max} > 0$, whereas the inverted U-shaped profile means that $\beta_1 + \beta_2 2FINDEV_{min} > 0$ and $\beta_1 + \beta_2 2FINDEV_{max} < 0$. Therefore the existence of U-shaped profile can be tested using the following hypothesis:

$$H_0 : (\beta_1 + \beta_2 2FINDEV_{min} \geqslant 0) \cup$$
$$(\beta_1 + \beta_2 2FINDEV_{max} \leqslant 0) \quad (14)$$

$$H_1 : (\beta_1 + \beta_2 2FINDEV_{min} < 0) \cup$$
$$(\beta_1 + \beta_2 2FINDEV_{max} > 0) \quad (15)$$

If the null hypothesis is rejected, it confirms the existence of U-shaped profile in the nonlinearity relationship between financial development and economic growth. Thus, the hypothesis of U-test depends on the quadratic model estimation from the two-step system-GMM results in this study.

RESULTS AND DISCUSSIONS

Table 3 reported the results of a two-step system-GMM estimating Eq. (4) using three financial development indicators separately in the quadratic polynomial model. Meanwhile, the results in Table 4 reported the existence of U-shaped or inverted U-shaped profiles to confirm the nonlinearity in either anti-Kuznets or Kuznets curve in the results of Table 3. Finance indicators measure were the domestic credit to private sector (DCPS), liquid liabilities (LL) and private credit to deposit money (PCDM).

The major purpose in this study was to investigate the nonlinearity of the relationship between financial development and economic growth, whether there exists U-shaped or inverted U-shaped. The results from system-GMM estimation in Model 1a-1c (see Table 3) showed that the coefficient of $\beta_1 + \beta_2$ from the equation (4) specification indicated by FINDEV and FINDEV^2 had negative and positive signs, respectively, and both were statistically significant. The mixture of signs from both coefficients indicated the relationship between financial development and economic growth was U-shaped or economic anti-Kuznets curve in all models.

TABLE 3. The nonlinear relationship between financial development on growth: Two-step sys-GMM

	Model 1a: Domestic credit to private sector	Model 1b: Liquid liabilities	Model 1c: Private credit
GROWTH (-1)	0.029**	0.038***	0.046***
CPI	–0.626***	0.068	–0.908***
GFCF	1.979***	1.950***	1.756***
HC	0.173***	0.049	0.255***
FDI	0.690***	0.622***	0.745***
FinDev	–6.398***	–6.344***	–6.850***
FinDev^2	0.792***	0.760***	0.891***
Constant	11.205***	8.911***	13.149***
AR(2) (p-value)	0.284	0.298	0.297
J-test (p-value)	0.409	0.341	0.466
No. of groups	65	65	65
No. of instruments	64	64	64
Threshold value	4.039 (56.770%)	4.174 (64.975%)	3.844 (46.712%)

Notes: (i) ***, ** and * denotes significant level at 1%, 5% and 10%, respectively
(ii) AR(2) are tests for autocorrelation in differences

TABLE 4. Sasabuchi-Lind-Mehlum (SLM) test for U-shaped

	Model 2a: Domestic credit to private sector	Model 2b: Liquid liabilities	Model 2c: Private credit
Extreme point	4.041	4.173	3.844
90% Fieller interval	[3.919, 4.193]	[3.933, 4.560]	[3.690, 4.019]
Slope at FINDEVmin	−4.234*** (−20.373)	−3.452*** (−8.438)	−5.024*** (−25.846)
Slope at FINDEVmax	1.551*** (7.727)	1.574*** (3.613)	2.072*** (9.067)
Hypothesis test	H_0: Inverted U-shaped H_1: U-shaped	H_0: Inverted U-shaped H_1: U-shaped	H_0: Inverted U-shaped H_1: U-shaped
SLM test for U-shaped (t-value)	7.73***	3.61***	9.07***
p-value	0.000	0.000	0.000

Notes: (i) *** denotes significant level at 1%.
(ii) t-value in parentheses.
(iii) The hypothesis testing is based on the two-step system-GMM estimation

This signified that financial development enhanced economic growth after surpassing the threshold level of financial development. Private credit by deposit money in Model 1c produced the highest negative and positive effects on economic growth whereas liquid liabilities (in Model 1b) had negative impact on economic growth followed by a positive at the lowest impact. However, liquid liabilities in Model 1b needed to achieve the threshold point which the highest point. These results were supported by the Lind and Mehlum (2010) of U-test in Table 4 indicated by the rejection of null hypothesis of the inverted U-shaped profile. Accordingly, the result showed that there exist U-shaped relationship between financial development and economic growth for all models. The slope of FINDEVmin was negative and statistically significant, while FINDEVmax was positively significant for all models, thus, the results conformed the U-shaped relationship between financial development and economic growth. Meanwhile, the coefficient of control variables shows the correctly sign. For example, FDI, FCAPITAL and HC showed positive impacts on economic growth in all models, in line with the endogenous growth theory. Meanwhile, CPI had negative impact on economic growth in Model 1a and Model 1c but not significantly so in Model 1b.

In addition, the threshold value of DCPS was 4.04% or 56.77% of GDP based on the first order derivation ($\partial GROWTH/\partial FINDEV$), from the estimation result in Model 1a (see Table 3). The result also approximated that of the threshold computed in Sasabuchi-Lind-Mehlum test (Table 4) at 4.04% or 56.88% of GDP within a range of 90% Fieller confidence interval [3.919, 4.193]. On the other hand, the threshold point of LL in Model 1b was 4.17% or 64.98% with 90% Fieller confidence interval [3.933, 4.560], and PCDM's threshold point was 3.84% or 46.71% in a range of 90% Fieller confidence interval [3.690, 4.019] in Model 1c. The threshold point for LL was the highest as compared to the remaining financial indicators. However, we are not comparing the threshold point from our findings with those of other studies because of two main reasons. First, our sample focused only on developing countries, while the sample of countries in other studies (e.g., Arcand et al. 2015; Cechetti & Kharroubi 2012; Law & Singh 2014) covered both developed and developing economies. Second, our period of study used recent data for the period following the global financial crisis from 2009 to 2015. Nevertheless, the percentage of the sample countries beyond the financial development threshold for DCPS, LL and PCDM were 21.03%, 23.85% 30.26%, respectively. In other words, there was a small number of developing countries which derived benefits from financial development in the recent economies. The reasons for this phenomena were attributed to some countries still adhering to the sentiment of 'too much finance harm growth' as mentioned in past literature.

This study supports Schumpeter's (1911) finding on the important role of financial development which is still relevant in the recent economy. Our results however contradict Asongu's (2011) argument in his meta-analysis study which claimed that Schumpeter might have erred. The U-shaped relationship shown in our findings does not support the meta-analysis of Asongu (2011) who was concerned with endogeneity which actually leads towards negative effect in finance and growth. Asongu criticized the finance spillover Schumpeter's hypothesis which suggested positive impact on economic growth. In our approach the

problem of endogeneity was resolved through adopting the GMM technique. Our results showed that the impact of finance, either positive or negative, was significant on growth although dependant on economic condition. Interestingly, the results contrasted the findings by Arcand et al. (2015), Cecchetti and Kharroubi (2012), Law and Singh (2014), and Samargandi et al. (2015). The U-shaped in our results also showed that financial development can boost economic growth if it surpassed the threshold point. In consequence the findings challenged the hypothesis of 'too much finance harm economic growth', but supported the 'more finance, more growth' proposition as highlighted by Levine (2003).

The nonlinearity in finance-growth of U-shaped commensurate with the chronology of post 2007-2008 Global Financial Crisis. The negative effect of finance on growth is an indicator of rapid financial development in conjunction with detrimental impact on economic growth in early of the post 2007-2008 Global Financial Crisis. This was associated with disruption on sources of growth such as industrial production,

currency depreciation (Frankel & Saravelos 2012), trade (Berkmen et al. 2009) and their consequences in addition to psychological pitfalls among investors (Chang et al. 2017). In the early post crisis period, the industrial production was sluggish causing harm to the liquidity in finance due to the lack of economic resources for utilization (Frankel & Saravelos 2012). The risk in liquidity crunch, followed by currency depreciation, reduced the capability in banking sector to channel credit to private sector caused by the effect of financial liberalization. An increase in private credit may waste financial resources which may be channelled into unproductive uses due to the detriment of industrial production in the early post 2007-2008 Global Financial Crisis. In addition, policy makers had taken appropriate action in tightening banking regulation and restoring economic condition among countries affected by negative spillovers of the crisis including the economies of developing countries. As a results, in 2009, the World Bank had introduced Global Trade Liquidity Program to support trade in developing countries and address the shortage of finance, followed by International
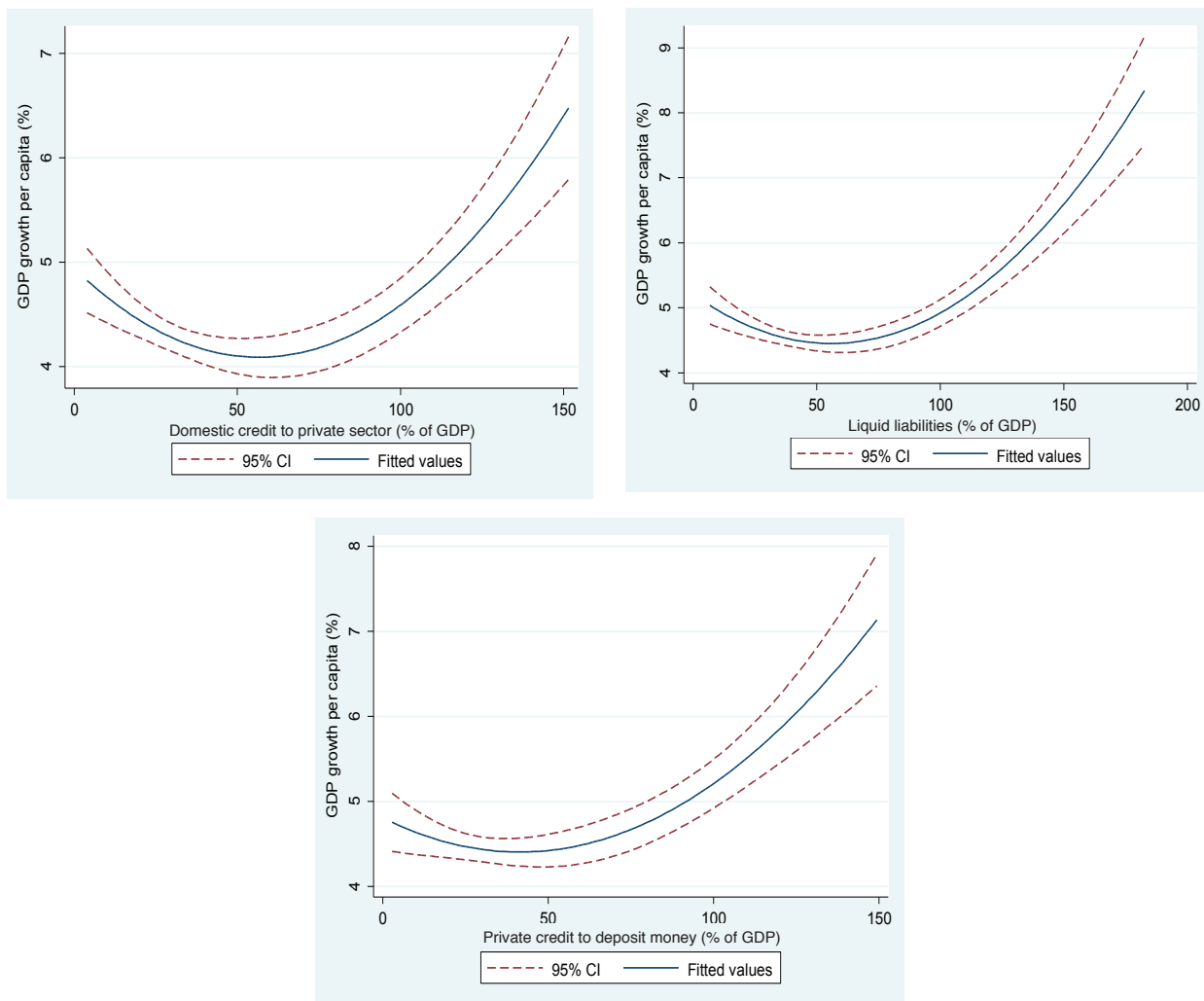

FIGURE 1. Nonlinear relationship between financial development and economic growth

Finance Corporation of multilateral financing for the private sector in developing countries in 2011. In addition, Bank of International Settlement (BIS) implemented Basel III of bank regulation in 2011, as a global regulatory framework for more resilient banks and banking systems by introducing revised capital rules, followed by Basel III of Liquidity Coverage Ratio and liquidity risk monitoring tools that aimed at strengthening global capital and liquidity regulations in 2013. These financial regulations were also implemented by several developing countries. Among other factors, the financial recovery may cause positive changes in financial development on economic growth when the threshold point of financial development was surpassed. The change simultaneously corresponds with an improvement in sources of growth, financial regulation and financial control and would elicit later positive impact due to lag effect in policy effectiveness. Therefore, by increasing the domestic credit to private sector, liquid liabilities and private credit, these financial intermediaries plays a role as a vehicle to activate the real sector in proper manner.

For better understanding of the nonlinear relationship between financial development and economic growth, the U-shaped profile for all financial indicators are illustrated in Figure 1. The solid line is fitted value within the range of 95% confidence interval as portrayed by the dashed line in the figure which confirms the U-shaped relationship of financial development on economic growth. These graphical properties were epitomised a significantly positive effect on economic growth after domestic credit to private sector, liquid liabilities, and private credit to deposit money exceeding the point of 56.77%, 64.98% and 46.71%, respectively. Weakening of financial development effectiveness below the threshold point may occur due to the transition period from the 'catastrophic' to 'remedy' period aftermath 2007-2008 Global Financial Crisis.

The results offered lessons to be learnt from the global financial crisis. The banking regulations in Basel I and Basel II which were implemented before the occurrence of the global financial crisis were not sufficient in reducing the negative effect of financial development. As a result, Basel III for banking regulation was implemented in 2011 to ensure that all banks have high capability on liquidity risk management (Basel Committee and Banking Supervision, 2010). Consequently, the ensuing focus will be more on tightening financial regulation and monitoring liquid activities in the economy. It seems that the countries affected by the global financial crisis have learnt their lessons well. Some had surpassed their threshold points after going through the learning process. The threshold points are important to policy makers in setting the appropriate financial cap to control financial activities. Having known that financial liberalisation may be harmful to economic growth which in turn requires

further financial regulation control and activities, this cap will require immediate reduction of moral hazard in financial activities. Since the financial sector is a major contribution to growth with time, the policy makers should thus expand the financial development continuously but in a controlled manner.

CONCLUSIONS

This study examined the nonlinearity of the relationship between financial development and economic growth for the case of 65 developing countries for the period in aftermath the global financial crisis. The use of panel data were appropriate in this study since we can increase data points and the degree of freedom, thereby providing the most robust estimation. The two-step system-GMM was said to be the appropriate model compared to the one-step system-GMM and also the difference-GMM. Results from the quadratic model in the two-step system-GMM demonstrated that financial development had a positively significant relationship on economic growth when the threshold values were surpassed (specifically, domestic credit to private sector, 56.77% of GDP; liquid liabilities, 64.98% of GDP, private sector credit, 46.71% of GDP), indicating the U-shaped curve exists.

The nonlinearity of financial development and economic growth had also been supported by the Sasabuchi-Lind-Mehlum test of U-shaped profiles. The hypotheses of the U-test were based on a previous estimation (Lind & Mehlum 2010). The extreme point of the U-test was close to the first order derivation from the two-step system-GMM estimation result, with 90% Fieller confidence interval. The U-test results consistently rejected the combined null hypothesis of an inverted-U or monotone relationship but favoured a U-shaped linkage between financial development and economic growth for all finance indicators. Interestingly, findings from this study have challenged the 'too much finance harm economic growth' hypothesis (Arcand et al. 2015; Law & Singh 2014), but supported the 'more finance, more growth' proposition by Levine (2003).

Our findings, contributed to the study of finance-growth in two aspects. First, the nonlinear of U-shaped relationship between financial development and economic growth as derived from the global financial crisis contrasted with findings of previous studies implying the transitory effect of 'too much finance harm economic growth' hypothesis in recent economies. Second, our findings suggested that policy review existing financial policy where the inverted U-shaped effect of financial development on economic growth is not prolonged nor characterize the recent economies. The findings of the U-shaped profile in the recent economy of developing countries in contrast to those of previous findings, may suggest new evidence that may contribute to the finance-growth literature.

In general, the policy makers should enhance the financial sector at least beyond the 90 percentile (refer to Table 2) to utilize the financial development in order to boost the economic growth. In terms of policy implication, findings from the study suggest that policy makers should not only expand on financial development in fostering economic growth but also increase the quality of financial sector. This implies the concurrent expansion and tightening of financial regulations with attendant control and monitoring of financial activities to ensure the effectiveness of financial development on economic growth as well as to avoid the 'vanishing effect' that may lead to recurrence of economic crises in the future. In lieu of the nonlinearity of the U-shaped profile in finance-growth relationship in our findings, does financial regulation and its implementation, such as Basel III, positioned on the right track? The financial policy as suggested by the previous studies need to be revised and to benefit from the 'more finance, more growth' proposition. By take into account not only the quantity of finance but also the quality, this study leads to 'more and better finance, more growth' proposition.

Despite, the nonlinearity of finance-growth relationship of U-shaped in our study contradicted with the previous study in different time period indicate that the financial development effect on economic growth may contingent on the economic situation. The study also challenged the findings by Arcand et al. (2015) who suggested that the 'vanishing effect' was not influenced by output volatility and banking crises. In addition, the effect of financial development on economic growth also depends on the level of macroeconomic variable and economic regulation such as inflation (Yilmazkuday 2011), financial sector policies (Abiad & Mody 2005), financial openness (Rajan & Zingales 2003) as a precondition, therefore this dependency indicates the fragility of financial in boosting the economic growth. Hence, as highlighted by Reinert (2012), which element should be controlled by policy makers, either to save the financial economy or save the real economy? The paper suggests that policy makers should control the financial mediating variables as well as the real economy instead only expanding the financial sector development with contemporaneous banking quality to improve the financial performance in promoting economic growth.

The findings also contribute to the finance-growth study to be extend and may lead to feasibility study ties to reassess the nonlinearity of finance-growth based on different situations. Research findings prior to the 2007-2008 Global Financial crisis produced the inverted U-shaped profile while post-crisis research studies produced the U-shaped profile in finance-growth relationship. For the future, is there the possibility of discovering a S-shaped relationship? Such a profile, may likely postulate the transition period from catastrophic to remedy period. The question may arise that, does the recent economy postulated as remedial period?

If S-shaped profile is possible then policy makers should be cautious that a regime-switch trigger in the cycle of finance-growth may likely occur in the future. Hence, further research is necessary to elucidate on this possibility.

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