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($i = 1, 2, \ldots, N$) and time period by subscript t($t = 1, 2, \ldots, T$). 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:

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

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:

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

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

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

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 $\left(\frac{\partial_{GROWTH}}{\partial_{FINDEV}}\right)$ 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

$$\frac{\beta_1 = \beta_2 f'(FINDEV_{max})}{\sqrt{s_{11} + 2f'(FINDEV_{max})s_{12} + f'(FINDEV_{max})^2 s_{22}}} > t_\alpha \quad (13)$$

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 (1-2α) 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***	–3.452***	–5.024***
	(–20.373)	(–8.438)	(–25.846)
Slope at FINDEVmax	1.551***	1.574***	2.072***
	(7.727)	(3.613)	(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 (*∂GROWTH/∂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

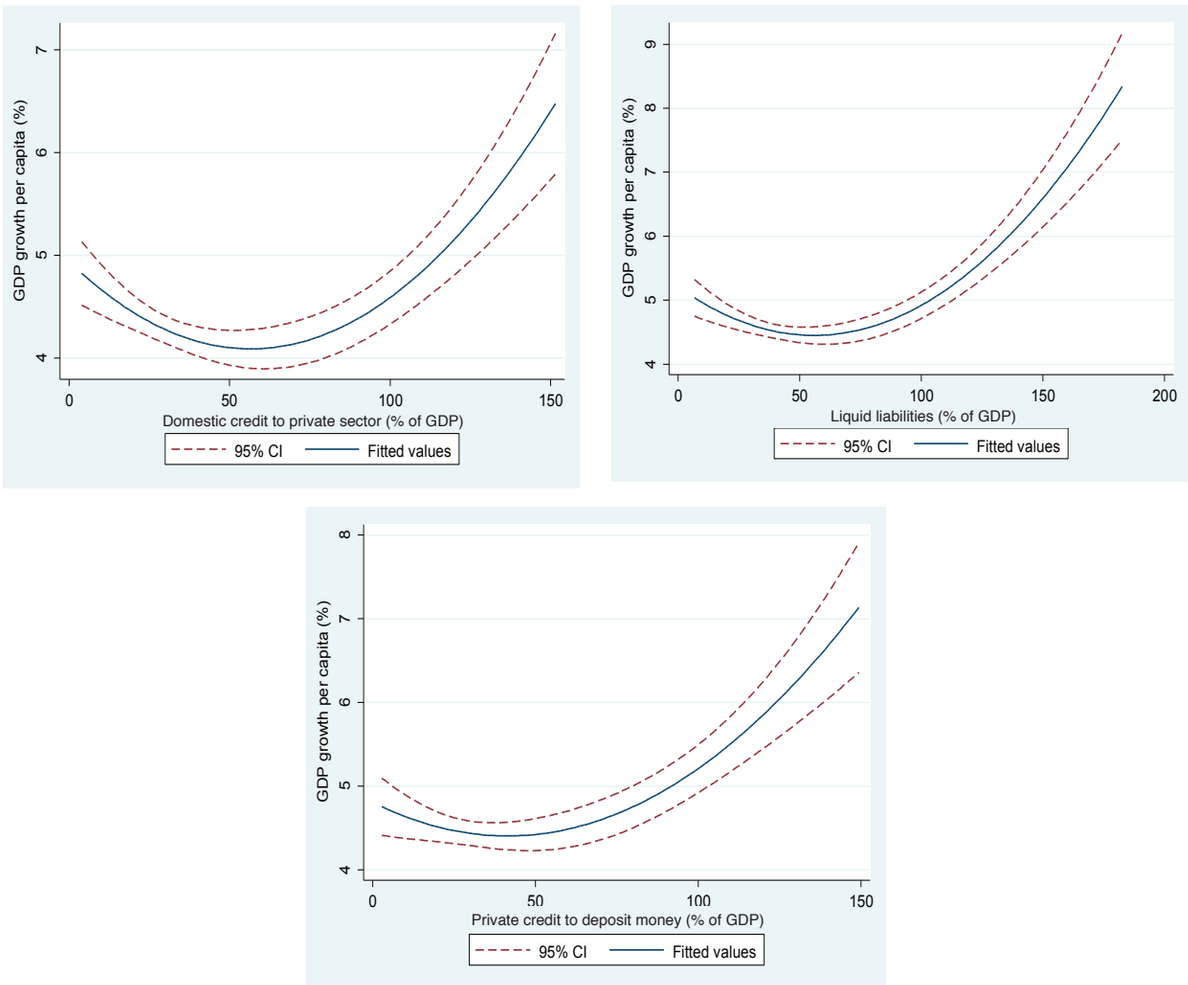

FIGURE 1. Nonlinear relationship between financial development and economic growth

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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