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FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH: EVIDENCE FROM PANEL COINTEGRATION

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Abstract: *The aim of this study is investigating the long-run relationship between financial development (FD) and economic growth (EG) by using panel data. To examine the linkage between FD and EG, panel cointegration and FMOLS are executed for the panel data of 50 countries over 2000-2013. The main findings are as follows: First, the empirical results support that there is a long-run relationship between EG and FD in three different categories (except Middle East). Comparing the effects of FD to increase EG in full sample, increasing domestic savings can raise higher EG than increasing domestic credit to private sector or M2. Second, comparing the differences to improve growth for high income countries and middle income countries, the best tool of FD is increasing EXPEND for middle income countries, but raising GDS will be the best choice for high income countries. Third, the results from different regions, promoting GDS will be the best choice to rise EG in Asia and Oceanic and Europe, while increasing EXPEND is the best tool in America. Finally, comparing the results of causality between EG and FD, in high income countries, there is bidirectional causality between FD and EG, whereas in middle income countries, unidirectional causality was appeared from growth to finance. As to results of four regions, in European countries, economic growth can cause financial development and vice versa, while in America, Asia-Oceania and Middle East, economic growth can cause financial development but financial development cannot cause economic growth.*

Keyword: *Financial Development, Economic Growth, Panel Cointegration, Panel Causality.*

INTRODUCTION

This paper investigates the linkage between financial development and economic growth across countries. Many economists indicate that financial development is paramount importance for output growth. Schumpeter (1912) emphasized that economic growth should be promoted by a well-functioning of financial system through the selection of productive investment to innovative technologies. In addition, McKinnon,1973 and Shaw, 1973 argued that government restrictions on the banking system could hinder financial development and reduce output growth. Nevertheless, there are debates issues about the linkage between financial

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development and economic growth. For example, Lucas (1988) argued that ''the importance of financial matters is very badly over-stressed in popular and even much professional discussion,'' and others also show finance development is only a minor growth factor (Greenwood and Smith,1997; Robinson, 1952; Phyoe, 2015). Conversely, Miller (1998) contradicted ''that financial markets contribute to economic growth is a proposition almost too obvious for serious discussion''.

In a review study, Levine (2005) explain the reasons of financial development to improve economic growth, which are as the following: by offering information about potential plans, monitoring the execution of investment, improving risk management and diversification, combining savings and smoothing the exchange of goods and services. Nevertheless, the recent 2007–2008 global financial crisis has caused researchers and policymakers to researchers the role of financial development. The shocks of the crisis showed the burdens of malfunctioning financial systems, which can directly and indirectly cause under investment and a misallocation of scarce resources. Consequently, there may be more serious damages of economic system, including the stagnation of economy, unemployment rising and worse poverty. Hence, facing the lessons of the crisis, economists and policy makers would enquiry the optimal size of financial systems for sustainable economic growth. Financial development is founded to promote economic growth, but is this true regardless of the size and growth of the financial sector?

Besides, the existing evidences of the relative literature have demonstrated that the relationship between finance and growth diverges by level of income. For example, the results of Rioja and Valev (2004) show that there is no significant relationship between financial development and economic growth for low income countries, but the relationship of middle income countries is significantly positive, and it is weakly significant for high income countries. Furthermore, the results of De Gregorio and Guidotti (1995) and Huang and Lin (2009) present that the positive effect of financial development on economic growth is less significant in high income countries, comparing with the effects in low income and middle income countries. The evidences of the above literature display the contradiction between these findings on the finance and growth relationship at different income levels. Hence, it should be reexamined the effects of financial development on economic growth for different income level countries.

This paper presents new evidence that bring to light the effect of financial development on growth. This paper studies the dynamic relationship between economic growth and financial development by using panel data of 50 countries, across geographic regions and income groups, over 2000-2013. To reduce the shortcomings of cross-sectional analysis, panel cointegration, fully modified OLS and as well as panel causality are executed to examine it. This paper contributes to

the relevant literature of financial development and economic growth as follows. First, there is a scarcity of empirical works on linkages between financial development and economic growth by using panel data analysis which covering the post period of 2008-2009 global financial crisis. To fill this gap, this study applies large and heterogeneous sample of 50 countries over the period of 2000-2013 to examine the long run and short run relationship between financial development and economic growth. Next, the existing evidence has demonstrated that this relationship between finance and growth varies by level of income. Hence, applying two sub-group countries of different income level, instead of heterogeneous cross-country samples, this paper examines whether there is appearance of distinction relationships between financial development and economic growth for different income level countries which can offer some useful suggestions for policy makers. Besides, this paper also discusses the diverse relationships between financial development on economic growth for different regional countries, which has infrequently studied on past literature.

The empirical analysis in this paper is executed in four steps. First, four different types of panel unit root test, Levin *et al.* (2002) test, Im *et al.* (2003) test, Fisher-type tests using ADF and PP tests (Maddala and Wu,1999; Choi, 2001; Phyoe, 2015), are employed to confirm the non-stationarity of the series in panel data. Second, Pedroni's (1999) cointegration test will be used to determine whether there is presence of cointegrating relationship between economic growth and financial development. Third, the long run relationship between economic growth and financial development is estimated by the methodology of panel fully modified ordinary least squares (FMOLS) of Pedroni (1999, 2001), which controls for potential endogeneity of the regressors and serial correlation and generates consistent estimates of the parameters in samples. Finally, the causality test is executed by using panel Granger causality test, which can be evaluated leading or lagging power of one variable with other variables.

The remainder of the paper is organized as follows: Section 2 presents existing empirical literature on financial development–economic growth. The econometric methodology is introduced in Section 3. Section 4 will discuss the empirical results. Section 5 will end up with the concluding remarks.

LITERATURE REVIEW

The relationship between financial development and economic growth has been extensively debated and investigated over past few decades. Some authors consider financial development is an important element of economic growth, such as Goldsmith (1969); McKinnon (1973); Shaw (1973) which causes that the academic researchers and policymakers bring out the important issue of the relationship

between financial development and economic growth (De Gregorio and Guidotti, 1995). However, there are some authors who questioned about the importance of financial system in promoting economic growth such as; Chandavarkar (1992); Lucas (1988); Robinson (1952); Singh and Weisse (1998); Stern (1989).

The theoretical relationship between financial development and economic growth already exist over one hundred year ago. Schumpeter (1912) argued that a well-functioning financial system should promote economic growth through the selection of the productive investments. Since the 1980s, the theoretical research has attracted a renewed concern to the relationship between financial development and economic growth (Barro, 1991; Hermes, 1994; Khan and Senhadji, 2003; Levine, 1997; Lucas, 1988; Romer, 1986;1990). Past the theory of economic growth debated that economic development is innovation process in both financial and real sectors, which generates a stimulus for dynamic economic growth. Some scholars also illustrate financial development as the innovations and improvements related to financial markets (Kar *et al.*, 2011; Khan and Senhadji, 2003). Several studies, have illustrated how the operation of the financial sector may affect the rate of economic growth in the endogenous framework (Bencivenga *et al.*, 1996; Bencivenga and Smith, 1990; Blackburn and Hung, 1998; Greenwood and Jovanovic, 1990; King and Levine, 1993a, b; Pagano, 1993).

In recent two decades, many scholars have examined the effect of financial development on economic growth by using an array of econometric techniques. Panel data has been used to examine the financial development and growth relationship. Levine *et al.* (2000) apply a panel GMM estimator to test the relationship between financial development and economic growth, however, Beck *et al.* (2000) studied the link between finance and the sources of growth. Both papers demonstrate a positive relationship between finance, growth and its sources. Rioja and Valev (2004) indicate that the impact of financial development on growth is stronger for high income countries than for low income countries. Loayza and Ranciere (2002) focus on the difference between the short and long-run impact of financial development on economic growth, and their results show that the negative short-term relationship is related to a surge of financial crisis. The empirical results of Rousseau and Watchel (2000) present that the exogenous component of bank and stock development contributes to economic growth.

Granger causality tests and vector autoregressive regressions (VAR) are used as time-series techniques to examine the relationship between finance and growth. The past relative empirical papers present diverse results about the direction of causality. Some papers argue that there is causal direction from financial development to economic growth, which shows that financial systems lead economic growth (King and Levine, 1993a; Levine *et al.*, 2000; McKinnon, 1973;

Xu, 2000), but some papers confirm that the causality direction is from economic growth to financial development (Goldsmith, 1969; Gurley and Shaw, 1967; Jung, 1986). Besides, some other papers find that there is bidirectional causality between financial development and economic growth (Demetriades and Hussein, 1996; Luintel and Khan, 1999).

Lately, the methodology of panel cointegration has been used by some researchers to examine the linkage between financial development and economic growth which can solve the problem of small size samples. The empirical works of Rousseau and Wachtel (2000) and Filer *et al.* (2003) provided an evidence of causality from financial development to economic growth. Using measures of banking and economic development, Christopoulos and Tsionas (2004) examine cointegrating vectors in a panel data set of ten countries over period 1970-2000, and the results of Christopoulos and Tsionas (2004) indicate that there is a single cointegrating vector between financial development and economic growth and unidirectional causality from financial depth to growth. On the contrary, Hurlin and Venet (2004) confirm that unidirectional causal relationship from economic growth to financial development, which is more occurred in developed than in developing countries. Apergis *et al.* (2007) used a similar approach and their results support a bidirectional causality between financial development and economic growth. Applying panel cointegration for a dynamic heterogeneous panel of 71 countries, Bangake and Eggoh (2011) use three different measures of financial development to study the linkage of financial development and economic growth, which shows clear support for the existence of a long-run equilibrium between financial development and economic growth. Cavenaile *et al.* (2014) focus on how the development of banks and stock markets to affect economic growth for 5 developing countries, and their results conclude to the existence of a single cointegrating vector between financial development and growth, as well as financial development leads economic growth.

METHODOLOGY

Unit Root Test

This section explains four different types of panel unit root test which are employed to confirm the non-stationarity of the series in panel data. Levin *et al.* (2002, LLC) test will be used to measure common unit root test, then the individual unit root tests are executed by using three types of panel unit root tests, including Im *et al.* (2003) test, Fisher-type tests using ADF and PP tests (Maddala and Wu, 1999; Choi, 2001).

Levin *et al.* (2002) assumes that the autoregressive coefficient for unit roots is identical across cross-sections. LLC model is exhibited as follows:

$$\Delta x_{i,t} = \alpha_i + bx_{i,t-1} + \Sigma_{z=1}^{L} \alpha_z \Delta x_{i,t-z} + \varepsilon_t \quad (1)$$

The test for null H_0:$b = 0$ will be designed toward the alternative hypothesis $b < 0$ for all $i = 1, \ldots, N$. The homogeneity assumption is limited and subject to the possible homogeneity bias of the fixed effect estimator (Maddala and Wu, 1999).

All of three tests, IPS, Fisher-ADF and PP tests, permit for individual unit root processes so that might differ across cross-sections, which are all considered by the combining of individual unit root tests to derive a panel-specific outcome. Hence, heterogeneous are allowed in IPS. For IPS test, each individual time series contains a unit root for null hypothesis, and not all of the individual series contains unit roots for alternative hypothesis. IPS test will be specified the ADF regression for each cross section as follows:

$$\Delta y_{i,t} = \alpha_0 + \beta_i Y_{i,t-1} + \Sigma_{j=1}^{pi} \rho_{i,j} \Delta y_{i,t-j} + \varepsilon_{t,t} \quad (2)$$

Where series $y_{i,t}$ ($i = 1, 2, \ldots, N$; $t = 1, 2, \ldots, T$) is the panel member series i over period t, and p_i is the lags number in the ADF regression, the error term $y_{i,t}$ is assumed to be independently and normally distributed random variables for all i's and t's with zero means and finite heterogeneous variances σ_i^2. β_i and the lag order r in I(1) are permitted to differ across sections. The null hypothesis of unit root is:

$$H_0 : \rho_i = 0, \ \forall i$$

for all i which the alternative hypothesis is:

$$\text{Ha} : r_i < 0, i = 1, \ldots, N_1 \text{ and } \rho_i = 0, i = N_1 + 1, \ldots, N.$$

Comparing with LLC test, the benefit of IPS test is allowing for the heterogeneity in the value of the autoregressive coefficient under the alternative hypothesis. The t-bar statistics, $\bar{t}$, is calculated by using the average t-statistics for b_i from the separate ADF regressions in the following form:

$$\bar{t} = \frac{1}{N} \sum_{i=1}^{N} (t_{iT}) \quad (3)$$

Where t_{iT} is the individual ADF t-statistic for the unit root test. IPS shows that under the null hypothesis of non-stationary, the t statistic follows the standard normal distribution asymptotically. Under the hypothesis the residuals are not serially correlated and t_{iT} are independent and identically distributed. IPS proposed a group mean, t-bar statistic, as the following:

$$Z_{tbar}^{a} = \frac{\sqrt{N}[t_{barNT} - E(t_{iT})}{\sqrt{Var(t_{iT})}} \quad (4)$$

When the residuals are serially correlated, the standardized t-bar statistic is modified as follows:

$$W_{tbar}(p,) = \frac{\sqrt{N}[t_{-bar_{NT}} - N^{-1}\sum_{i=1}^{N} E[t_{it}(p_i,0)/_i = 0]]}{\sqrt{N^{-1}\sum_{i=1}^{N} Var[t_{it}(p_i,0)/_i = 0]}} \quad (5)$$

The $W_{t\,\text{bar}}$ (ρ, β) statistic has a standard normal distribution as N and $T \Rightarrow \infty$ and $N/T \Rightarrow k$, where k is a finite positive constant.

Maddala and Wu (1999) and Choi (2001) suggested to combine the p-values of the individual unit root ADF. They also argued that heterogeneous alternative is better, but they indicated that averaging the ADF statistics is not the most efficient way to use the information. Maddala and Wu (1999) demonstrated that Im et al (1997) tests relax the assumption of homogeneity of the root across the units, several difficulties still remain. They suggested to use a Fisher type test, which is based on combining the p-values, π_I of the test-statistic for a unit root in each cross-sectional unit. The MW test statistic λ is given by:

$$\lambda = -2\Sigma_{i=1}^{N} \ln \pi_i \quad (6)$$

The Maddala and Wu test statistic is distributed as Chi square with 2N degrees of freedom under the hypothesis of cross-sectional independence.

Panel Cointegration Test

Granger (1981) illustrated the meaning of cointegration is the linear combination among non-stationary individual variables is stationary. Panel cointegration technique proposed by Pedroni (2004) will be used to determine the existence of long run relationship. The preceding cointegration test was including simple two step which is argued by Engle and Granger (1987). Nevertheless, this method sustains some problems, furthermore, the three step procedure who proposed by Engle and Yoo (1987) has been extended to break these problem.

Unfortunately, both Engle and Granger (1987) and Engle and Yoo (1987) methods have shortcoming which cannot treat as the case where the possibility of more than one cointegrating relationship. Moreover, Johansen (1988) proposed vector auto regression (VAR) test of integration method which deal with homogeneous across member's procedure that useful in conducting individual cointegration tests, but does not handle cointegration test in panel settings. As a result, Pedroni (1999, 2004) use specific parameters which are allowed to vary across individual members of the sample to take into account about the heterogeneity.

Pedroni's cointegration method considers the following panel regression:

$$Y_{it} = \alpha_i + \delta_{it} + \beta_{li} x_{l,it} + \beta_{2i} x_{2,it} + ... + \beta_{Mi} x_{M,it} + \varepsilon_{it} \quad (7)$$

For $i = 1, ..., N$; $t = 1, ..., T$; $m = 1, ..., M$

where N refers to the numbers of individual members in the panel; T refers to the number of observation over time; M refers to the number of exogenous variables. The structure of estimated residuals is follows:

$$\hat{\varepsilon}_{it} = \hat{\rho}_i \hat{\varepsilon}_{it-1} + \hat{u}_{it} \quad (8)$$

Pedroni develops seven different statistics to test for panel cointegration. Four of them are based on pooling which is referred within-dimension, then the rest is based on between-dimension statistics. Within-dimension based statistics are referred to panel cointegration statistics which takes into account common time factors and allows for heterogeneity across members. On the other side, between-dimension based statistics are termed as group mean cointegration statistics which allows for heterogeneity of parameters across members.

The null hypothesis of Pedroni cointegration test is the absence of cointegration. As to the alternative hypothesis on "within-dimension" test, the alternative hypothesis is $\rho_i = \rho < 1$ for all i, while the alternative hypothesis in "between-dimension" is $\rho_i < 1$, for all i.

Fully Modified Ordinary Least Square (FMOLS) Cointegration Estimation

When the dependent variable and explanatory variables are succeeding to establish cointegration, the next step is to estimate the cointegrating vector by using Fully Modified Ordinary Least Square (FMOLS) technique which proposed by Pedroni (2000). In light of FMOLS method, the residuals from the cointegration regression will be transformed and nuisance parameters will be removed by using non-parametric techniques (Phillips, 1995; Pedroni, 2001). In addition, FMOLS addresses the problem of non-stationary regressors, as well as the problem of simultaneity bias raised by Levine *et al.* (2000): OLS estimation yields biased results because, in general, the regressors are endogenously determined in the I(1) case.

FMOLS estimator which is based on the estimation of the following cointegrated panel are shown as follows:

$$Y_{i,t} = \alpha_i + \beta x_{i,t} + \mu_{i,t} \text{ and,} \quad (9)$$

$$x_{i,t} = x_{i,t-1} + v_{i,t} \quad (10)$$

Where, α_i allows for the country specific fixed effects, β is a cointegrating vector if $y_{i,t}$ is integrated of order 1. At the same time, the vector error process $\varepsilon_{i,t} = (\mu_{i,t}, \nu_{i,t})$ is a stationary process.

DATA AND EMPIRICAL RESULTS

Data

This paper investigates cointegration between economic growth and financial development over the period, 2000-2013, which covers the influences of global financial crisis in 2008. This empirical model contains five variables in natural logarithm. The first variable is GDP per capita which is an indicator of economic growth. Second variable is the ratio of general government final consumption expenditure to GDP (EXPEND) which includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security, but excludes government military expenditures that are part of government capital formation. Therefore, EXPEND will be an indicator of real sector in this research.

Moreover, the first indicator of financial development is gross domestic savings (GDS) as a proportion of GDP which are calculated as GDP less final consumption expenditure (total consumption). Krieckhaus (2002) shows that a higher degree of national savings led to upper investment and consequently caused higher economic growth. Pagano (1993) illustrated that the stabilized of growth rate depends positively on the percentage of savings switched to investment, suggesting that converting savings to investment is one channel through which financial deepening affects growth. As an alternative, the expectation of financial development is giving advantage from higher GDS and consequently, higher volume of investment.

Furthermore, domestic credit to the private sector as a percentage of GDP (DCPS) was used as the proxy of financial development. An upper ratio of domestic credit to GDP denotes not only a higher degree of domestic investment, but also higher expansion of financial system. Financial systems that allocate more credit to the private sector are more likely to be engaged in researching borrower firms, exerting corporate control, providing risk management control, facilitating transactions, and mobilizing savings (Levine,2005), which requires a higher level of financial development.

The last variable of financial development is money supply (M2) to GDP which measures the level of monetization in the economy to exhibit the real size of the financial sector of raising economy in which money serves valuable payment and saving services.

The dataset comprises 50 countries and all of data are collected from World Bank's World Development Indicators (WDI) 2014 database. For discussing whether different income levels could cause different relationships between economic growth and financial development, this paper follows the World Bank's classifications and divide the sample's countries into two income sub-groups. There

are two sub-groups: one is middle income group whose GNI per capita of 2014 is from $2,013 to $7,873, and another is high income group whose GNI per capita of 2014 is from $7,874 to $38,317. Besides, this paper also divides the sample's countries into four geographic-area groups. Categories of the sample's countries in income level and geographic area are listed as table 1.

Table 1
List of countries

High Income				*Middle Income*			
Australia	Cyprus	Germany	Japan	Brazil	Guyana	Jordan	Peru
Austria	Denmark	Greece	Korea Rep.	China	India	Malaysia	Philippine
Belgium	Finland	Iceland	Latvia	Colombia	Indonesia	Mexico	Suriname
Brunei	France	Ireland	Lithuania	Ecuador	Iran	Paraguay	Turkey
Canada	Netherlands	Italy	Luxembourg	Egypt			
New	Qatar	Spain	Singapore				
Zealand	Saudi	Sweden	Uruguay				
Norway	Arabia	Switzerland	Portugal				
Poland		UK	US				

America		*Asia and Oceanic*		*Europe*			*Middle East*
Brazil	Paraguay	Australia	Korea, Rep.	Austria	Lithuania	Spain	Egypt
Canada	Peru	Brunei	Malaysia	Belgium	Luxembourg	Sweden	Iran
Colombia	Suriname	Darussalam	New	Cyprus	Netherlands	Switzerland	Jordan
Ecuador	United	China	Zealand	Denmark	Norway	Turkey	Qatar
Guyana	States	India	Philippine	Finland	Poland	United	Saudi
Mexico	Uruguay	Indonesia	Singapore	France	Portugal	Kingdom	Arabia
		Japan		Germany	Iceland	Italy	
				Greece	Ireland	Latvia	

Source: World Bank (2014), World Development Indicators 2014.

THE RESULTS OF FULL SAMPLE

The Results of Panel Unit Roots for Full Sample

The panel unit root tests will be conducted to investigate the stationary of the series on panel data. Levin *et al.* (2002) test will be used to measure common unit root test, then the individual unit root tests are executed by using three type of panel unit root tests, including Im *et al.* (2003) test, Fisher-type tests using ADF and PP tests (Maddala and Wu (1999) and Choi (2001). The results of four-unit root tests are presented in table 2.

All variables, GDP, EXPEND, GDS, DCPS, and M2, are tested in level and first differences. The result of all variables in level, as table 2, shows that the null hypothesis of the unit roots for the panel data cannot be rejected at 1% significant level. As to the results of the variables in first difference, the null hypotheses for

Table 2
Panel unit root tests for full sample

	Variables	*Total Sample*			
		LLC	*IPS*	*ADF*	*PP*
Level	GDP	–0.5639	1.635	81.86	107.72
		(0.2864)	(0.9490)	(0.9069)	(0.2813)
	EXPEND	0.2538	–1.0094	115.60	69.39
		(0.6002)	(0.1564)	(0.1364)	(0.9915)
	GDS	0.12427	–0.2812	94.26	96.73
		(0.5495)	(0.3893)	(0.5313)	(0.4598)
	M2	3.99453	–0.1832	90.27	112.67
		(1.0000)	(0.4273)	(0.6458)	(0.1176)
	DCPS	3.3046	–0.2474	122.7460	119.1260
		(0.9995)	(0.4023)	(0.0610)	(0.0932)
First Difference	ΔGDP	–18.883	–9.928	280.3	428.4
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
	ΔEXPEND	–17.360	–7.135	243.1	352.8
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
	ΔGDS	–18.148	–8.927	258.7	451.8
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
	ΔM2	–16.495	–7.798	266.6	342.1
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
	ΔDCPS	–11.4495	–5.4084	213.5150	326.3210
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***

Note: Numbers in parentheses denote marginal significance levels (p-values). *, ** and *** denote significance at 10%, 5% and 1%, respectively. All 4 panel unit root tests above have the null hypothesis of unit roots (non-stationary)

all of five variables are rejected at 1% significant level. In other words, these results strongly display that all of five variables in level are non-stationary and stationary in first differences, that is, all of variables are I(1) processes. Hence, the paper will examine the presence or absence of a long-term relationship between economic growth and financial development by using panel cointegration test.

The Results of Panel Cointegration for Full Sample

According to the results of previous section, the evidence show that all variables are I(1). Then, this section starts to discuss the long-run analysis by employing panel cointegration tests to examine the relationships among five variables. Pedroni's (1999) cointegration test will be used to determine whether there is absence or presence of cointegrating relationship between economic growth and financial development. This analysis use four within-group tests and three between-group tests of Pedroni (1999) to examine the null hypothesis of no cointegration against the alternative hypothesis of cointegration. Pedroni (1999) derived the

asymptotic distributions and computed critical values for cointegration tests by considering both time-series and cross-sectional data.

The within-group statistics (panel statistic) is based on the within-dimension approach, which is estimated by polling the autoregressive coefficient across different countries. The between-group statistic (group statistic) is based on estimators that average individually estimated coefficients for each country. Table 3 shows the results of all panel cointegration when the dependent variable is GDP per capita.

Table 3
Pedroni's (1999) panel cointegration test for full sample

Test		*Total Samples*	
		Statistic	*Probability*
Pedroni	Panel v-Stat	7.8562	0.0000***
	Panel rho-Stat	7.5675	1.0000
	Panel PP-Stat	–2.5125	0.0060***
	Panel ADF-Stat	–5.7023	0.0000***
	Group rho-Stat	10.0282	1.0000
	Group PP-Stat	–8.0340	0.0000***
	Group ADF-Stat	–8.8675	0.0000***

Note: The signs ***, ** and * denote significance at 1%, 5% and 10%, respectively.

In Table 3, the first four test statistics are calculated by the "within" dimension (panel statistics). If the null is rejected, then the cointegration of GDP and other four variables exists. The last three test statistics are calculated by the "between" dimension (group statistics). The statistics in table 3 show inconsistent results; at 1% significant level, five statistics are significant, but two statistics are insignificants, such as the panel and group versions of Panel *rho*-statistic and the Group *rho*-statistic. Because the sample includes 50 countries, the inconsistent results can be caused by the different relationships between GDP and other macroeconomic variables in the 50 countries. However, most results of Pedroni's panel cointegration tests, as table 3, suggest the null hypothesis of no cointegration is rejected at 1% significant level. In consequence, the evidence suggests that there is a cointegration among economic growth, financial development, and real sector variables in full sample.

The Results of FMOLS Estimation for Full Sample

Fully Modified OLS (FMOLS) is applied to estimate a long-run relationship among economic growth, real sector and three financial development variables because there is an evidence that all variables are stationary and long-run cointegration exists as the results of the previous sections. The estimating results of FMOLS are reported in table 4.

Table 4
FMOLS estimates for full sample

Test	*Variables*	*Total Samples*	
		Coefficient	*Probability*
FMOLS	EXPEND	1.5033	0.0000***
	GDS	2.8549	0.0000***
	DCPS	0.4698	0.0000***
	M2	0.4452	0.0000***

Note: The signs ***, ** and * denote significance at 1%, 5% and 10%, respectively.

Table 4 presents the result from FMOLS estimates of cointegrating relationship as the dependent variable is GDP, and the coefficient on table 4 can represent the long-run elasticity for full sample[1].

In table 4, all of estimated coefficients of EXPEND, GDS, DCPS and M2 are positive and statistically significant at 1% level for FMOLS estimation. The coefficient of the indicator of real sector, EXPEND, is 1.5033, that is, the government expenditure elasticity of GDP is 1.5033, which implies if increasing 1% of government expenditure will average rise 1.5033% GDP per capita for full sample's countries. As to the coefficients of three indicators of financial development, the coefficient of gross domestic savings (GDS) is the largest, 2.8549, and the other two coefficients of domestic credit to private sector (DCPS) and money and quasi money (M2) are 0.4698 and 0.4452, respectively. Comparing the three coefficients of financial development's variables, the coefficient of GDS is over six times to the coefficients of DCPS and M2, which implies that a more effectively way to increase economic growth is to increase domestic savings rather than to increase domestic credit to private sector or M2.

The Results of Panel Causality for Full Sample

The next part is observing the causality test between these variables by using panel Granger causality test which can be evaluated any potential predictability power of one variable with the other. The result of panel granger causality for full sample is as table 5.

In table 5, all of results of Granger causality test show that null hypothesis of other four variables (EXPEND, GDS, DCPS and M2) does not Granger cause GDP is rejected at 1% and 5% significance level. Conversely, the contrary null hypothesis, GDP does not Granger cause other variables, also is rejected at 1% and 5% significance level. Thus, there are bidirectional causality presence between economic growth and each indicator of three financial developments, GDS, DCPS,

Table 5
Panel causality for full sample

	Total Samples			
	EXPEND	*GDS*	*DCPS*	*M2*
GDP	16.6198 (0.0000)*** →	15.8590 (0.0000)*** →	25.6034 (0.0000)*** →	17.6008 (0.0000)*** →
	3.4332 (0.0169)** ←	4.0908 (0.0069)*** ←	3.1909 (0.0234)** ←	3.5878 (0.0137)** ←

Note: The signs ***, ** and * denote significance at 1%, 5% and 10%, respectively.

and M2, for full sample. Besides, there is also bidirectional causality between economic growth and EXPEND, an indicator of real sector for full sample.

THE RESULTS OF DIFFERENT INCOME GROUPS

To discuss for similarity or distinction relationships between high and middle countries, this section categorizes the 50 economies into high and middle income groups according to the World Bank income classifications in 2014 by GNI per capita.

The Results of Panel Unit Roots for Different Income Groups

The panel unit root tests for different income groups will be conducted to test whether all variables are non-stationary in level or stationary in first differences. The results of panel unit root tests for high and middle income groups are as table 6.

In table 6, all results of four panel unit root tests show that the null hypothesis of the unit roots for the panel data of both groups cannot be rejected in level. However, the results of first difference for all variables present that null hypothesis is rejected at 1% significant level. Hence, the variables in level are non-stationary and stationary in first differences. As the results, all variables are I(I) processes.

The Results of Panel Cointegration for Different Income Groups

To examine whether there is presence of cointegrating relationship between economic growth and financial development for high and middle income group, the results of Pedroni's (1999) panel cointegration test are shown as table 7.

Table 6
Panel unit root tests for different income groups

	Variables	*High Income*				*Middle Income*			
		LLC	*IPS*	*ADF*	*PP*	*LLC*	*IPS*	*ADF*	*PP*
Level	GDP	–1.1761	3.139	45.68	41.67	–0.0454	4.4398	8.579	11.91
		(0.1198)	(0.9992)	(0.9733)	(0.9917)	(0.4819)	(1.0000)	(1.0000)	(0.9998)
	EXPEND	2.1240	–1.4085	79.90	44.28	–1.1606	–0.3675	35.10	43.32
		(0.9832)	(0.0795)	(0.1167)	(0.9817)	(0.1229)	(0.3566)	(0.4159)	(0.1314)
	GDS	–1.5007	–0.3663	64.69	68.74	2.6870	0.3019	27.77	27.99
		(0.0667)	(0.3571)	(0.5227)	(0.3847)	(0.9964)	(0.6186)	(0.5825)	(0.5709)
	M2	4.8816	0.6481	63.82	81.00	0.0290	1.7845	26.6422	25.42
		(1.0000)	(0.7415)	(0.5533)	(0.1011)	(0.5116)	(0.9628)	(0.8116)	(0.8557)
	DCPS	6.3714	–1.5240	80.6206	79.5843	1.1606	3.2097	17.0235	26.2557
		(1.0000)	(0.0638)	(0.1063)	(0.1216)	(0.8771)	(0.9993)	(0.9933)	(0.8262)
Δ	ΔGDP	–16.653	–9.482	205.3	314.5	–10.326	–3.984	75.9	113.9
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
	ΔEXPEND	–14.106	–6.167	155.8	203.2	–11.391	–4.045	90.4	149.6
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
	ΔGDS	–13.691	–6.800	166.0	242.5	–13.751	–6.747	104.5	209.3
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
	ΔM2	–11.291	–4.785	152.9	213.8	–12.984	–7.633	114.1	128.3
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
	ΔDCPS	–22.6279	–5.9967	142.8270	212.7480	–11.4938	–5.2217	84.4872	113.5740
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***

Note: The signs ***, ** and * denote significance at 1%, 5% and 10%, respectively.

Table 7
Pedroni's (1999) panel cointegration test for different income groups

Test		*High Income*		*Middle Income*	
		Statistic	*Probability*	*Statistic*	*Probability*
Pedroni	Panel v-Stat	3.9580	0.0000***	9.4147	0.0000***
	Panel rho-Stat	6.6384	1.0000	3.5990	0.9998
	Panel PP-Stat	–2.4276	0.0076***	–1.0536	0.1460
	Panel ADF-Stat	–5.4180	0.0000***	–1.9866	0.0235**
	Group rho-Stat	8.7784	1.0000	4.8850	1.0000
	Group PP-Stat	–7.8374	0.0000***	–2.6510	0.0040***
	Group ADF-Stat	–7.9478	0.0000***	–4.0286	0.0000***

Note: The signs ***, ** and * denote significance at 1%, 5% and 10%, respectively.

The statistics in table 7 show inconsistent results. At 1% significant level, five statistics are significant for high income group, but two statistics are insignificant, such as Panel rho- statistic and the Group rho-statistic. As to the results of middle income group, there are four statistics are significant, while three statistics are insignificant, such as Panel rho- statistic, Panel PP-Statist, and the Group rho-statistic. However, most of the results reject the null hypothesis at 1% and 5% significance level. It means that no matter high income or middle income group appear the existence of cointegration relationship between economic growth and financial development. Therefore, FMOLS will be used to estimate the long run relationship among EXPEND, GDS, DCPS, M2, and economic growth.

The Results of FMOLS Estimation for Different Income Groups

Table 8
FMOLS estimates for different income group

Test	*Variables*	*High Income*	*Middle Income*		
		Coefficient	*Probability*	*Coefficient*	*Probability*
FMOLS	EXPEND	0.9249	(0.0000)***	4.6795	(0.0000)***
	GDS	1.0572	(0.0000)***	0.4187	(0.0000)***
	DCPS	0.7602	(0.0000)***	0.1144	(0.0341)**
	M2	0.1462	(0.0000)***	2.0557	(0.0000)***

Note: The signs ***, ** and * denote significance at 1%, 5% and 10%, respectively.

Table 8 presents the results of FMOLS estimations of cointegrating vectors as the dependent variable is GDP per capita for both income groups. In table 8, except the coefficient of DCPS for middle income group, other coefficients of both income groups are positive and statistically significant at 1% level. Besides, the analysis of table 8 results as the followings: First, comparing the coefficients of the indicator of real sector, EXPEND, for two income groups, the coefficient for the middle

income countries, 4.6795, is far higher than 0.9249, the coefficient for high income countries, which implies that increasing development of real sector could will cause higher economic growth in middle income countries than high income countries.

Second, as to the coefficients of the indicator of financial development, the coefficient of M2 for the middle income countries, 2.0557, is far higher than 0.1462, the coefficient of M2 for high income countries, that is, increasing M2 could bring about higher economic growth in middle income countries than high income countries. Conversely, the coefficients of other two indicators of financial development, GDS and DCPS, display contrary effects for middle income countries. For middle income countries, the coefficients of GDS and DCPS are 0.4187 and 0.1144, respectively, both are lower than the coefficients of GDS and DCPS, 1.0572 and 0.7602, respectively, for high income counties. Hence, increasing gross domestic savings (GDS) and domestic credit to private sector (DCPS) cannot make higher economic growth in middle income countries than high income countries. The coefficient of domestic credit to private sector (DCPS) for middle income countries is statistically significant, which implies that rising domestic credit to private sector can significantly raise economic growth in middle income countries. Being based on the above discussions, to improve economic growth, the best tool of financial development is to increase EXPEND for middle income countries, but increasing gross domestic savings will be the best choice of financial development for high income countries.

The Results of Panel Causality for Different Income Groups

The results of panel Granger causality for two different income groups are shown as table 9. In light of the causality between economic growth and financial development for high income group, all of independent variables and economic growth are bidirectional causalities at 1% and 5% significant level which is

Table 9
Panel causality for different income groups

	High Income				*Middle Income*			
	EXPEND	*GDS*	*DCPS*	*M2*	*EXPEND*	*GDS*	*DCPS*	*M2*
GDP	16.6198 (0.0000)*** →	15.8590 (0.0000)*** →	25.6034 (0.0000)*** →	17.6008 (0.0000)*** →	5.7566 (0.0009)*** →	4.2706 (0.0064)*** →	5.6262 (0.0010)*** →	2.2506 (0.0841) ×
	3.4332 (0.0169)** ←	4.0908 (0.0069)*** ←	3.1909 (0.0234)** ←	3.5878 (0.0137)** ←	2.7283 (0.0461)** ←	1.4321 (0.2361) ×	0.2204 (0.8822) ×	2.1072 (0.1009) ×

Note: The signs *** and ** denote significance at 1% and 5% respectively.

consistent with the causality results of full sample observation. This evidence shows a virtuous cycle between financial development and economic growth, that is, increasing each of four variables, EXPEND, GDS, DCPS and M2, will cause economic growth, and vice versa. As to the causality between economic growth and financial development for middle income group, GDP leads two indicators of financial development, GDS and DCPS, which implies that economic growth affects financial development, but latter cannot lead economic growth. Besides, there is no causality between GDP and M2, displaying these two variables cannot significantly interact with each other in the short run.

In short, comparing the results of causality between economic growth and financial development for two income groups, in high income countries, economic growth can cause financial development, and vice versa. As to middle income countries, economic growth can cause financial development but financial development cannot cause economic growth.

THE RESULTS OF DIFFERENT REGIONS

This section categorizes 50 economies of the full sample observation into 4 different region groups including America, Asia and Oceanic, Europe and Middle East countries to discuss for similarity or difference relationships among geographic groups.

THE RESULTS PANEL UNIT ROOT FOR DIFFERENT REGIONS

The results of panel unit root tests for distinction geographic groups are as table 10. In table 10, all results of four panel unit root tests, for all variables in level show that the null hypothesis of the unit roots for the panel data cannot be rejected at 1% significant level for all different region groups and all variables in first difference rejected the null hypothesis for all different region groups. Therefore, all variables of all different region groups are I(I) processes.

The Results of Panel Cointegration for Different Regions

The results of Pedroni's (1999) panel cointegration test for different region groups are shown as table 11, which show inconsistent results. At 1% and 5% significant level, four statistics are significant for America and Asia-Oceanic, but three statistics are insignificant, such as Panel rho-statistic, Group rho-statistic and Group ADF-statistic. As to the results of Europe, there are three statistics are significant, while four statistics are insignificant. In addition, only one statistic is significant in the Middle East. Hence, except for the Middle East, most of the results of other three regions confirm the existence of cointegration relationship between economic

Table 10
Panel unit root tests for different regions

Variables		*America*				*Asia–Oceanic*			
		LLC	*IPS*	*ADF*	*PP*	*LLC*	*IPS*	*ADF*	*PP*
Level	GDP	–0.6186	3.2889	5.565	10.62	0.0958	3.0849	7.7549	7.564
		(0.2681)	(0.9995)	(0.9998)	(0.9798)	(0.5382)	(0.9990)	(0.9978)	(0.9981)
	EXPEND	–0.9960	1.0370	13.7865	20.86	–1.0147	1.6203	13.6248	14.78
		(0.1596)	(0.8501)	(0.9089)	(0.5293)	(0.1551)	(0.9474)	(0.9143)	(0.8715)
	GDS	–0.7487	–0.1196	17.59	23.57	–0.1498	–1.0930	31.91	33.76
		(0.2270)	(0.4524)	(0.6144)	(0.2617)	(0.4405)	(0.1372)	(0.0789)	(0.0519)
	M2	1.1731	1.4177	20.1854	19.34	2.7429	0.0611	20.2288	33.4444
		(0.8796)	(0.9219)	(0.5714)	(0.6242)	(0.9970)	(0.5244)	(0.5687)	(0.0559)
	DCPS	–0.8164	0.6400	20.6600	28.4644	1.6262	0.1097	23.1966	32.5477
		(0.2071)	(0.7389)	(0.5418)	(0.1608)	(0.948)	(0.5437)	(0.3907)	(0.0685)
First Difference	ΔGDP	–7.900	–5.8593	71.424	82.7	–7.301	–5.4532	68.1990	96.274
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
	ΔEXPEND	–8.405	–5.5405	71.038	73.4	–8.334	–5.8612	71.4888	80.748
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
	ΔGDS	–22.142	–10.6201	78.412	84.8	–11.278	–8.9414	105.7340	131.814
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
	ΔM2	–14.815	–9.4726	106.286	95.1	–8.314	–7.0928	88.0037	115.639
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
	ΔDCPS	–11.9791	–6.8827	83.1349	83.4717	–7.8234	–4.6064	61.1683	77.1271
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
Variables		*Europe*				*Middle East*			
		LLC	*IPS*	*ADF*	*PP*	*LLC*	*IPS*	*ADF*	*PP*
Level	GDP	–1.0996	5.4870	8.696	3.26	–0.6998	1.4963	3.894	2.02
		(0.1357)	(1.0000)	(1.0000)	(1.0000)	(0.2420)	(0.9327)	(0.9520)	(0.9962)
	EXPEND	0.7411	–1.5983	56.6698	59.25	0.9173	–1.1315	13.8762	11.81
		(0.7707)	(0.0550)	(0.1346)	(0.0908)	(0.8205)	(0.1289)	(0.1787)	(0.2979)

Cont. table 10

Variables		*Europe*				*Middle East*			
		LLC	*IPS*	*ADF*	*PP*	*LLC*	*IPS*	*ADF*	*PP*
	GDS	–0.5241	0.0921	40.41	33.96	1.9005	1.0435	4.9121	4.01
		(0.3001)	(0.5367)	(0.7046)	(0.9057)	(0.9713)	(0.8516)	(0.7669)	(0.8561)
	M2	3.3535	–0.0930	45.3166	60.94	–1.0637	–0.8279	12.5923	12.20
		(0.9996)	(0.4630)	(0.5008)	(0.0691)	(0.1437)	(0.2039)	(0.2474)	(0.2722)
	DCPS	2.0484	1.6510	33.3618	48.3018	–0.3256	0.0999	7.9027	6.7435
		(0.9797)	(0.9506)	(0.8787)	(0.3033)	(0.3724)	(0.5398)	(0.6383)	(0.7494)
First Difference	ΔGDP	–16.563	–10.0891	176.510	253.0	–3.007	–2.4572	23.3961	32.896
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0013)***	(0.0070)***	(0.0094)***	(0.0003)***
	ΔEXPEND	–12.562	–4.9999	109.111	128.5	–4.986	–3.1568	30.4045	36.490
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0008)***	(0.0007)***	(0.0001)***
	ΔGDS	–10.069	–4.3586	97.332	153.2	–11.667	–6.5677	40.4624	51.707
		(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0000)***
	ΔM2	–7.983	–2.9658	90.946	100.4	–4.407	–4.1081	34.2488	54.505
		(0.0000)***	(0.0015)***	(0.0001)***	(0.0000)***	(0.0000)***	(0.0000)***	(0.0002)***	(0.0000)***
	ΔDCPS	–20.8868	–4.8568	79.2043	111.3080	–4.7291	–3.8832	31.9582	33.9185
		(0.0000)***	(0.0000)***	(0.0017)***	(0.0000)***	(0.0000)***	(0.0001)***	(0.0004)***	(0.0002)***

Note: Numbers in parentheses denote marginal significance levels (p–values). *, ** and *** denote significance at 10%, 5% and 1%, respectively. All 4 panel unit root tests above have the null hypothesis of unit roots (non–stationary)

Table 11
Pedroni's (1999) panel cointegration test for different regions

Test		*America*		*Asia-Oceanic*	
		Statistic	*Probability*	*Statistic*	*Probability*
Pedroni	Panel v-Stat	5.8700	0.0000***	7.8997	0.0000***
	Panel rho-Stat	2.5148	0.9940	3.7935	0.9999
	Panel PP-Stat	–4.0389	0.0000***	–1.2291	0.1095
	Panel ADF-Stat	–3.6226	0.0001***	–1.9217	0.0273**
	Group rho-Stat	4.1959	1.0000	5.1118	1.0000
	Group PP-Stat	–3.6579	0.0001***	–1.6623	0.0482**
	Group ADF-Stat	–1.5637	0.0589	–2.5165	0.0059**
Test		*Europe*		*Middle East*	
		Statistic	*Probability*	*Statistic*	*Probability*
Pedroni	Panel v-Stat	0.3192	0.3748	5.5873	0.0000***
	Panel rho-Stat	5.6315	1.0000	2.3784	0.9913
	Panel PP-Stat	–0.4409	0.3296	0.7641	0.7776
	Panel ADF-Stat	–4.2543	0.0000***	–1.4393	0.0750
	Group rho-Stat	7.5030	1.0000	2.8996	0.9981
	Group PP-Stat	–4.7458	0.0000***	–0.1670	0.4337
	Group ADF-Stat	–7.5063	0.0000***	–2.1058	0.0176

Note: The signs *** and ** denote significance at 1% and 5% respectively.

growth and financial development. Next section, the long run relationship among EXPEND, GDS, DCPS, M2 and economic growth will be estimated by FMOLS for three different regions, but the Middle East will be excluded.

The Results of FMOLS Estimation for Different Regions

The results of FMOLS estimation for three different regions, America, Asia-Oceanic, and Europe, are shown as table 12. In table 12, real sector and financial development coefficients for three regions are positive and statistically significant at 1% level. Moreover, comparing the coefficients of the indicator of real sector, EXPEND, for three regions, the coefficient in Asia and Oceanic, 0.5767, is only a half of Europe's coefficient, 1.0352, which implies that increasing development of real sector could cause lower economic growth in Asia-Oceanic than in Europe. In addition, the same coefficient in America, 1.3047, which means that raising development of real sector could cause higher economic growth in America countries than in Asia-Oceanic but lower than in Europe.

Furthermore, the coefficient of M2 in America, 1.0820, is the highest coefficient for all of regions, which displays that increasing M2 could bring about higher economic growth in America countries than in other regions'. On the other hand,

Table 12
FMOLS estimates for different regions

Test	*Variables*	*America*		*Asia-Oceanic*	
		Coefficient	*Probability*	*Coefficient*	*Probability*
FMOLS	EXPEND	1.3047	(0.0000)***	0.5767	(0.0000)***
	GDS	0.4034	(0.0000)***	2.2896	(0.0000)***
	DCPS	0.2934	(0.0000)***	0.6677	(0.0000)***
	M2	1.0820	(0.0000)***	0.7114	(0.0000)***

Test	*Variables*	*Europe*	
		Coefficient	*Probability*
FMOLS	EXPEND	1.0352	(0.0000)***
	GDS	1.0685	(0.0000)***
	DCPS	0.6049	(0.0000)***
	M2	0.2229	(0.0000)***

Note: The signs *** and ** denote significance at 1% and 5% respectively.

the coefficient of DCPS in three regions shows diverse effects. In America, the coefficient of DCPS, 0.2934, is lower than one half of the same coefficient in Asia and Oceanic, 0.6677, and also lower than the Europe's coefficient, 0.6049. Hence, the enlarging domestic credit to private sector (DCPS) cannot make higher economic growth in America countries than in Asia-Oceanic and Europe. Finally, the coefficients of gross domestic saving (GDS) in Europe is 1.0685, which is higher than the coefficients of GDS in America, 0.4034, but is far lower than the coefficient of GDS in Asia-Oceanic, 2.289. However, increasing GDS could bring higher economic growth in Asia-Oceanic than other regions.

Being based on the above discussions, to improve economic growth, the best tool of financial development is to increase government expenditure in America, but increasing gross domestic savings will be the best choice of financial development in both regions, Asia-Oceanic and Europe.

The Results of Panel Causality for Different Regions

The results of panel Granger causality for four regions are as table 13. In table 13, in America countries, there is no causality between GDP and DCPS, which displaying these two variables cannot significantly interact with each other in the short run. Besides, GDP leads two indicators of financial development, GDS and M2, and the indicator of real sector, EXPEND, which implies that economic growth affects financial development and real sector, but latter cannot lead economic growth. Hence, in American countries, economic growth can cause financial development but financial development cannot cause economic growth in the short run.

Table 13
Panel causality for different regions

	America				*Asia-Oceanic*			
	EXPEND	*GDS*	*DCPS*	*M2*	*EXPEND*	*GDS*	*DCPS*	*M2*
GDP	6.3990 (0.0005)***	3.6333 (0.0157)**	2.1116 (0.1029)	5.0167 (0.0027)***	3.4327 (0.0194)**	2.8355 (0.0413)**	7.1416 (0.0002)***	1.3786 (0.2531)
	→	→	×	→	→	→	→	×
	1.8930 (0.1352)	0.9399 (0.4247)	1.2091 (0.3100)	1.2818 (0.2843)	2.8662 (0.0397)**	1.2806 (0.2845)	0.2448 (0.8649)	0.3709 (0.7742)
	×	×	×	×	←	×	×	×
	Europe				*Middle East*			
	EXPEND	*GDS*	*DCPS*	*M2*	*EXPEND*	*GDS*	*DCPS*	*M2*
GDP	12.1734 (0.0000)***	5.3566 (0.0014)**	6.5065 (0.0003)***	15.0624 (0.0000)***	0.7809 (0.5114)	3.4155 (0.0304)**	1.0593 (0.3752)	1.5904 (0.2040)
	→	→	→	→	×	→	×	×
	0.9149 (0.4344)	11.7312 (0.0000)***	5.6942 (0.0009)***	2.3496 (0.0732)	1.4254 (0.2492)	1.2301 (0.3166)	0.6847 (0.5658)	2.8916 (0.0449)**
	×	←	←	×	×	×	×	←

Note: The signs *** and ** denote significance at 1% and 5% respectively.

Moreover, in Asian-Oceanic countries, the indicator of real sector, EXPEND, and economic growth show bi-directional causalities, which indicates a virtuous cycle between real sector and economic growth, that is, enlarging EXPEND will rise economic growth, and vice versa. Next, GDP leads two indicators of financial development, GDS and DCPS, which is consistent with the results of causality for middle income group. This evidence implies that economic growth affects financial development, but latter cannot lead economic growth. Besides, there is no causality between economic growth and M2, showing these two variables cannot significantly interact with each other in the short run. In Asia-Oceania's countries, economic growth can cause financial development but financial development cannot cause economic growth in the short run, which is same as the results of American countries.

Furthermore, in European countries, there are two bidirectional causalities between economic growth and two variables of financial development, GDS and DCPS, that is, raising GDS and DCPS will increase economic growth. Then, economic growth leads the indicators of real sector, EXPEND, and one indicator of financial development, M2, which implies that economic growth affects real sector and M2, but both cannot lead economic growth. Being different form the results of causality between economic growth and financial development in the above two regions, in European countries, economic growth can cause financial development, and vice versa.

As to the causalities of the Middle East countries, there is no causality between economic growth and indicator of real sector, EXPEND and one indicator of financial development, DCPS, which is implying these two variables cannot significantly interact with each other in the short run. However, in this region, GDP leads government saving and M2 leads GDP, which displays that increasing M2 is only effectively tool of improving economic growth in the short run for the Middle East countries. Being same as the results of causality between economic growth and financial development in America and Asia-Oceanic countries, economic growth can cause financial development in Middle East but financial development cannot cause economic growth in the short run.

Overall, comparing the results of causality between economic growth and financial development in four regions, in Europe, economic growth can cause financial development, and vice versa. As to other three regions, Middle East, America and Asia-Oceania, economic growth can cause financial development but financial development cannot cause economic growth.

CONCLUSION

This paper applies panel cointegration and causality tests to examine the linkage between financial development and economic growth for the panel data of 50 countries over 2000-2013. Our main findings are as follows.

First, the results of Pedroni's panel cointegration tests support that there is existence of long run relationship between economic growth and financial development among three diverse categories including full sample observation, income level and distinction regions (except Middle East). Comparing with the effects of three indicators of financial development to increase economic growth, increasing domestic savings can raise higher economic growth than increasing domestic credit to private sector or M2 in full sample of observation. Moreover, examining the result of financial development impact on economic growth in income level, EXPEND is the best option to raise economic growth in middle income countries and gross domestic saving will be the best tool to increase growth in high income countries. Furthermore, the are some differences in comparing the results of improving economic growth in four different geographic areas (America, Asia-Oceania, Europe and Middle East), for almost all regions except America, the best option is increasing gross domestic saving while increasing government expenditure is the best choice in America to raise economic growth.

Finally, according to the results of causality between economic growth and financial development, which shows that in high income countries, financial development can cause economic growth and vice versa, while in middle income countries, financial development cannot cause growth but economic growth can

cause financial development. As to the results of causality for four geographic areas, Europe countries show there is bidirectional causality between economic growth and financial development, then economic growth can cause financial development and vice versa. However, in America, Asia-Oceania and Middle East, there is existence of one directional causality which is economic growth can cause financial development but financial development cannot cause growth.

Note

1. The coefficients can be defined as elasticity because all variables are used as natural logarithm.

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