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## Article

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## FINANCIAL ECONOMICS | RESEARCH ARTICLE

# Contribution of financial market development in competitiveness growth

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**Abstract: Purpose:** The study aims at re-examining the relationship between financial market development and economic development in the context of competitiveness of developed and higher income countries. **Methodology/approach:** The study employs generalized least square (GLS) regression model to analyze the panel data of 21 higher income countries over the period (2009–2017). Further, the study checked the robustness of the results by introduces a lagged dependent variable in the regression models by employing the generalized methods of moments (GMM) for Dynamic Panel analysis. **Findings:** Results reveal that four independent variables: Financial market development (FMDG), trade openness (OPNG), Labor market efficiency (LMEG), and Technological readiness (TRG), were positive and significant, which indicates the existence of relationship from those variables to competitiveness in the context of growth. while one of the independent variables is Market size (MSG) was positive but insignificant. Moreover, the results from the GMM estimator remain robust in terms of directions and significance levels



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### PUBLIC INTEREST STATEMENT

The sources of global competitiveness and economic growth attract the most economists and business researchers' attention around the world. Some economists believe that the greater the financial development, the higher would be the economic growth and competitiveness. Others just believe that the relationship between financial development and economic growth is not important. To moderate such conflicts, this paper describes the contribution of financial market development besides other competitiveness sources in competitiveness growth. It was found that growing of financial market development, trade openness, labor market efficiency, and Technological readiness, will contribute positively in competitiveness growth. Understanding these effects can improve countries' competitiveness and future development programs and policies. Exploration of competitiveness sources can also help both public and private institutions to direct communities and individuals in the mobilization of savings and its allocation to high return projects which support economic growth and competitiveness.

and confirm the robustness of the findings. **Originality:** This paper represents a significant contribution especially for the higher income countries that can help them in designing the policies and strategies in order to improve their performance and competitiveness by financial market development besides other competitiveness sources.

**Subjects:** Economics; Econometrics; Development Economics; Finance

**Keywords:** competitiveness; financial markets development; economic growth; higher income countries

**JEL classification:** O16; O47

## 1. Introduction

Financial market development can be defined as the factors, policies, and the institutions that lead to the efficient intermediation and effective financial markets. Therefore, it is improving the competence of the financial market to perform efficiently as an intermediary to stimulate economic growth and reduce poverty.

According to neoclassical growth theory in 1950s, long run economic growth relies only on sustainable technological progress and other factors that impact economic growth is contained in Solow residual, non-illustrated part of the sources of economic growth. However, the endogenous growth theory, which raised in 1980s permitted endogeneity of other potential variables impacting economic growth in economic model. Thus, the effect of financial system could be better explained.

The relationship among financial development and economic growth has drawn an important degree of attention recently. Yet, there are consisting thoughts concerning the effect that the financial system may cause to economic growth. Some economists believe that the greater the financial development, the higher would be the mobilization of savings and its allocation to high return projects which support economic growth and competitiveness (Beck, 2008; Fink, Haiss, & Mantler, 2005; Odedokun's, 1996; Calderon & Liu, 2003). Others just do not believe that the relationship between financial development and economic growth is important (Koivu, 2002; Mehl, Vespro, & Winkler, 2005; Zang & Kim, 2007).

To moderate such confusions, this paper aims at re-examines this relationship in the context of competitiveness of developed and higher income countries. It will employ secondary data for 21 higher income countries, which were collected from the Global Competitiveness reports over the period (2009–2017). Thus, this study employs generalized least square (GLS) regression model to analyze the panel data and re-examining the relationship between financial market development and economic development in the context of competitiveness of developed and higher income countries. It is expected that results will highlight many views that benefit policy makers and enable them to work more directly and efficiently, which can improve country's competitiveness and future development programs and policies.

The rest of the paper is organized as follows: Section 2 present the literature review on the link between financial market development and competitiveness, Section 3 explains the research methodology in details, Section 4 is for regression analysis followed by robustness check and finally the conclusion in Sections 5 and 6.

## 2. Literature review on the financial market development and competitiveness

The relationship between financial market development and competitiveness started to be one of the major topics as the financial market development is one of the global competitiveness index.

Most of the previous studies investigate the effect of financial market development on economic growth as a strong indicator for competitiveness. The pillars of global competitiveness are strongly inspired by the theories of endogenous growth. Economic growth may also come from the following two channels: technological progress or enhanced production efficiency; growth factors of production. In general, economic growth related to a number of economic variables that ranged into two levels: first, the micro level, such as the productivity of factors of production; Second, the macro level, such as the availability of macroeconomic resources for growth. So that identification of economic growth sources is the cornerstone in activating the economic activity and making structural changes supporting it (Alfaro, Chanda, Kalemli-Ozcan, & Sayek, 2004; Barro, 1991; Chenery & Strout, 1966; Fields, 1980; Harris-Todaro, 1970; Landau, 1983; Lensink & Morrissey, 2006; Lewis, 1954; Lucas, 1988; Romer, 1986; Solow, 1956; Wolde-Rufael, 2009).

Financial markets were not seen by the economic theory as directly relevant for development as technological progress and factors growth were (Christopoulos and Tsionas, 2004). This has changed with the development of endogenous growth models, which state that investment in research and development, physical capital and human capital<sup>1</sup> are major determinants of economic growth (Beck, Demirgüç-Kunt, & Levine, 2000). This means that growth is a positive function of the investment ratio. It states that in the long run, economic growth will depend on the policy measures contain openness, competition and innovation which will promote growth and competitiveness (Aghion & Howitt, 1998). But the question is about: how to finance these investments and how the financial intermediaries will allocate funds?

Levine emphasized to consider the importance of financial sector in economic growth. Hicks (1969) argue that the financial system of England played a critical role in the industrial revolution. Schumpeter (1911) points out that a well-functioning financial system encourages technological innovations by increasing funding to entrepreneurs, which ultimately leads to economic growth. Subsequent supporting research studies mention that the development of financial system is positively correlated with current and future economic growth, physical capital accumulation and economic productivity. On the contrary, Kuznets (1955), Friedman and Schwartz (2008) suggest that the causation goes the other way, that is, the financial system developed as a result of economic growth.

Levine (2004) reveals that countries with better functioning banks and financial markets expand faster and thus become more competitive. Hartmann, Heider, Papaioannou, Duca, and Marco (2007) clarifies that there are a number of ways in which the financial market framework conditions in Europe can be enhanced to rise the contribution of the financial system to innovation, productivity, growth and hence competitiveness. Classens (2009) reviews many previous studies and concluded that as financial services industries develop, and as financial markets and products become more complicated and global, new regulatory and competition policy issues emerge. Accordingly, approaches to competition issues need to modify, important since competition policy in the financial sector is often already behind. Wurgler (2000) explained that developed financial markets are associated with a better allocation of capital comparing to countries with weak financial markets, financially developed countries increase investments in growing industries and decrease them in contracting ones. Therefore, the core advantage of financially developed countries is beyond the higher investment rate to the better allocation of resources to profitable investment projects.

Gray and Blejer (2006) reveals that the GCC countries have developed financial markets comparing to the other Arabic countries as a function of larger wealth besides the policies to enhance economic diversification and hence increase the competitiveness.

Yokoi-Aria and Yoshino (2006) trade openness is important for competitiveness but such wide openness of the financial market to foreign firms could lead to the absolute dominance of foreign firms which could lead to inverse response in the host nation as well. It is important to get

a balance between the need to open markets and improve competitiveness with financial market tendency.

They added that the developed financial markets that are liberalized tend focus more on qualitative competitiveness more than quantitative expansion.

Whereas earlier economists reached a general consensus that the link between financial development and economic growth was positive, other studies have another point of view. Subsequent empirical study by Favara (2003) that the relationship between financial development and economic growth is very weak. On the other hand, Giovannini, Iacopetta, and Minetti (2013) reveal that there is an adequate degree of learning-by-doing in production in developing countries besides the prompt absorption of foreign technologies, the static loss of GDP translates into slower long-run growth. In addition, the visible enlargement of financial markets causes a more fragile economic environment and to more sharp impacts of financial crises. Arcand, Berkes, and Panizza (2012) have showed a negative relation between finance and growth under certain conditions. Ruiz (2018) found that financial development has negative effect on economic growth when the financial development is below the threshold. This study therefore re-examines this relationship in the context of competitiveness of developed and higher income countries.

### 3. Research methodology

#### 3.1. Target population and sample size

According to the World Economic Forum, 21 countries that classified as highest income countries in the world were included in this study during the years 2009–2017. Those countries are (Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Japan, Netherland, Norway, Poland, Portugal, Russian Federation, Spain, Sweden, Switzerland, United Kingdom, United States, and Italy).

#### 3.2. Types and sources of data

since no quarterly data are available, this study employed annual secondary data for higher income countries, which were collected from the world Bank, and the Global Competitiveness reports that were issued by the World Economic Forum during the fiscal years of 2009 to 2017. Thus, this study will be utilizing the Panel data.

#### 3.3. Variables with its measurement

The various sources of economic growth—As an indicators of competitiveness—are strongly inspired by the theories of endogenous growth. Since most economists believe that the economic development confirms the positive effect of economic and resources growth, driven by the level of the global competitiveness and efficiency enhancers. Thus, Lucas (1988) developed an endogenous growth model centered on the human capital, which accumulated by education, training, health and the innovation. In the same way, Romer (1990); Aghion and Howitt (1992, 1998)) developed two models of endogenous growth based on technological innovation. Pagano (1993) also analyzed theoretically the role of financial development in the efficient allocation of financial resources and therefore in economic growth. Moreover, Grossman and Helpman (1991) proposed a model where economic growth depends on the opening-up of the economy assuming that opening encourages technological transfers and opens new foreign markets. Accordingly, Table 1 shows variables of the study with its measurement.

According to world economic forum WEF, the study's variables are defined as the following:

**First**, The Competitiveness (COMP) is calculated within the Global Competitiveness index (GCI) by including a weighted average of many different components, each measuring a different aspect of competitiveness. **Second**, the Financial Market Development (FMD) measured by capital available for private-sector investment from the resources saved by a nation's population, as well as those entering the economy from abroad as loans from a sound banking sector,

**Table 1. The variables measurement**

Variable	Formula	Measures	Expected Sign
COMPG	$COMP_{G_{it}} = \frac{COMP_{it} - COMP_{it-1}}{COMP_{it-1}} \times 100$	Competitiveness growth rate	
FMDG	$FMDG_{it} = \frac{FMD_{it} - FMD_{it-1}}{FMD_{it-1}} \times 100$	Growth rate of financial market development	Positive
LMEG	$LMEG_{it} = \frac{LME_{it} - LME_{it-1}}{LME_{it-1}} \times 100$	Growth rate of labor market efficiency	Positive
MSG	$MSG_{it} = \frac{MS_{it} - MS_{it-1}}{MS_{it-1}} \times 100$	Growth rate of Market size	Positive
TRG	$TRG_{it} = \frac{TR_{it} - TR_{it-1}}{TR_{it-1}} \times 100$	Growth rate of Technological readiness	Positive
OPNG	$OPNG_{it} = \frac{OPN_{it} - OPN_{it-1}}{OPN_{it-1}} \times 100$ Where: $OPN_{it} = \frac{EXPORTS_{it} - IMPORTS_{it}}{GDP_{it}}$	Growth rate of trade openness	Positive
GMEG	$GMEG_{it} = \frac{GME_{it} - GME_{it-1}}{GME_{it-1}} \times 100$	Growth rate of goods market efficiency	Positive
HETG	$HETG_{it} = \frac{HE_{it} - HE_{it-1}}{HE_{it-1}} \times 100$	Growth rate of higher education and training	Positive

Sources: Prepared by the authors based on the World Bank data and World Economic Forum, Global Competitiveness report.

well-regulated securities exchanges, venture capital, and other financial products. **Third**, Labor Market Efficiency (LME) Measures the efficiency and flexibility of the labor market for ensuring that workers are allocated to their most effective use in the economy and provided with incentives to give their best effort in their jobs. **Fourth**, Market Size (MS) Measures the domestic demand by including both domestic and foreign markets in our measure. **Fifth**, Technological Readiness (TR) measures the agility with which an economy adopts existing technologies to enhance the productivity of its industries, with specific emphasis on its capacity to fully leverage information and communication technologies (ICTs) in daily activities and production processes for increased efficiency and enabling innovation for competitiveness. **Sixth**, Trade openness (OPN) measured by the sum of exports and imports to the Gross Domestic Production GDP, the higher value indicates more openness. **Seventh**, Good Market Efficiency (GME) measured based on demand conditions and Healthy market competition, both domestic and foreign. **Eighth**, Higher education and training (HET) Measures secondary and tertiary enrollment rates as well as the quality of education as evaluated by business leaders, the extent of staff training is also taken into consideration.

### 3.4. Model specification

Panel data analysis becoming valuable for comparing the performance of firms and countries, whereas it is more common in economic studies that apply the econometric analysis (Bujari, Martínez, & Lechuga, 2017). This paper employs panel regression model to analyze the relationship between financial market development and economic development in the context of competitiveness of developed and higher income countries. Through literature review, this study constructs an empirical regression model below:

$$COMP_{it} = \alpha_i + \sum_{j=1}^k B_j X_{it} + U_{it} \quad (1)$$

Where  $COMP_{it}$  is the competitiveness growth rate,  $X_{it}$  is independent variables for country “i” at time “t,”  $\alpha$  is constant,  $\beta$  is the coefficient of  $j$  independent variables, and  $U$  is the error term.

The use of panel data has many advantages and disadvantages. The most common advantage that it allows examining a large number of observations with heterogeneous information, and produces less data multicollinearity among the explanatory variables. Moreover, it allows using more data and can keep track of each unit of observation. It has also disadvantages as the data become more complex and heterogeneity appears and is not properly treated. If the properties of the country are not observable, then the errors will be correlated with the observations, and the OLS estimators are inconsistent (Baltagi, 1995). In this study we have to determine which of the two models (fixed effect (FE) and random effect (RE)) is best fit after conducting the Hausman test for random effects.

Given Equation (1), each country  $i$  has  $n$  observations over time  $t$ . The FE model aims at determining the behavior of each country independently, by making the intercept ( $\alpha$ ) vary between countries. This model allows for differences between countries by estimating the intercept for each country assuming it is variable between countries and constant over time (Time Invariant), with constant coefficients of the explanatory variables of each country. Whereas the FE for each country is the most important as it allows the existence of a heterogeneity or individuality among countries allowing to have its own intercept value. Thus, the term of FE is due to the fact that although the intercept may differ across countries, but it does not vary over time.

Several kinds of fixed effects differ in the assumptions about, the intercept and the slope coefficients. Introducing dummy variable is the simplest method of isolating individual or time-specific effect to avoid the problem of multicollinearity in a regression model (Greene, 2002). The individual effect is picked up by the dummy variable  $D_{mi}$  where ( $m = n-1$ ). The least squares method is then used to estimate the model. This method is called the least squares dummy-variables model (LSDV). The FE model involves fewer assumptions about the behavior of residuals.



Allison (2009) says “In a fixed effects model, the unobserved variables are allowed to have any associations whatever with the observed variables”. By adding the phantom variables to Equation (1), the FE model becomes as follows:

$$COMP_{G_{it}} = \alpha_1 + \sum_{d=2}^n \alpha_d D_{mi} + \sum_{j=1}^k B_j X_{it} + \varepsilon_{it} \quad (2)$$

Where the section  $\left( \alpha_1 + \sum_{d=2}^n \alpha_d D_{mi} \right)$  refers to change of the intercept for each  $i$  country. In the FE model, it is assumed that the error  $\varepsilon$  takes the form of normal distribution with a mean equals zero and a constant and a homoscedastic variance is  $\sigma^2$  in order to produce unbiased estimators.

The random effects model (RE) is appropriate in estimating coefficients if the above assumptions are not completed (Baltagi, 2005). This model treats the Intercept as a random variable that takes a weight equal to  $(\mu)$  as the following equation:

$$\alpha_i = \mu + v_i \quad (3)$$

Where the intercept  $\alpha_i$  can be decomposed into two parts: a fixed part that remains constant for each country  $v_i$ , and a random part  $\mu$  that meets the requirements of OLS.

The random effects model (RE) has the same specification as the fixed effects except that the term  $v_i$ , rather than being fixed for each country and constant over time is a random variable with mean  $E[v_i]$  and variance  $(v_i) \neq 0$ . Where the RE model contains a compound error consisting of  $(v_i + \varepsilon_{it})$ . Quoting Allison (2009), “In a random effects model, the unobserved variables are assumed to be uncorrelated with all the observed variables.” Thus, the RE model is given by:

$$COMP_{G_{it}} = \mu + \sum_{j=1}^k B_j X_{it} + v_i + \varepsilon_{it} \quad (4)$$

Now  $v_i$  is a random term. Noting that the RE model is more efficient but less consistent than FE, because it contains a compound error. Thus, the RE model uses the GLS method to estimate the coefficients of the model. The GLS method assumes the homoscedastic variance, and white error (Baltagi Badi, 2005).

In order to determine which of the two previous models (FE, RE) is suitable for the Panel data analysis, the Hausman Test is performed. The null hypothesis (H0) indicating the acceptance of the Random Effect model versus the alternative hypothesis (H1) indicating the acceptance of the Fixed Effect. The Hausman test takes the following formula:

$$H = \left( \hat{\beta}_{FE} - \hat{\beta}_{RE} \right)' \left[ \text{var } \hat{\beta}_{FE} - \text{var } \hat{\beta}_{RE} \right]^{-1} \left( \hat{\beta}_{FE} - \hat{\beta}_{RE} \right) \quad (5)$$

The Hausman statistic takes the distribution of a *Chisquare*  $\chi^2$  with a degree of freedom equal to K.

### 3.4.1. Data statistical description

Before starting regression analysis, it is important to take a look at descriptive data and statistics that give an idea about the maximum, minimum, average, and standard deviation of study's variables of higher income countries' competitiveness in 2017. Table 2 shows the data statistics.

The statistics in Table 2 indicate that both *Switzerland* and *United States* achieved the highest competitiveness score among the higher income countries, respectively, whereas the *United States* got the first rank in FMD and MS and *Switzerland* got the first rank in LME and TR. *Finland* and *France* were the highest countries in the HET and GME, respectively. *Belgium* got the higher rank for OPN.

**Table 2. Statistical description of higher income countries in 2017**

Country	COMP	FMD	LME	MS	TR	OPN	GME	HET
Australia	5.2	5.5	4.7	5.1	5.7	0.42	4.9	5.9
Austria	5.2	4.6	4.5	4.6	6	1.05	4.9	5.7
Belgium	5.2	4.7	4.5	4.8	5.9	1.69	5.2	5.8
Canada	5.3	5.4	5.4	5.4	5.9	0.64	5.2	5.8
Denmark	5.4	4.9	5.2	4.3	6.1	1.03	5.1	6
Finland	5.5	5.5	4.8	4.2	6	0.77	5.2	6.2
France	5.2	4.5	4.3	5.7	5.9	0.63	5.7	5.4
Germany	5.7	5	5	6	6.2	0.87	5.3	5.7
Iceland	5	4.2	5.2	5.2	6.2	0.90	4.8	5.8
Japan	5.5	4.9	4.8	6.1	6	0.30	5.2	5.4
Netherlands	5.7	4.6	5.1	5.1	6.3	1.61	5.5	6.1
Norway	5.4	5.2	5.1	4.4	6.1	0.69	5	5.9
Poland	4.6	4.2	4.1	5.2	4.9	1.05	4.6	5
Portugal	4.6	3.3	4.4	4.3	5.7	0.85	4.7	5.1
Russian Federation	4.64	3.4	4.3	5.9	4.5	0.47	4.2	5.1
Spain	4.7	4	4.2	5.4	5.7	0.66	4.5	5.2
Sweden	5.52	5.1	4.9	4.7	6.3	0.86	5.2	5.6
Switzerland	5.86	5.3	5.9	4.7	6.4	1.19	5.5	6.1
United Kingdom	5.51	5	5.4	5.8	6.3	0.63	5.3	5.5
United States	5.85	5.7	5.6	6.9	6.2	0.26	5.5	6.1
Italy	4.5	3.1	3.7	5.6	5.1	0.60	4.4	5
<b>Max</b>	5.86	5.7	5.9	6.9	6.4	1.69	5.7	6.2
<b>Min</b>	4.54	3.14	3.7	4.2	4.5	0.26	4.2	5
<b>S.D</b>	0.42	0.74	0.55	0.71	0.49	0.37	0.4	0.39
<b>Average</b>	5.24	4.67	4.81	5.21	5.88	0.82	5.04	5.64

Source: Prepared by the authors based on the Global Competitiveness Report 2017, World Economic Forum

*Italy, Poland, Portugal, and Russian Federation* have the lowest scores among the higher income countries in terms of competitiveness, respectively. However, these four countries have the lowest scores in the HET, whereas *Italy* has the lowest score in the LME and FMD. And *Russian Federation* has the lowest score in both GME and TR. Moreover, the trade openness indicates that the *United States* got the lower rank. After doing more research about the causes of such low competitiveness it was found that *Poland* suffered from weak educational system and transport infrastructure, low productivity of labor and cheap labor force and dirty energy. It needs to develop substantial levels of R&D and innovation.

Kuzin (2007) reveals that the most serious indicators of Russia's lag behind the leading and other similar in size, as well as potential and development stage countries.

#### 3.4.2. Testing stationary problem

Since the appearance of the papers by Levin and Lin (1992, 1993); Lavin and Lin and Chu (2002), the use of panel data unit root tests has become very popular among empirical researchers with access to a panel data set. It is by now a generally accepted argument that the commonly used unit root tests like the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests is one way of increasing the power of unit root tests (Maddala & Wu, 1999). Unit root test is used to check the stationarity of the study's variables. In this study, three of unit root tests (ADF, PP, and LLC) are applied to check the order of integration of the variables and ensure their stability. The null hypothesis (H0) for these tests indicates for existence of unit root (instability) in the variables. Noting that the LCC test assumes common unit root process where it considers an appropriate test in a small sample, and both tests ADF and PP assumes individual unit root process (Asteriou and Hall, 2007). The results of the unit root tests are given in Table 3.

According to probability of *Chi-square* and *t-statistic* values of the unit root tests, the results show that all variables are stationary in their level that means reject H0 and there is no unit root in model's variables.

#### 3.4.3. Testing multi-collinearity problem

The study employed the spearman rank-order to test Multi-collinearity between the explanatory variables. It assesses how well the relationship between two variables can be described using a monotonic function. The Spearman correlation between two variables will be high when observations have a similar rank between the two variables, and low when observations have a dissimilar rank between the two variables. The null hypothesis (H0) for Spearman test indicates for existence of no association between ranks. The results are presented in Table 4.

Correlation coefficients and its probability in Table 4 reveal all the independent variables are correlated with the dependent variable (COMPG), meaning that these variables may impact on competitiveness growth. On other hand, some independent variables were correlated (when (Prob. < 0.05), it indicates that there is association between ranks) which means there is multi-collinearity between those correlated variables. Whereas HETG is correlated with all the independent variables and GMEG correlated with FMDG and LMEG. Thus, the study will **exclude** the two variables HETG and GMEG to avoid the multi-collinearity problem. The results are presented in Table 5.

Correlation coefficients in Table 5 indicate that no correlation problem between the independent variables after excluding GMEG and HETG. Hence the four independent variables (FMDG, LMEG, MSG, and TRG) can be retaining in the model of this study.

The study applied Variance Inflation Factors (VIF) as another diagnostic test that reveals the multi-collinearity. According to Robert (2007) and A rule of thumb is that the variance inflation factor (VIF) above 5 or the tolerance value (1/VIF) below 0.2 is an indication that there is a problem of multi-collinearity among the variables. The results are presented in Table 6.

**Table 3. Unit root tests**

Variables	COMPG	FMDG	LMEG	MSG	TRG	OPNG	GMEG	HETG
ADF	Chi-square	120.86	135.08	89.49	176.39	190.93	159.81	103.95
	Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Stationary	Level*	Level*	Level*	Level*	Level*	Level*	Level*
PP	Chi-square	129.77	218.07	100.69	228.96	233.71	242.62	133.14
	Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Stationary	Level*	Level*	Level*	Level*	Level*	Level*	Level*
LLC	t-statistic	-11.99	-12.66	-9.31	-14.86	-27.56	-11.63	-9.67
	Probability	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Stationary	Level*	Level*	Level*	Level*	Level*	Level*	Level*

\*.- stationary with individual effects and individual linear trends.

**Table 4. Spearman rank-order test**

	COMPG	FMDG	LMEG	MSG	TRG	OPNG	GMEG	HETG
COMPG	1 - -							
FMDG	0.489 [7.639] (0.000)	1 - -						
LMEG	0.351 [5.098] (0.000)	<b>0.132</b> <b>[1.833]</b> <b>(0.067)</b>	1 - -					
MSG	-0.159 [-2.204] (0.028)	<b>-0.138</b> <b>[-1.912]</b> <b>(0.057)</b>	<b>-0.016</b> <b>[-0.228]</b> <b>(0.819)</b>	1 - -				
TRG	0.248 [3.486] (0.000)	<b>0.041</b> <b>[0.564]</b> <b>(0.572)</b>	<b>0.075</b> <b>[1.030]</b> <b>(0.304)</b>	<b>0.008</b> <b>[0.111]</b> <b>(0.911)</b>	1 - -			
OPNG	0.203 [2.827] (0.005)	<b>0.141</b> <b>[1.937]</b> <b>(0.054)</b>	<b>-0.142</b> <b>[-1.940]</b> <b>(0.053)</b>	<b>-0.074</b> <b>[-1.014]</b> <b>(0.311)</b>	<b>-0.049</b> <b>[-0.670]</b> <b>(0.503)</b>	1 - -		
GMEG	0.507 [8.000] (0.000)	0.477 [7.727] (0.000)	0.308 [4.442] (0.000)	-0.051 [-0.697] (0.486)	0.070 [0.963] (0.336)	0.002 [0.035] (0.971)	1 - -	
HETG	0.407 [6.076] (0.000)	0.253 [3.579] (0.000)	0.365 [5.373] (0.000)	-0.223 [-3.138] (0.002)	-0.146 [-2.031] (0.043)	0.253 [3.559] (0.000)	0.206 [2.891] (0.004)	1 - -

[] and () denote for t-statistics and t-probability, respectively.

**Table 5. Spearman rank-order test**

	FMDG	LMEG	MSG	TRG	
FMDG	1 - -				
LMEG	0.132 [1.833] (0.067)	1 - -			
MSG	-0.138 [-1.912] (0.057)	-0.016 [-0.228] (0.819)	1 - -		
TRG	0.041 [0.564] (0.572)	0.075 [1.030] (0.304)	0.008 [0.111] (0.911)	1 - -	
OPNG	0.141 [1.937] (0.054)	-0.142 [-1.940] (0.053)	-0.074 [-1.014] (0.311)	-0.049 [-0.670] (0.503)	1 - -

[] and () denote for t-statistics and t-probability respectively.

**Table 6. Testing Variance Inflation Factors (VIF)**

Variable	VIF	1/VIF
FMDG	1.042	0.959
LMEG	1.053	0.949
MSG	1.009	0.991
TRG	1.013	0.987
OPNG	1.021	0.979
Mean VIF	1.027	

Table 6 shows that there is no VIF greater than 5 and 1/VIF below 0.2; in turn reveals any of the independent variable included in this study is not explained by the other. Hence, all variables can be retained in the model of this study.

#### 3.4.4. Testing the endogeneity between variables

In this study, we model selected variables using Pairwise Granger causality analysis as proposed by Granger (1969). The null hypothesis  $H_0$  is a test that  $X_{it}$  does not Granger-cause  $Y_{it}$ . Similarly, is a test that  $Y_{it}$  does not Granger cause  $X_{it}$ . In each case, a rejection of the null hypothesis implies there must be either bi-directional or unidirectional Granger causality between the variables. The case of bi-directional causality indicates the existence of endogeneity problem between X and Y but unidirectional causality is not. Table 7 presents the main results obtained from the Pairwise Granger-causality analysis done in this study.

Pairwise Granger causality analysis reveals the appearance of unidirectional causality between FMDG and MSG, TRG and OPNG in the seventh, eighth, and ninth models respectively. Also, there are unidirectional causalities in the nineteenth model between TRG and LMEG, and in the model number 25th between OPNG and TRG. The causality models do not have any bi-directional causality. Thus, the study's variables do not have endogeneity problem.

the FMDG causes the MSG, TRG, and OPNG, because the financial market development is measured by capital available from the resources saved by a nation's population, as well as those entering the economy from abroad, well-regulated securities exchanges, venture capital, and other financial products. All of this may impact on the size of domestic demand, support the agility with which an economy adopts existing technologies to enhance the productivity of its industries, and enhance the value of exports and imports in the context of trade openness.

The TRG causes LMEG because Technological readiness emphasis on the capacity to fully leverage information and communication technologies (ICTs) in daily activities and production processes for increased efficiency and enabling innovation, that may support the efficiency and flexibility of the labor market for ensuring that workers are located in their most effective use in the economy as mentioned by Rastegar, Mahbanooei, and Ghasemi (2012). Moreover, OPNG causes TRG as a result to more communication technologies can be obtained from economic openness and the connections with the rest of the world. As it was noted by Duczynski (2000) and Sarkar (2008), more openness countries have a greater ability to catch up to leading technologies

#### 3.4.5. Testing serial correlation problem

Because serial correlation in linear panel-data models biases the standard errors and causes the results to be less efficient, researchers need to identify serial correlation in the idiosyncratic error term in a panel-data model. The Durbin-Watson (DW) statistic is a test for first-order serial correlation. More formally, the DW statistic measures the linear association between adjacent residuals from a regression model. The Durbin-Watson is a test of the hypothesis ( $\rho = 0$ ) in the specification:

$$u_{it} = \rho u_{it-1} + \varepsilon_{it} \quad (6)$$

If there is no serial correlation, the DW statistic will be around 2. The DW statistic will fall below 2 if there is positive serial correlation (in the worst case, it will be near zero). If there is negative serial correlation, the statistic will lie somewhere between 2 and 4. A rule of thumb is that test statistic values in the range of 1.5 to 2.5 are relatively normal. The results show that DW statistic in our model equals to 1.89 that means DW is relatively normal, and there is no serial correlation.

### 4. Regression analysis

To determine which model of effects FE or RE is appropriate to study's regression analysis, Hausman test was conducted as shown in Table 8.

**Table 7. Results of Pairwise Granger causality tests**

<b>Null Hypothesis: H0</b>	<b>F-Statistic</b>	<b>P-value</b>	<b>Decision</b>	<b>Causality</b>
COMPG does not Granger Cause FMDG	0.464	0.629	Do not reject H0	No causality
COMPG does not Granger Cause LMEG	2.832	0.062	Do not reject H0	No causality
COMPG does not Granger Cause MSG	2.876	0.059	Do not reject H0	No causality
COMPG does not Granger Cause TRG	0.530	0.589	Do not reject H0	No causality
COMPG does not Granger Cause OPNG	0.792	0.454		
FMDG does not Granger Cause LMEG	0.014	0.986	Do not reject H0	No causality
FMDG does not Granger Cause MSG	4.014	0.020	Reject H0	unidirectional
FMDG does not Granger Cause TRG	3.392	0.036	Reject H0	unidirectional
FMDG does not Granger Cause OPNG	9.763	0.000	Reject H0	unidirectional
LMEG does not Granger Cause FMDG	1.657	0.194	Do not reject H0	No causality
LMEG does not Granger Cause MSG	0.764	0.467	Do not reject H0	No causality
LMEG does not Granger Cause TRG	0.756	0.471	Do not reject H0	No causality
LMEG does not Granger Cause OPNG	2.093	0.127		
MSG does not Granger Cause FMDG	1.024	0.361	Do not reject H0	No causality
MSG does not Granger Cause LMEG	1.492	0.228	Do not reject H0	No causality
MSG does not Granger Cause TRG	1.578	0.209	Do not reject H0	No causality
MSG does not Granger Cause OPNG	0.839	0.434		
TRG does not Granger Cause FMDG	0.634	0.531	Do not reject H0	No causality
TRG does not Granger Cause LMEG	5.985	0.003	Reject H0	unidirectional
TRG does not Granger Cause MSG	0.092	0.911	Do not reject H0	No causality
TRG does not Granger Cause OPNG	2.189	0.115		

(Continued)

**Table 7. (Continued)**

Null Hypothesis: H0	F-Statistic	P-value	Decision	Causality
OPNG does not Granger Cause FMDG	1.512	0.224	Do not reject H0	No causality
OPNG does not Granger Cause LMEG	0.323	0.724	Do not reject H0	No causality
OPNG does not Granger Cause MSG	1.923	0.149	Do not reject H0	No causality
OPNG does not Granger Cause TRG	5.014	0.007	Reject H0	unidirectional

Decision Indicates reject H0 if P-value < 0.05.

**Table 8. Hausman test for random effects**

Null Hypothesis: RE is appropriate model	$\chi^2$	Degree of Freedom	Probability
	<b>1.405</b>	<b>5</b>	<b>0.923</b>

**Cross-section test comparisons**

Variable	FE	RE	Variance	Probability
FMDG	0.149	0.146	0.000	0.574
LMEG	0.169	0.167	0.000	0.832
MSG	0.005	0.005	0.000	0.971
TRG	0.076	0.081	0.000	0.328
OPNG	0.042	0.044	0.000	0.589

According to *Chi-square statistic* 1.405 and its *probability* 0.923, the Hausman test shows that RE is appropriate for the regression model. The results of regression analysis are given in Table 9.

The regression results in Table 9 show the relationship between competitiveness growth and the growth of some pillars of the competitiveness in higher income countries. Four independent variables (FMDG, LMEG, TRG, and OPNG) out of five were positive and significant at 1% significance level. That indicates the existence of relationship from those variables to competitiveness.

**Table 9. Panel RE model (GLS) regression results**

Variables	Coefficient	t-statistic	p-value
Constant	0.002	2.264	0.025**
FMDG	0.146	5.317	0.000*
LMEG	0.167	5.094	0.000*
MSG	0.005	0.540	0.589
TRG	0.081	3.693	0.000*
OPNG	0.044	3.288	0.001*
R-squared	0.40	<b>S.E. of Regression</b>	0.011
F-statistic	24.99 (0.000)	<b>D.W- Statistic</b>	1.89
Observation	180		

\* and \*\* indicates significance level 1% and 5%, respectively. () indicates for probability.



Whereas economic growth will depend on the policy measures contain openness, competition and innovation which will promote growth and competitiveness (Aghion & Howitt, 1998). Further, the market size growth MSG was positive but insignificant, meaning the growth of domestic demand may not affect on competitiveness growth in our research model.

The coefficient of the study's main variable (FMDG) indicates that when the financial market development growing by 1% the competitiveness will grow by 15%. This result justifies the importance of the financial markets that has been regulated by governments to enhance productivity and economic development. For sure, the availability of venture capital and national savings as well as the well regulating of financial markets, will contribute in the countries competitiveness. Thus, the wealthy and regulated countries like *USA, Australia, Finland, Canada, and Switzerland*, have high competitiveness scores. Our result is in line with the findings of the studies (Beck, 2008; De and Guidotti, 1995; Fink et al., 2005; Masoud & Hardaker, 2012) that the financial market is positively correlated with economic growth, where the financial markets represent the engine of economic growth.

The coefficient of (LMEG) indicates that the growth by 1% in the labor market efficiency will increase the growth of country's competitiveness by 16%. Meaning that, increasing the flexibility of the labor market, and the efficient allocation of workers in their most effective uses in the economy, will increase the labor productivity supported with incentives to give their best effort in their jobs. Thus, labor productivity has a positive effect on economic competitiveness (Rusu & Roman, 2018) that will contribute in competitiveness growth specially for those countries that provide incentives for their workers, and they have a flexible labor market like *Switzerland USA, UK, and Canada*. This fact shows that the growth of labor productivity per hour worked stimulates the competitiveness of a country. These results are in line with the findings of the studies (Atkinson, 2013; O'Mahony and Ark, 2003; Rusu & Roman, 2018).

The Coefficient of (TRG) indicates that the growth by 1% in the technological readiness will increase the country's competitiveness growth by 8%, where the competitiveness between the countries requires enabling innovations that adopts existing and new technologies with emphasis on fully leverage information and communication technologies. That results in enhancing the economic activities and efficient production processes enabling countries to compete between each of other. Our finding matches with Razavi, Mostafa, Rohollah, and Kashani (2011). Their findings show that there is a significant and positive relationship between the Technological readiness and Innovation, believing that the competitiveness requires enabling innovations that adopts existing and new technologies. Further, Duraisamy and Nedunchezian (2015) found that there is a strong positive correlation between Global competitiveness ranking and Technical readiness ranking.

The Coefficient of (OPNG) indicates that the growth by 1% in the trade openness will increase the country's competitiveness growth by 4%. With regard to a theoretical relationship between trade openness and economic growth in the context of competitiveness, Tahir and Azid (2015); Musila and Yiheyis (2015) confirm it to be positive. Moreover, in higher income countries, trade policies are oriented toward regional trade cooperation with an explicit aim of integration in global economics (Pilinkiene, 2016). Where the higher exports may promote real output expansion (Helpman & Krugman, 1985), and higher imports may exert less pressures on the costs of production (Markusen, Rutherford, & Hunter, 1995). Thus, trade openness may contribute to more efficient distribution of resources, and allows to exploit country's competitiveness advantages.

The results in Table 9 show that the value of R-square 40% is acceptable, meaning 40% of the competitiveness variation of higher income countries is explained by the independent variables. Durbin Watson coefficient (DW = 1.89) is close to 2, meaning that there is no evidence of autocorrelation between the residuals as a rule of thumb. Moreover, F-statistic and its probability show that the overall regression model is statistically significant. And the standard error of regression model 1.1% is very low. Under these circumstances, the RE model seems to be appropriate for this study, after conducting the Robustness checks to control for potential endogeneity.

**Table 10.** Generalized methods of moments (GMM) regression results

Variables	Coefficient	t-statistic	p-value
COMP <sub>G</sub> (-1)	-0.064	-1.502	0.135
FMDG	0.110	5.071	0.000*
LMEG	0.252	3.268	0.001*
MSG	0.003	0.079	0.936
TRG	0.070	4.347	0.000*
OPNG	0.024	2.848	0.005*
AR(1) p-value	0.108	<b>S.E. of Regression</b>	0.016
AR(2) p-value	0.294	<b>Observation</b>	147
Hansen p-value	0.370		

\* indicates significance level 1%. Instruments are the lagged independent variables.

### 5. Robustness check

To check for the robustness of the results, this study introduces a lagged dependent variable in the regression models by employing the generalized methods of moments (GMM) for Dynamic Panel analysis instead of RE model. The panel GMM estimator allows controlling heterogeneity of countries and overcoming the endogeneity of the explanatory variables that may arise in the relationship between financial market development and competitiveness by using instruments, and therefore yields consistent estimates. The reliability of the GMM method depends critically on the validity of the instruments, which can be evaluated with Hansen’s test of over-identifying restrictions that produces *J*-statistic, and asymptotically distributed as *Chi-square* in the number of restrictions. A rejection of the null hypothesis that instruments are orthogonal to the errors would indicate that the estimates are not consistent (Baum, Caglayan, & Talavera, 2010). Therefore, if the *J*-statistic less than the critical value, or the probability of *J*-statistic exceeds 5%, then we fail to reject the null,<sup>2</sup> and conclude that the instruments are exogenous. Table 10 presents the GMM estimator analysis.

The results of the GMM regression analysis reveal that all the independent variables (FMDG, LMEG, TRG, and OPNG) except MSG, were positive and significant, which indicates that the results are invariant with earlier results (RE model). The Hansen *J*-test with associated p-value, is proved as valid instruments for all tested equations. Therefore, the results from GMM estimator have proved the null hypothesis. As result, Hansen p-value test fail to reject the null hypothesis. In addition, the study present Arrelano–Bond test statistics for the first and second order serial correlations (AR(1) and AR(2)). Where in a dynamic panel data context, second order serial correlation should not be present if the instruments are appropriately uncorrelated with the errors (Baum et al., 2010). It can be observed from Table 10 that AR(1) and AR(2) tests show that at the 5% significance level our instruments are appropriately orthogonal to the error and no any first or second order serial correlation is detected, respectively.

The results from the GMM estimator remain robust in terms of directions and significance levels. Whereas they keep the same sign, the same order of magnitude, they remain significant as they were so in the RE model, and the standard error of regression model 1.6% is very low. As can be observed, the GMM model confirms the robustness of our findings.

### 6. Conclusion

The study aims at re-examining the relationship between financial market development and economic development in the context of competitiveness growth of developed and higher income countries. For this purpose, the study employs GLS regression model to analyze the panel data of 21 higher income countries over the period (2009–2017). The study tested the stationarity, multi-collinearity, endogeneity, and serial correlation and rejected the existence of any problems among

the variables. According to Chi-square statistic (1.405), the Hausman test shows that random effects are appropriate for the regression model.

The results of regression analysis reveal that four independent variables (FMDG, LMEG, TRG, and OPNG) were positive and significant at 0.99% confidence interval, which indicates the existence of relationship from those variables to competitiveness, while one of the independent variables (MSG) is positive but insignificant.

Besides, the study checked, the robustness of the results and according to the Hansen J-test the results from GMM estimator have proved the null hypothesis which means that Hansen p-value test fail to reject the null hypothesis. In addition, the study present Arrelano–Bond test statistics, which shows that at the 5% significance level our instruments are appropriately orthogonal to the error and no any first- or second-order serial correlation is detected, respectively. The results from the GMM estimator remain robust in terms of directions and significance levels and confirm the robustness of the findings.

The study recommends enhancing the dialogue between competition and financial authorities to enhance productivity and economic development besides more investing in human capital and information and communication technologies.

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#### Notes

1. The term “human capital” refers principally to workers’ acquisition of skills and know-how through education and training, the majority of studies have measured the quality of human capital using proxies related to education e.g. school-enrolment rates, tests of mathematics and scientific skills. A large number of studies have found evidence suggesting that educated population is key determinant of economic growth (e.g. Hanushek & Kimko, 2000).
2. The hypothesis that instrumental variables are not correlated with the set of residuals.

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