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Financial Inclusion and Economic Growth Utilizing Panel Co-Integration

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Abstract*: This paper attempts to test the co-integration association flanked by financial inclusion and economic growth. The study uses a composite score of financial inclusion and GDP per capita as a proxy of economic growth for its empirical analysis. The panel data covers a large sample of 52 countries for the time period 2005-2015, separated in three groups depending on their income level – low, middle and high. For the analysis, first the study constructed an index of financial inclusion (IFI) utilizing the methodology adopted by Sarma [41]. Then the study applied unit root checks to validate if the variables are non-stationary and co-integrated. Last, the study utilized Pedroni's panel co-integration analysis to investigate the long-run affiliation. The study also cross checked the results using Fisher's panel co-integration test. The empirical analysis is based on 11 countries from high income economies, 19 countries from middle income economies and 21 countries from low income economies. The findings confirm a long-run association flanked by economic growth and index of financial inclusion for the middle income countries. This concludes that financial inclusion can contribute substantially to economic growth through better penetration, availability and use of financial services in the middle income countries.

Keywords: Economic growth, index of financial inclusion, panel unit roots, Panel co-integration

I. INTRODUCTION

This Financial inclusion is a catchword now-a-days. In the past, studies such as Schumpeter [39], Word Bank [44] and King [22] have investigated the affiliation flanked by finance and growth. The role of financial system on economic growth through mobilization of savings and allocation of resources has been studied expansively in the literature such as Levine [26], Kirkpatrick [23], Sarma [41]. Similarly, the linkage between financial development and poverty has been studied in Honohan [18], Beck [7]. The linkage between financial inclusion and development outcomes has gained wide spread attention in the recent studies. Theoretical evidence shows that financial development through deepening of financial system positively impacts growth and reduces poverty. But there is no harmony on the linkage between financial inclusion and economic growth.

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Odhiambo [31] state that financial development lowers poverty through increased access to credit facilities. Others have conflicting views on the relationship between financial development and growth. Studies such as Todaro [43], Stiglitz [40] and Beck [6] are of the opinion that there are market imperfections in the financial system.

These imperfections distort economic growth. As a result the income and wealth of the rich increases and it does not essentially improve the lives of the poor. Literature posits that financial development affects growth up to a certain point but at the same time increases the cost of the financial system. However, no study has been made on the association between a composite index of financial inclusion in specific and economic growth.

The thought is that all the countries worldwide are interested in fostering universal financial inclusion with initiatives like World Bank Group's Universal financial access by 2020, G20 Financial Inclusion Action Plan, Alliance for Financial Inclusion and so on. These initiatives through access, availability and use of financial services have been expected to promote economic growth. Conversely, the usefulness of such policies necessitates long-run association flanked by financial inclusion and economic growth. Further measuring financial inclusion only with demand or supply side factors gives a partial picture. Hence, in this paper it is reviewed whether financial inclusion through a composite index has any relationship with economic growth and whether policy focus on financial inclusion is apt for economic growth. We have used econometric techniques to examine the long-run association. The common question is: are they associated? Or do we overemphasize the relationship between the two? This paper intends in making a contribution to the ongoing discussion by displaying empirical evidence from high, middle and low income economies during the period 2005-2015.

The rest of the document is organized into seven segments together with introduction. Section 2 presents the review of extant literature. Section 3 and 4 provides the objectives and rationale of the study. Section 5 depicts the data and details the econometric method. Section 6 presents the observed results and its discussion. The last section concludes the paper and highlights the policy implications of the study.

II. REVIEW OF LITERATURE

In the past studies, the linkage between financial development and economic growth has been attempted widely [39; 44 and 27]. The studies on financial inclusion focused only on the theoretical and conceptual development. The measurement of financial inclusion was limited to individual indicators based on either the demand side or supply side factors.

However, there are multiple dimensions of financial inclusion. Later on studies such as Sarma [42], Sarma [41], Arora [2] have highlighted the measurement of financial inclusion through a composite index taking into account the different dimensions. Recent studies have evolved on the linkage flanked by the financial inclusion index and other development indicators.

Studies such as Beck [7] and Kendall [24] posit that financial inclusion through availability and use of financial services increases state per capita growth. Ghosh [17] in the study on India provided a positive association of financial inclusion on economic growth. Sarma [38] also supported the alliance flanked by the financial inclusion and country-specific factors. Demetriades [12], Rousseau [36, 37] and Arestis [1] in their study on the association between financial deepening and growth across countries pointed that in the long-run the relationship weakens. Studies such as Ndebbio [30], Rousseau [36, 37], Berentsen [9] and Masoud [29] noted an indirect association between financial inclusion and economic growth. Pradhan [35] in a study on emerging economies reported a long-run relationship between financial deepening and growth. Similarly, Aspergis [3] in a cross-country analysis between the two pointed a bi-directional causality. Sharma [11] also suggest a positive association between financial inclusion and economic growth in the Indian context. Best [5] reported a unidirectional relationship among financial deepening and economic growth both in the short and long-run. However, Barajas [8] pointed that all countries or economies may not show a long-run relationship between financial inclusion and growth. Beck [6] also examined the finance – growth nexus using regressor's simultaneity. Christopoulos [13] used panel – based unitary roots and co-integration to study the liaison stuck between finance and growth in ten developing countries. The study provided evidence in favor of the finance – growth nexus. However, the study ignored the integration and co-integration features of the data. Also no econometric study has been made on the association between a composite index of financial inclusion in specific and economic growth. Giving this milieu, this paper stares at the long run dynamics between a composite index of financial inclusion and economic growth.

III. OBJECTIVE OF THE STUDY

By considering the existing literature, it is important to scrutinize if there is any involvement among financial inclusion and economic growth in the long-run. This paper looks into the long run dynamics between a composite index of financial inclusion and economic growth for 52 countries separated in three kinds depending on their income level – low, middle and high within the time frame, 2005-2015. This study looks for co-integrating relationship between index of financial inclusion and economic growth within a panel framework.

IV. RATIONALE OF THE STUDY

The current manuscript tests the long-run connection among the composite indices of financial inclusion and economic growth. Most of the earlier studies have taken individual indicators of financial inclusion based on either the demand side or supply side factors. However, financial inclusion is a multi-dimensional concept. In this regard, a composite measure will give more appropriate results than individual factors. Adding to this, there are few studies that empirically tested the long-run association between financial inclusion and economic growth. This study has used an index of financial inclusion and appropriate econometric tools like co-integration to measure the long-run relationship. Thus the paper adds to the existing literature in terms of the co-integrating relation between the two and thereby presenting policy implications.

V. DATA AND ECONOMETRIC METHODOLOGY

The purpose of this paper is to test the potential long-run affiliation which exists or not between a composite index of financial inclusion and economic growth. The study used the normal logarithm of GDP Per Capita at constant prices as a substitute for economic growth. The study then computed a composite index of financial inclusion following the methodology adopted by Sarma [41]. The variables used for the construction of the index are deposit accounts with commercial banks per 1,000 adults, Automated Teller Machines (ATMs) per 100,000 adults, Branches of commercial banks per 100,000 adults and outstanding Deposits and Loans with Commercial Banks. The secondary data on GDP per capita at constant prices is collected from International Monetary Fund (IMF) Database. The financial inclusion variables are collected from Financial Access Survey (FAS) Survey data published by IMF. The scope of this study is limited to 52 countries separated in three types depending on their income level – low, middle and high covering the period 2005 to 2015. The standard utilized was the World Bank sorting, but for size satisfactoriness, the panel of low income countries was formed by combination of low and lower middle income countries (see Appendix B). The other two types remain unchanged. The selection of the countries is based on the requirement of continuous data over the periods 2005-15.

The linkage between financial inclusion and log of GDP Per Capita (as a substitute of economic growth) is executed in four steps. First, the study constructed an index of financial inclusion (IFI) utilizing the methodology adopted by Sarma [41]. Second, the paper used the panel unit root test whether IFI and log of GDP Per Capita are stationary or not. Third, a panel co-integration analysis was used to know the presence of long-run affiliation between IFI and log of GDP Per Capita. All the tests were performed in E Views. The detail descriptions of these steps are as follows.

A. Index Of Financial Inclusion

Financial inclusion is a multi-dimensional concept. Therefore measuring financial inclusion only with the demand side or supply side factors is not a better way. The study constructed a composite index of financial inclusion utilizing the methodology proposed by Sarma [41] using three dimensions. Besides as an alternative of using average of the dimension indexes as in UNDP's methodology of Human Development Index (HDI), the study used the distance from the worst and ideal situation. The formula mentioned below is used to calculate the dimension index d_i:

$$d_i = w_i * \frac{A_i - m_i}{M_i - m_i} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

(w_i = weight attached to the facet i, $0 \leq w_i \leq 1$
A_i = actual worth of dimension i
M_i = upper limit of the value of dimension i
m_i = lower limit of the value of dimension i)

The lower bound for all facets can be taken as Zero. However, it is not easy to fix the upper bound of a dimension. In theory, it is unlikely to have a 'maximum' or even an 'optimum' level of achievement for a facet of financial inclusion. Selecting the empirically observed highest worth of a dimension as the upper limit is a clear-cut method. The highest value of a dimension was selected as the upper limit.

The above equation 1 makes certain that $0 < d_i < 1$. The country's accomplishment in facet i will be superior if the value of di is high. If n facets of financial inclusion are taken, then a country's achievement in these facets will be given by a point $X = (d_1, d_2, d_3, \ldots, d_x)$ on the n-dimensional area. In the n-dimensional area, the point $O = (0, 0, 0, \ldots, 0)$ signifies the point of worst state while the point $W = (w_1, w_2, \ldots, w_n)$ signifies an ideal situation demonstrating the chief achievement in all facets.

Higher financial inclusion is indicated by larger distance flanked by X and O and smaller distance between X and W. The study used a effortless technique of the average of the Euclidian distance among X and O and the opposite Euclidian distance between X and W in this paper. Both the distances are normalized by the distance among O and W, to make them lie amid 0 and 1. The opposite distance between D and W is considered for computing the simple average among the distances. This makes the indices to lie between 0 and 1 and be monotonically escalating. Thus for calculation of indices of financial inclusion, first the study calculated X_1 (distance between X and O) and X_2 (inverse distance between X and W) and then a simple average of X_1 and X_2 to calculate the indices of financial inclusion. The modus operandi is given below:

$$X_1 = \sqrt{\frac{{d_1}^2 + {d_2}^2 + \cdots + {d_n}^2}{{w_1}^2 + {w_2}^2 + \cdots + {w_n}^2}}$$

$$X_2 = 1 - \sqrt{\frac{(w_1 - d_1)^2 + (w_2 - d_2)^2 + \cdots + (w_n - d_n)^2}{{w_1}^2 + {w_2}^2 + \cdots + {w_n}^2}}$$

$$IFI = {(X_1 + X_2)}/{2} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

X_1 is the standardized Euclidean distance of X from the worst point O. It is standardized by the distance connecting the worst point O and the ideal point W. This will make the value of X_1 lie between 0 and 1. Higher value of X_1 indicates more financial inclusion.

The contrary normalized Euclidean distance of X from the ideal point W is X_2. The numerator gives the Euclidean distance of X from the ideal point W, normalizing it by the denominator and subtracting by 1 gives the inverse normalized distance. This will make the value of X_2 lie between 0 and 1. The higher distance means higher value of X_2 and higher financial inclusion.

The index of financial inclusion is the average of X_1 and X_2, representing the distance from both the worst point and the ideal point is. Since, the study considered all facets to be equally important in measuring the inclusiveness of a financial system, then wi = 1 for all i. Thus, the ideal situation will be W = (1,1,1,…,1) in the n-dimensional space. The formula will be:

$$X_1 = \sqrt{\frac{{d_1}^2 + {d_2}^2 + \cdots {d_n}^2}{n}}$$

$$X_2 = 1 - \sqrt{\frac{(1 - d_1)^2 + (1 - d_2)^2 + \cdots (1 - d_n)^2}{n}}$$

$$IFI = {(X_1 + X_2)}/{2}$$

The study used three facets for measuring the extent of financial inclusion in this study due to lack of consistent data on other dimensions. The dimensions considered are penetration of the banking services, availability and use of banking services. We have used number of deposit accounts with commercial banks per 1000 adult population as an indicator for penetration dimension. We used number of bank branches per 100000 population and number of Automated Tailor Machines (ATMs) per 100000 adults to measure the availability dimension. The study have given 2/3rd weights to branch availability and 1/3rd weights to ATM availability. Further the sum of outstanding deposits with commercial banks and outstanding loans with commercial banks was used to measure usage dimension. Since cross country consistent data on payments, remittances and transfers do not exist till date. The study assigned weight 1 to the penetration dimension because it being the primary indicator of financial inclusion. Since data on bank branches and ATM's do not give a true picture of the availability of banking services because of mobile banking and internet banking, we assigned weight of 0.5 to the availability dimension. Moreover we assigned a weight 0.5 for the index of utilization as other services such as payments, transfers and remittances of the banking system are not covered due to lack of consistent data over a period of time. Given these weights, a country K is represented by a point (p_k , a_k , u_k) in the three dimensional space, such that $0<=p_k<=1, 0<=a_k<=0.5, 0<=u_k<=0.5$, where p_k , a_k and u_k are the dimension indexes for country k. The point (0,0,0) will indicate complete financial exclusion (worst situation) and the point (1,0.5,0.5) will designate complete financial inclusion (best situation). The IFI for the country k is measured by the simple average of normalized Euclidean distance of the point (p_k , a_k , u_k) from the point (0,0,0) and its normalized opposite Euclidian distance the ideal point (1, 0.5, 0.5). The ultimate procedure with weights will be:

$$X_1 = \sqrt{\frac{{p_k}^2 + {a_k}^2 + {u_k}^2}{1.5^2}}$$

$$X_2 = 1 - \sqrt{\frac{(1 - p_k)^2 + (0.5 - a_k)^2 + (0.5 - u_k)^2}{{w_1}^2 + {w_2}^2 + \cdots + {w_n}^2}}$$

$$IFI = {(X_1 + X_2)}/{2}$$

Based on this formula the study developed a composite index of financial inclusion for 52 countries separated in three kinds depending on their income level – low, middle and high for the time period 2005-2015. The trends and status of the index for all the 52 countries are presented (see *Appendix* A). Japan, Korea, Turkey and Bulgaria consistently rank high in the index over the years. However, Ireland has improved over the years to top the index in the year 2015.

B. Panel Unit Root Test

The macro economic variables pose a serious problem in estimation of results due to non stationary characteristics. The results are spurious if the variables are non stationary. Therefore, the variables should be integrated of the same order for a possible long run relationship. Recent studies such as Levin [27] suggested that Levin, Lin and Chu (LLC) panel unit root test is better given the sample size and time period of the study. The LLC allows for heterogeneity of the intercepts across affiliates of the panel. Similarly, Augmented Dickey-Fuller (ADF) test provides stable critical values and is more preferable due to its power to different sampling experiments [15, 16]. Therefore, we have used LLC and ADF panel unit root tests. The outcomes are detailed (see *Table 1*). The study first test the presence of unit root in levels and then in first differences. Lag selection is based on information criteria. The results provide no unit root in first differences but do not reject a unit root in levels. Hence, the series are integrated of first order and became stationary at first difference. The next step is to investigate co-integrating relationship in a heterogeneous panel data set.

C. Panel Co-integration Test

If the sequences are integrated of the equal order individually, then there is a possibility of co-integration or some linear combination between the variables. Granger [15] first introduced the concept of co-integration to test the long-run relationship between variables. Abadir [4] also suggested that co-integration is used to investigate whether two or more integrated variables diverge considerably from a definite association. Conversely, the short-run interruptions will be corrected in the long-run if the variables are co-integrated. Further, Dickey [10] opined that if two or more variables are not co-integrated, they may walk randomly far away from each other.

However the conventional co-integration analysis like Engle [14] and Johansen [21] has problems with small samples and heterogeneous data. Pedroni [34] proposed a heterogeneous panel data co-integration test which is an expansion of Engle and Granger. Pedroni's analysis takes care of the limitations in the traditional methods and is a better test to investigate long-run relationship between variables [25]. Pedroni's method has different group of values for the co-integration analysis in the panel data surroundings. The first four values are within-dimension. The last three statistics is between-dimension which means group mean panel co-integrating statistics. The study used Pedroni's co-integration test to investigate their long-run association. Last the additional test of co-integration proposed by Fisher was used to validate the results.

VI. RESULT AND DISCUSSION

This study used the LLC and the ADF panel unit root analysis to test the stationary properties of the variables. The result of the unit root test (utilizing LLC and ADF test) is corroborated in Table 1.

Table 1 demonstrates that the null premise for all the variables is discarded in their first differences at LLC and ADF test. Thus, the unit root test outcomes confirm that all the variables used in the model are stationary and integrated of the same order, that is, I (1). That means, all the variables are non-stationary in the level data but stationary in the first difference.

Table 1: LLC and ADF Unit Root Test

Panel	Variables	Statistics	At Level (p**)			At First Difference (p**)			Conclusion
			NIT	I	IT	NIT	I	IT	
Low Income	IFI	LLC	0.9826	0.9993	0.0000*	0.0000*	0.0000*	0.0000*	1 (1)
		ADF	0.9977	0.9883	0.3231	0.0000*	0.0000*	0.0008*	1 (1)
	LGDP								
		LLC	1	0.0025*	0.0001*	0.0006*	0.0000*	0.0000*	1 (1)
		ADF	1	0.4423	0.1405	0.0000*	0.0000*	0.0000*	1 (1)
Middle Income	IFI	LLC	0.0031*	0.0334**	0.0000*	0.0000*	0.0000*	0.0000*	1 (1)
		ADF	0.0138**	0.997	0.4519	0.0000*	0.0000*	0.0000*	1 (1)
	LGDP								
		LLC	1	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	1 (1)
		ADF	1	0.0041*	0.0010*	0.0000*	0.0000*	0.0001*	1 (1)

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High Income	IFI	LLC	0.1899	0.8972	0.0044*	0.0000*	0.0211**	0.0000*	1 (1)
		ADF	0.4231	0.2391	0.1032	0.0000*	0.0075*	0.0008*	1 (1)
	LGDP								
		LLC	1	0.0001*	0.0000*	0.0000*	0.0000*	0.0000*	1 (1)
		ADF	1	0.0173*	0.0118**	0.0000*	0.0000*	0.0097*	1 (1)
All countries	IFI	LLC	0.5979	0.9824	0.0000*	0.0000*	0.0000*	0.0000*	1 (1)
		ADF	0.452	0.9946	0.1796	0.0000*	0.0000*	0.0000*	1 (1)
	LGDP								
		LLC	1	0.0000*	0.0000*	0.0000*	0.0000*	0.0000*	1 (1)
		ADF	1	0.0028*	0.0001*	0.0000*	0.0000*	0.0000*	1 (1)

Source: Author's calculations by using E-views software.
Note: *, ** indicates significance at 1% and 5% respectively. NIT: No trend and intercept; I: only intercept and no trend; IT: Both trend and intercept; *: Indicates level of significance at 5%; and other notations are defined earlier.

Since all the indicators are co-integrated in their initial order, that is *I* (1), the study can go for the Pedroni's panel co-integration test. The Pedroni panel co-integration analysis is allowed to check the existence of long run affiliation among index of financial inclusion and economic growth. The result of co-integration test for all the 52 countries - high, low and middle income is reported in Table 2.

Table 2 provides strong evidence that the index of financial inclusion (IFI) and log of GDP per capita as a substitute of economic growth are co-integrated only in middle income countries. The connection was noteworthy only for middle income countries both when intercept and trend as well as only an intercept are considered. Pedroni [32] reported that when the calculated panel statistics have large negative figures, the null premise of no co-integration among the variables was rejected. The study considered the criterion reported by most of the results. In our study when we consider only intercept and no trend 6 out of 11 statistics reject the null premise of no co-integration at the conservative size of 0.01 for middle income countries. Further, when both intercept and trend in middle income countries is considered 7 out of 11 statistics reject null hypothesis of no co-integrating relationship between the two. Nevertheless, the intended test values also accounted a collective interpretation in each model.

Table 2: Pedroni Panel Co-integration Tests

	Statistics	Low	Middle	High	All Countries
Model 1 (Only intercept)	**Within Dimension**				
	Panel v- Statistics	0.5790 (0.2813)	0.7043 (0.2406)	3.3493 (0.0004)*	2.5850 (0.0049)*
	Panel ρ- Statistics	0.3020 (0.6187)	-0.9411 (0.1733)	-0.0645 (0.4743)	-0.6078 (0.2717)
	Panel PP- Statistics	-0.3628 (0.3584)	-2.8078 (0.0025)*	-0.0803 (0.5320)	-2.0982 (0.0179)*
	Panel ADF- Statistics	-0.3567 (0.3607)	-2.9847 (0.0014)*	-1.0170 (0.1546)	-2.7428 (0.0030)*
	Weighted Panel v- S	0.7105 (0.2387)	0.0806 (0.4679)	0.8057 (0.2102)	0.8445 (0.1992)
	Weighted Panel ρ- S	-0.8283 (0.2037)	-0.6900 (0.2451)	0.5102 (0.6950)	-0.7403 (0.2296)
	Weighted Panel PP- S	-2.6760 (0.0037)*	-2.6725 (0.0038)*	0.6232 (0.7334)	-3.0200 (0.0013)*
	Weighted Panel ADF- S	-2.3147 (0.0103)*	-3.1334 (0.0009)*	-1.3635 (0.0864)*	-4.1357 (0.0000)*
	Between Dimension				
	Group ρ- Statistics	1.8568 (0.9683)	1.2545 (0.8952)	1.8851 (0.9703)	2.8438 (0.9978)
	Group PP- Statistics	-1.6080 (0.0539)*	-2.8043 (0.0025)*	1.7123 (0.9566)	-1.8946 (0.0291)*
	Group ADF- Statistics	-1.7440 (0.0406)*	-2.9706 (0.0015)*	-1.5302 (0.0630)*	-3.6390 (0.0001)*
Model 2 (Intercept + Trend)	**Within Dimension**				
	Panel v- Statistics	-1.4489 (0.9263)	1.4126 (0.0789)*	1.2210 (0.1110)	0.9455 (0.1722)
	Panel ρ- Statistics	2.3971 (0.9917)	0.7900 (0.7852)	1.1357 (0.8720)	2.4300 (0.9925)
	Panel PP- Statistics	-0.6609 (0.2543)	-5.4166 (0.0000)*	0.3069 (0.6205)	-2.7012 (0.0035)*
	Panel ADF- Statistics	-1.5074 (0.0659)*	-6.0241 (0.0000)*	-0.5952 (0.2759)	-4.4341 (0.0000)*
	Weighted Panel v- S	-1.9137 (0.9722)	-1.3840 (0.9168)	0.0057 (0.4977)	-2.1660 (0.9848)
	Weighted Panel ρ- S	1.8174 (0.9654)	1.7304 (0.9582)	2.1170 (0.9829)	3.1569 (0.9992)
	Weighted Panel PP- S	-3.6203 (0.0001)*	-4.8485 (0.0000)*	0.7401 (0.7704)	-4.7994 (0.0000)*
	Weighted Panel ADF- S	-3.4527 (0.0003)*	-5.4160 (0.0000)*	-2.2825 (0.0112)*	-6.7463 (0.0000)*
	Between Dimension				
	Group ρ- Statistics	3.9089 (1.0000)	2.8001 (0.9974)	3.2467 (0.9994)	5.7361 (1.0000)
	Group PP- Statistics	-4.1798 (0.0000)*	-7.6317 (0.0000)*	1.4834 (0.9310)	-6.5576 (0.0000)*
	Group ADF- Statistics	-3.4874 (0.0002)*	-6.3321 (0.0000)*	-2.3165 (0.0103)*	-7.1580 (0.0000)*

Model 3 (No Intercept & Trend)	**Within Dimension**				
	Panel v- Statistics	0.8300 (0.2033)	-0.4813 (0.6848)	7.0707 (0.0000)*	1.7715 (0.0382)*
	Panel ρ- Statistics	0.1616 (0.5642)	0.2794 (0.6100)	-1.5642 (0.0589)*	-0.0767 (0.4694)
	Panel PP- Statistics	-0.0591 (0.4765)	-0.3343 (0.3691)	0.0011 (0.5004)	0.0304 (0.5121)
	Panel ADF- Statistics	-0.3966 (0.3458)	-0.3043 (0.3804)	-0.5121 (0.3043)	-0.1797 (0.4287)
	Weighted Panel v- S	-0.8618 (0.8056)	-1.3505 (0.9116)	2.4547 (0.0071)*	-1.1763 (0.8803)
	Weighted Panel ρ- S	0.2689 (0.6060)	-0.0087 (0.4965)	-0.5826 (0.2801)	0.0578 (0.5203)
	Weighted Panel PP- S	-0.1775 (0.4295)	-0.9387 (0.1739)	-0.2509 (0.4009)	-0.8257 (0.2045)
	Weighted Panel ADF- S	-0.9024 (0.1834)	-0.9127 (0.1807)	-1.3279 (0.0921)*	-1.5401 (0.0618)
	Between Dimension				
	Group ρ- Statistics	3.2808 (0.9995)	3.2205 (0.9994)	1.2911 (0.9017)	4.6518 (1.0000)
	Group PP- Statistics	1.0486 (0.8528)	0.7982 (0.7876)	0.7716 (0.7798)	1.5195 (0.9357)
	Group ADF- Statistics	-0.3235 (0.3731)	0.7357 (0.7690)	-1.8222 (0.0342)*	-0.6362 (0.2623)

Source: Our own processing data in EViews. **Note**: Model 1 is co-integration between access IFI and log GDP with only intercept and no trend; Model 2 is co-integration between IFI and log GDP with both intercept and trend; parentheses point to the probability level; and * show statistically significance at 5%.

Table 3: Fisher Panel Co-integration Test

Countries	Co-integration	Tests	Only Intercept and No Trend	Both Intercept & Trend
Low	IFI – LGDP	Fisher (None)*	157.2 (0.0000)	217.1 (0.0000)
		Fisher (At most 1)*	68.53 (0.0060)	64.39 (0.0147)
Middle		Fisher (None)*	151.8 (0.0000)	238.1 (0.0000)
		Fisher (At most 1)*	71.74 (0.0008)	77.47 (0.0002)
High		Fisher (None)*	116.5 (0.0000)	339.3 (0.0000)
		Fisher (At most 1)*	45.9 (0.0044)	71.95 (0.0000)
All		Fisher (None)*	425.5 (0.0000)	794.0 (0.0000)
		Fisher (At most 1)*	186.2 (0.0000)	213.7 (0.0000)

Source: Our own processing data in EViews.
Note: *Results from Trace Test;The study used 1 lag interval because of annual data; probabilities for Fisher Test are computed using asymptotic Chi-square distribution.

To conclude the summary of the co-integration results is presented (see *Table 4*). So the unit root variables (IFI and log GDP per capita) are co-integrated by most of the results. This corroborates that the incidence of long run equilibrium relationship flanked by index of financial inclusion and economic growth is stronger for the middle income countries in the data panel.

Table 4: Summary of Co-integration Tests

Co-integration	Tests	Only Intercept and No Trend				Both Intercept & Trend			
		Low	Middle	High	All	Low	Middle	High	All
IFI – LGDP	Pedroni	No	Yes	No	Yes	No	Yes	No	Yes
	Fisher (None)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Fisher (At most 1)	N0	Yes	Yes*	Yes	Yes*	Yes	Yes	Yes

Source: Our own processed data in EViews.
Note: * 5% level of significance

VII. CONCLUSION

The study constructed the financial inclusion index for all the countries in the data panel. Japan, Korea, Turkey and Bulgaria consistently rank high in the index over the years. Korea, Republic of top the index in the year 2015. This study corroborates that there is long-run connection between index of financial inclusion and economic growth in general. However, the association between the composite index of financial inclusion and economic growth was found significant for the middle income countries in the panel. The two ends, that is, a lower and a higher level of income have no significant association with the level of financial inclusion. The results indicate that a greater penetration,

availability and use of financial services especially banking services together leads to higher GDP per capita as a substitute of economic growth in the middle income countries. This reveals that financial inclusion can contribute substantially to economic growth. The financial inclusion drive needs to be strengthened more.

However, more investigation can be made in this direction. A study on estimating the standard equation could reveal the degree of association.

It should also be pointed out that the present papers used access, availability and utilization of banking services as three broad dimension of financial inclusion due to availability of consistent data over the years. Nevertheless, other dimensions of financial inclusion such as mobile banking and internet banking users, etc would give a complete picture. In short, therefore the findings are indicative and not conclusive.

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Index of Financial Inclusion (IFI)											
Country.Name	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
High Income Countries											
Austria	0.1728	0.1659	0.1591	0.1595	0.1617	0.1601	0.1580	0.1711	0.1954	0.2111	0.2055
Chile	0.0809	0.1057	0.1273	0.1526	0.1718	0.1886	0.1943	0.2032	0.2162	0.2225	0.1534

Czech Republic	0.0893	0.0896	0.1019	0.1149	0.1236	0.1320	0.1343	0.1422	0.1778	0.2105	0.1166
Estonia	0.2608	0.3036	0.3531	0.2954	0.2916	0.3183	0.2939	0.2109	0.2121	0.2155	0.1249
Hungary	0.0251	0.0335	0.0468	0.0572	0.0619	0.0606	0.0397	0.0290	0.0349	0.0492	0.0543
Ireland	0.2572	0.2486	0.2830	0.2909	0.2927	0.2736	0.2358	0.2143	0.2178	0.2190	0.7726
Japan	1.0503	1.0416	1.0334	1.0359	1.0617	1.0673	1.0616	1.0828	1.0856	1.0797	0.7609
Latvia	0.1559	0.1804	0.2743	0.2975	0.2984	0.3066	0.2947	0.2592	0.2536	0.1937	0.1288
Netherlands	0.1831	0.1807	0.1843	0.1781	0.1675	0.1504	0.1161	0.0886	0.0899	0.0856	0.0450
Seychelles	0.1874	0.1888	0.1775	0.2103	0.2215	0.2222	0.2337	0.2800	0.3341	0.3918	0.3726
Spain	0.5739	0.5716	0.5742	0.5739	0.5753	0.5746	0.5649	0.5569	0.5534	0.5392	0.5104
Switzerland	0.4472	0.4363	0.4314	0.4224	0.4405	0.4418	0.4478	0.4509	0.4956	0.5079	0.4124
Middle Income Countries											
Algeria	0.2553	0.2538	0.2642	0.2430	0.1172	0.0995	0.0944	0.0949	0.0998	0.0608	0.0497
Angola	0.0114	0.0157	0.0176	0.0203	0.0377	0.0499	0.0776	0.1138	0.1263	0.0974	0.1503
Argentina	0.4090	0.3920	0.3654	0.3512	0.3756	0.2966	0.3282	0.3638	0.3741	0.3750	0.3750
Bosnia & Herzegovina	0.3336	0.3608	0.4012	0.4079	0.4279	0.3235	0.3841	0.3400	0.3390	0.3143	0.2921
Bulgaria	0.8043	0.8332	0.8727	0.9007	0.9083	0.7756	0.7726	0.7313	0.6872	0.6656	0.6583
Costa Rica	0.4973	0.5753	0.5966	0.5464	0.5567	0.4065	0.4566	0.4225	0.4339	0.4272	0.4041
Ecuador	0.1747	0.1654	0.1939	0.2221	0.2519	0.2723	0.3992	0.4794	0.4780	0.4393	0.4395
Equatorial Guinea	0.0375	0.0312	0.0316	0.0152	0.0019	0.0022	0.0042	0.0075	0.0133	0.0090	0.0145
Fiji	0.3864	0.4412	0.3649	0.3688	0.3631	0.2915	0.3071	0.2779	0.2857	0.2999	0.3183
Georgia	0.1846	0.2378	0.2837	0.3480	0.3548	0.3092	0.3772	0.4325	0.4389	0.4866	0.4819
Guyana	0.3741	0.2708	0.3187	0.2986	0.3635	0.2586	0.2491	0.2394	0.2291	0.1913	0.1682
Jamaica	0.5669	0.5072	0.4619	0.4306	0.4170	0.2879	0.2598	0.2559	0.2438	0.2232	0.2165
Lebanon	0.7329	0.6933	0.6889	0.7006	0.7195	0.5967	0.6017	0.5602	0.5369	0.4569	0.4387
Malaysia	0.8190	0.7866	0.7888	0.7801	0.7872	0.6145	0.6197	0.6121	0.6056	0.6005	0.5432
Mexico	0.3469	0.3188	0.3097	0.4132	0.4123	0.3506	0.2926	0.2856	0.3346	0.2303	0.2273
Peru	0.2002	0.1972	0.2187	0.2455	0.2451	0.2105	0.2384	0.2366	0.2484	0.2692	0.3667
South Africa	0.3119	0.3110	0.3183	0.3326	0.3730	0.3196	0.3287	0.3816	0.4095	0.4155	0.3841
Thailand	0.5784	0.5832	0.6011	0.6065	0.6052	0.4849	0.4791	0.4820	0.4729	0.4615	0.4485
Turkey	0.7417	0.7089	0.7232	0.6787	0.6838	0.7999	0.8221	0.8138	0.8198	0.8191	0.8167
Low Income Countries											
Armenia	0.3003	0.2975	0.3176	0.3332	0.3300	0.3557	0.4231	0.4375	0.4455	0.4680	0.4854
Bangladesh	0.1849	0.1694	0.1534	0.1476	0.1420	0.1580	0.1816	0.1854	0.1878	0.1905	0.2016
Bhutan	0.3302	0.2914	0.2614	0.2546	0.2449	0.2915	0.3806	0.2464	0.3577	0.3827	0.4010
Burundi	0.0184	0.0194	0.0123	0.0076	0.0083	0.0117	0.0164	0.0284	0.0392	0.0395	0.0426
Honduras	0.4139	0.4150	0.4431	0.4480	0.4155	0.3926	0.4373	0.4497	0.4459	0.4448	0.4277
India	0.2655	0.2442	0.2304	0.2341	0.2384	0.2562	0.2885	0.3019	0.3192	0.3481	0.3861
Indonesia	0.3530	0.3436	0.3373	0.3391	0.3453	0.3582	0.4551	0.4864	0.5753	0.5084	0.5120
Kenya	0.0703	0.0684	0.0751	0.0930	0.1059	0.1281	0.1487	0.1593	0.1851	0.2150	0.2532
Korea, Republic of	1.0043	1.0040	0.9968	0.9917	0.9890	0.9813	0.9739	0.9657	0.9928	0.9551	0.9538
Madagascar	0.0110	0.0111	0.0058	0.0045	0.0039	0.0147	0.0043	0.0136	0.0184	0.0254	0.0330
Moldova	0.3145	0.3170	0.3416	0.3698	0.3537	0.3643	0.3943	0.3907	0.3948	0.3814	0.2929
Morocco	0.2692	0.2607	0.2599	0.2770	0.3616	0.3882	0.4437	0.4436	0.4445	0.4468	0.4558
Mozambique	0.0381	0.0395	0.0378	0.0363	0.0413	0.0484	0.0586	0.0688	0.0761	0.0827	0.0935
Nicaragua	0.1548	0.1560	0.1513	0.1595	0.1445	0.1245	0.1470	0.1417	0.1489	0.1497	0.1607
Pakistan	0.1831	0.1721	0.1594	0.1568	0.1459	0.1526	0.1763	0.1790	0.1831	0.1876	0.1967
Philippines	0.2222	0.1999	0.1743	0.1687	0.1589	0.1696	0.1920	0.1885	0.1945	0.1996	0.2079
Rwanda	0.0002	0.0002	0.0013	0.0801	0.0828	0.0899	0.1114	0.1211	0.1221	0.1133	0.1155
Samoa	0.4311	0.4348	0.4365	0.4321	0.4497	0.4485	0.4318	0.4434	0.5138	0.5084	0.4843
Solomon Islands	0.2015	0.1837	0.1601	0.1539	0.1396	0.0930	0.0890	0.0918	0.0780	0.1091	0.1151
Uganda	0.0256	0.0272	0.0240	0.0346	0.0394	0.0416	0.0384	0.0518	0.0552	0.0587	0.0643
Ukraine	0.6671	0.6886	0.7265	0.7147	0.7210	0.7210	0.7049	0.7284	0.4822	0.4739	0.4680

Source: Author's own calculation

Our classification of countries		
Low Income Countries	**Middle Income Countries**	**High Income Countries**
World Bank Classification*		

Low Income (GNI per capita < US$1,025)	Lower Middle (US$1,026 < GNI per capita < US$4,035)	Upper middle income (US$4,036 < GNI per capita < US$12,475)		High income (GNI per capita > US$12,476)
Burundi	Armenia	Algeria	Georgia	Austria
Korea, Republic of	Bangladesh	Angola	Guyana	Chile
Madagascar	Honduras	Argentina	Jamaica	Czech Republic
Mozambique	India	Bosnia & Herzegovina	Lebanon	Estonia
Rwanda	Indonesia	Bulgaria	Malaysia	Hungary
Uganda	Kenya	Costa Rica	Mexico	Ireland
	Moldova	Ecuador	Peru	Japan
	Morocco	Equatorial Guinea	South Africa	Latvia
	Nicaragua	Fiji	Thailand	Netherlands
	Pakistan		Turkey	Seychelles
	Philippines			Spain
	Samoa			Switzerland
	Solomon Islands			
	Ukraine			

Source: Prepared by Author based on The World Bank, *Data – Country and Lending Groups*.
Note: * For 2015 fiscal year; GNI per capita is calculated using the World Bank Atlas method

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