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By

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Financial Inclusion and Economic Growth: Evidence from Asian Countries

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Abstract

Over the past few decades, the role of financial inclusion in achieving inclusive economic growth has been widely recognized, especially in developing countries. Despite the importance of financial inclusion, there seem to be few empirical studies regarding this, with a focus on the Asian region. Therefore, this study discusses the impact of financial inclusion on the economic growth of 28 Asian countries using the Financial Access Survey (FAS) data from 2004 to 2019. The study employs a two-stage Principal Component Analysis (PCA) to develop the Financial Inclusion Index (FII) as a measure of financial inclusion. Using the FII constructed, we employ the fixed effect regression with a robust error of heteroskedasticity and autocorrelation. We also employ the System Generalized Method of Moments for robustness check, which confirms that the results are robust to the baseline estimation. Accordingly, our findings support the view that financial inclusion is one of Asia's main drivers of economic growth. Policy implications appeared to bring solutions to enhance the financial accessibility to disadvantaged people in society and spur economic growth.

Keywords: Financial inclusion index, principal component analysis, economic growth, system generalized method of moments, Asia.

JEL Classification: G21, O5, O43

1. Introduction

As explained by Kim et al. (2018), financial inclusion entails the accessibility and availability of formal financial services to all participants in the economy. An inclusive financial system provides efficient avenues for secure savings practices and facilitates the delivery of efficient financial services (Sarma & Pais, 2011). The presence of financial services like bank accounts and digital payment options is deemed crucial as they foster development, alleviate poverty, and provide a means to manage financial emergencies. This highlights the notion that high levels of financial inclusion empower a majority of economic participants to access financial services and attain financial stability. Nevertheless, a significant portion of the population faces financial hardships due to the absence of essential financial services (Hamdan et al., 2022). This can lead to insecurity and financial challenges. However, with 1.4 billion unbanked adults globally residing in developing countries (Demirgüç-Kunt et al., 2022), policymakers are increasingly focused on enhancing financial inclusion for disadvantaged segments in these nations (Hoy et al., 2022). Consequently, financial inclusion has emerged as a top policy priority in numerous countries. It is in this context that the World Bank has accorded significant attention to promoting financial inclusion (Demirgüç-Kunt et al., 2018).

Financial inclusion extends access to essential financial services such as bank accounts, debit cards, loans, home mortgages, and capital for entrepreneurs (Chakraborty & Abraham, 2021). Importantly, access to financial services plays a pivotal role in enhancing individuals' productivity and welfare in developing countries (Claessens & Perotti, 2007). Consequently, increasing access for both firms and households to a variety of banking services while also encouraging female participation exerts a positive impact on economic growth (Sahay et al., 2015). Furthermore, financial inclusion contributes to economic growth through improved quality of governance and institutions (Park & Mercado, 2015). Erlando et al. (2020) have long contemplated the relationship between financial sector development and economic growth. Theoretically, financial inclusion is seen as a driving force behind economic growth. However, despite the recognition of this influence in the literature, empirical studies on the impact of financial inclusion on economic growth remain limited (Johnson & Arnold, 2012). Moreover, empirical studies regarding this concern seem to be immature, with a focus on the Asian region (Van et al., 2021).

In light of these considerations, this study seeks to explore the role of financial inclusion and assess its impact on economic growth in Asian countries. Consequently, the research question can be framed as follows:

"Does financial inclusion influence economic growth in Asian countries?"

The impetus for this study arises due to the dearth of empirical research addressing the significance of an inclusive financial system and the ongoing debate regarding its relevance to economic growth. Furthermore, the absence of a comprehensive measurement for financial inclusion, owing to its multidimensional nature (Cámara & Tuesta, 2014; Sarma, 2008), poses a challenge in analysing the relationship between financial inclusion and economic growth. Therefore, the scarcity of well-established literature on financial inclusion measurement and the risk of drawing erroneous conclusions based on a limited set of indicators has prompted this study. The research aims to bridge this gap by introducing a multidimensional Financial Inclusion Index (FII) tailored to the Asian context and analysing the impact of financial inclusion on economic growth employing appropriate econometric techniques. Thus, the paper brings a noteworthy contribution to the Asian context. With the motivation highlighted above, the main objective is to develop a multidimensional index to measure financial inclusion. This will contribute to the literature by constructing an FII in the Asian context through two-stage Principal Component Analysis (PCA). Following the developed FII, the second objective is to examine the impact of financial inclusion on economic growth. Most research has not empirically examined the impact of financial inclusion on economic growth (Van et al., 2021) due to the unavailability of data. To the best of our knowledge, this is the first attempt to examine the effect of financial inclusion on economic growth using a multidimensional FII in the Asian region from 2004 to 2019. Hence, this study will contribute to the literature by examining the impact of inclusive finance towards economic growth in panel data settings of 28 Asian countries.

The remainder of the paper is organised as follows: Section 2 provides the literature review; Section 3 discusses the financial inclusion in the Asian region; Section 4 explains the data and methodology; Section 5 outlines the results and discussion, and in Section 6, we summarise the conclusion and bring recommendations.

2. Literature Review

Financial inclusion is the process that assures the ease of access, availability, and usage of a formal financial system for all members of an economy (Sarma & Pais, 2011). Financial inclusion is commonly known as the expansion of financial systems, financial services, or financial products to provide more convenient access to adults in society. This has been an interesting topic among academics, policymakers, and regulators in recent years (Van et al., 2021). An inclusive financial system facilitates efficient resource allocation while reducing the cost of capital. This essentially reduces the informal sources of credit growth that are often found to be exploitative (Sarma & Pais, 2011). Consequently, in recent decades, financial inclusion has drawn wider attention from researchers, politicians, and other financial stakeholders (Kim et al., 2018). Therefore, the importance of an inclusive financial system is extensively acknowledged in policy circles.

At the 2010 G20 Summit in Seoul, financial inclusion was recognised as one of the main pillars of the global development agenda (Zins & Weill, 2016). Financial inclusion means a person owns an account at a formal financial institution that enables them to save and borrow money formally, to contract insurance, or to use payment services. Thus, financial inclusion essentially leads to deriving economic benefits. It can help disadvantaged and poor people to increase their income and the probability of being employed (Bruhn & Love, 2014). Also, access to financial tools enables people to invest in their education and finance projects and become entrepreneurs (Demirguç-Kunt & Klapper, 2012). In addition, financial inclusion can help female empowerment (Swamy, 2014) and contribute to financial stability (Han & Melecky, 2013). Therefore, it should be noted that the absence of an inclusive financial system can lead to emerging poverty traps and hinder economic development.

Globally, almost 1.4 billion adults (24%) are unbanked without having a formal account with a financial institution or through a mobile money provider, and most of them live in developing countries (Demirgüç-Kunt et al., 2022). As per Connolly (2014), people in developed economies are twice as likely to be banked compared to developing economies. Most importantly, unbanked adults are associated with minimal education fulfilment, where only 50 percent or less adults in developing countries have primary education (Demirgüç-Kunt et al., 2022).

Financial inclusion has been identified as playing a vital role in economic growth. More importantly, firms and households can have the prospect of increasing their income, which

in return affect the economic growth of a country. If people are unable to access formal financial products and services, that could result in a loss of development avenues, poverty, and cost to access (Van & Ha Linh, 2019).

However, the existing literature shows less evidence on the relationship between financial inclusion and economic development and growth (Sharma, 2016). Moreover, given the different pillars of financial development that vary from banking to equity to bonds and to insurance, only a small number of studies have attempted to investigate if they have affected economic growth differently. Nevertheless, it has become important for policymakers and banking personnel to boost the financial sector development and sustainable economic growth (Bakar & Sulong, 2018; Lenka & Sharma, 2017). Hence, financial inclusion has been identified as a major driver of economic growth (Bakar & Sulong, 2018).

3. Financial Inclusion in the Asian Region

This section highlights financial inclusion and its important dimensions in the context of Asia. This paper mainly focuses on *financial outreach* and *financial usage* dimensions of 28 countries in the Asian region. Accordingly, the outreach dimension is comprised of demographic outreach and geographic outreach. Demographic outreach is measured with two indicators, namely, the number of ATMs per 100,000 adults and the number of commercial bank branches per 100,000 adults. Geographic outreach is also measured by two indicators: The number of ATMs per 1000 km^2 and the number of commercial bank branches per 1000 km^2. Usage dimension is measured by outstanding deposits with the commercial bank (as a % of GDP) and outstanding loans from the commercial bank (as a % of GDP).

According to the IMF (2019), traditional banking services have intensified over time in low and middle-income countries. Accordingly, data from the FAS 2020 indicates that the number of ATMs, deposits, and loans have increased over the past years in these economies. However, the number of commercial bank branches does not show a tremendous increase compared to other indicators.

Figure 1 exhibits the trends in financial inclusion in selected 28 Asian countries from 2004 to 2019.

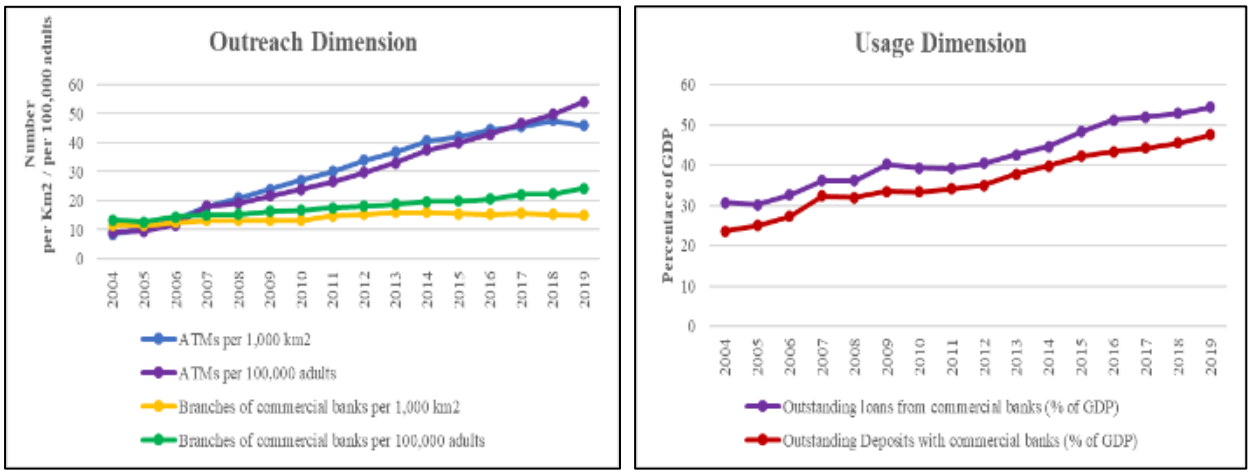

Figure 1. *Trends in Financial Inclusion for the Asian Region, 2004-2019*

Source: FAS (2020) database, International Monetary Fund

Globally, the number of commercial banks per 100,000 adults has grown by only 1 per cent over the last decade while low and middle-income countries indicated a growth. This shows that an increase in the number of banks has occurred in countries that have a higher need in terms of unmet demand for banking services. At the same time, mobile and internet banking showed a growing trend. As such, Mongolia is one of the countries that has leveraged mobile and internet banking to extend financial inclusion in remote areas (IMF, 2019). Moreover, banks in low and middle-income countries had focused on low-cost business models such as retail agent outlets or banking agents to strengthen financial access in the areas not reachable by bank branches. The retail and banking agents have made significant changes in South Asia and East Asia, where the increase in retail agents in East Asia is mainly driven by Indonesia. As such, these trends in Asian countries are led by the increase of mobile money and branchless banking services in those countries.

4. Data and Methodology

This section describes the data, sources of data, and the methodology used for the study.

4.1 Data and Sources of Data

The data for financial inclusion was obtained from the 2020 Financial Access Survey (FAS, 2020) of the International Monetary Fund (IMF). The financial inclusion-related data from

2004 onwards can be retrieved from this database. FAS (2020) gives a time series observation across countries on their performance regarding financial inclusion. The sample size is determined based on the data availability for the financial inclusion indicators. Furthermore, the dependent variable (GDP per capita in natural logarithms) and the control variables, namely population growth, school enrolment and gross capital formation were obtained from the World Development Indicators (WDI), 2022. Table A.1 in the appendix gives the variables, a description of the respective variable and their data sources.

Countries for the study were selected based on the United Nations Economic and Social Commission for Asia and Pacific (UNESCAP). Accordingly, countries in East and Northeast Asia, North and Central Asia, South-East Asia, and South and South-West Asia regions were selected for the study (see Appendix Table A.2).

4.2. Methodology

4.2.1. Financial Inclusion Index Strategy

As outlined in the preceding section, financial inclusion is a multi-dimensional construct. Moreover, the measurement of financial inclusion can vary depending on the specific focus of different studies. Despite its paramount importance, there exists a lack of a well-established framework for comprehensively measuring financial inclusion (Cámara & Tuesta, 2014). Meanwhile, the multidimensional nature of financial inclusion poses a considerable challenge in devising a unified measurement approach.

While numerous indicators can be employed to gauge distinct facets of financial inclusion, using all dimensions simultaneously in a regression can result in issues related to multi-collinearity. Also, when these indicators are considered individually, they may offer only partial insights into the inclusiveness of the financial system. Moreover, reliance on singular indicators may potentially lead to misconceptions about the extent of financial inclusion within an economy (Sarma, 2015). Consequently, the development of a composite index for assessing financial inclusion is deemed highly pertinent. Accordingly, this study focuses on developing the FII using PCA to overcome these problems. In developing the index, each of the indicators were normalised, in which case their scales of measurement will not be material (Cámara & Tuesta, 2014; Kebede et al., 2021). Consequently, the indicators were normalised as shown below.

$$X_{i,t,n} = \frac{X_{i,t} - X_{min}}{X_{max} - X_{min}} \quad (1)$$

where $X_{i,t,n}$ is normalised values of indicator X for country i at time t; $X_{i,t}$ is the actual value of indicator X for country i at time t; X_{min} and X_{max} are the minimum and maximum values of indicator X, respectively. $X_{i,t,n}$ lies between zero and one, indicating the performance of a country in terms of financial inclusion from the point of view of indicator X. Hence, it is measured monotonically (higher values in the dimension index will give rise to higher values of the FII). The closer the $X_{i,t,n}$ is to one, the more inclusive the financial system is in terms of indicator X, while the closer it is to zero, the more exclusive the financial system is in terms of the indicator.

Despite Principal Component Analysis and Common Factor Analysis being two parametric approaches for indexing, PCA is the most used method based on previous literature (Cámara & Tuesta, 2014). Therefore, this study develops a financial inclusion measurement employing a two-stage PCA approach of indexing (Ahamed & Mallick, 2019; Cámara & Tuesta, 2014; Kebede et al., 2021; Park & Mercado, 2018). In par with that, in the first stage, the outreach and usage dimensions were indexed considering underlying indicators, and the second stage involves indexing the overall financial inclusion from the two, outreach and usage dimensions.

Following Kebede et al. (2021), we define the outreach dimension index as a weighted function of the geographic and demographic availability and accessibility of financial services variables and the usage dimension index as a weighted function of loans and deposits, as shown below.

$$Outreach_{i,t} = w_1 ATMperPoP_{i,t} + w_2 BranchesperPop_{i,t} + w_3 ATMperKM2_{i,t} + w_4 BranchesperKM2_{i,t} \quad (2)$$

$$Usage_{i,t} = w_1 Loan_{i,t} + w_2 Deposits_{i,t} \quad (3)$$

Accordingly, the multidimensional financial inclusion index (FII) is developed as follows.

$$FII = \sum_{i=1}^{k} W_i X_i \quad (4)$$

where W_i is the factor loading and X_i is the respective dimension of the financial inclusion. Following a two-stage PCA analysis, the eigenvalues generated from the analysis are considered to identify an appropriate principal component to generate the respective dimension. Accordingly, the principal components with the larger proportion(s) of the variation (eigenvalue greater than 1) in eigenvalues are selected as the weights in generating the outreach, and usage dimensions respectively and the overall FII as depicted in above (2)-(4) formulas. In line with that, the study aims to develop the overall FII after indexing the outreach and usage dimensions.

4.2.2. The Main Model

Based on major studies on financial inclusion in the literature (e.g., Kebede et al., 2021; Van et al., 2021), we use the following model to examine the impact of financial inclusion on economic growth:

$$lnGDPPC_{i,t} = \alpha_0 + \beta_1\, lnFII_{i,t} + \sum_{k=1}^{n} \gamma_k Z_{i,t,k} + \epsilon_{i,t} \qquad (5)$$

where lnGDPPC (dependent variable) represents the logarithm of GDP per capita for all i^{th} number of countries at time t; $lnFII_{i,t}$ (Financial Inclusion Index in natural logarithms) measures financial inclusion across the countries at time t; $Z_{i,t,k}$ stands for other macroeconomic variables identified as control variables. α_0 is the constant term and $\epsilon_{i,t}$ is the error term. The FII is the composite index consisting of outreach dimension and usage dimensions. Accordingly, the above model examines the influence of financial inclusion on economic growth.

Using time series data from 2004 to 2019 for 28 Asian countries, a panel model is used for this paper. For model estimation, the STATA software is used. As the nature of the economic growth model often has a dynamic effect, i.e., it closely relates to its previous value, the model should take the dynamic effect into account. This is obtained by adding lagged GDP per capita as an explanatory variable. Thus, the static model (5) is transformed into its dynamic form (6) as follows:

$$lnGDPPC_{i,t} = \alpha_0 + \beta_1 lnGDPPC_{i,t-1} + \beta_2\, lnFII_{i,t} + \sum_{k=1}^{n} \gamma_k Z_{i,t,k} + \epsilon_{i,t} \qquad (6)$$

where $lnGDPPC_{i,t}$ (dependent variable) represents logarithm of per capita GDP for all i[th] number of countries at time t; $lnGDPPC_{i,t-1}$ represents the logarithm of per capita GDP for the previous year; $lnFII_{i,t}$ (Financial Inclusion Index in natural logarithms) measures financial inclusion across the countries at time t; $Z_{i,t,k}$ stands for other macroeconomic variables identified as control variables. α_0 is the constant term, and $\epsilon_{i,t}$ is the error term.

The panel used in this paper is a short panel with a relatively large N (cross-section) and short T (time series) containing 28 countries and only 16 years. The fixed effects regression with a robust error of heteroskedasticity and autocorrelation was performed for the data. To estimate the dynamic model consistently with the short panel, the System Generalised Method of Moments (SYS-GMM) is employed (Van et al., 2021). Besides accounting for a problem of endogeneity, the SYS-GMM provides a more robust estimation as compared to the ordinary least squares (OLS) model.

5. Results and Discussion

This section encompasses the results and discussion on the construction of FII, a comparative analysis of financial inclusion levels across Asian countries employing the constructed FII, and the main empirical results that explore the impact of financial inclusion on economic growth in 28 Asian countries.

5.1. Construction of Financial Inclusion Index

With the multidimensional nature of financial inclusion indicators, this study aims to construct an FII. The results of FII performed using PCA can be described at the beginning. Prior to the indexing strategy, the indicators were normalised such that the respective dimension lies between 0 and 1. Following the first stage of PCA, the study indexes the outreach and usage dimensions of financial inclusion, and the second stage includes generating the overall financial inclusion. ATMs per 100,000 adults and Branches of commercial banks per 100,000 adults represent the demographic outreach, and ATMs per 1,000 km^2 and Branches of commercial banks per 1,000 km^2 make up the geographic outreach dimension. Outstanding deposits with commercial banks (% of GDP) and outstanding loans from commercial banks (% of GDP) make up the usage dimension.

Accordingly, the results of PCA analysis show that with respect to the outreach dimension, the first principal component has a 1.757 eigenvalue with a 43.9% variation, and the second

principal component has a 1.439 eigenvalue with a 36% variation of data, which explains a 79.9% of the overall variation. Therefore, the first and second Principal Components (PC) were used as both give eigenvalues greater than one to index the outreach dimension. The outreach index of financial inclusion is computed using the combined weights of 0.704, 0.877, 0.568, and 0.643. Accordingly, PCA assigns the highest weight (0.877) to ATMs per 100,000 adults and the lowest weight (0.568) to branches of commercial banks per 1,000 km^2. In computing the usage index, the first PC has a 1.865 eigenvalue with a 93.2% variation. Therefore, the usage index was computed using the weights of 0.707 for both indicators. Following the first stage indexing, the overall FII was developed using outreach and usage indices generated, which has a 1.232 eigenvalue for the first component with a 61.6% variation of data (See Table A.3-A.5 in Appendix).

Figure 2 shows the FII for each country in the Asian region. When the FII is closer to zero, it reflects financial exclusion or a low level of inclusive finance of the country, and when it is closer to one, it demonstrates the high level of financial inclusion of the country.

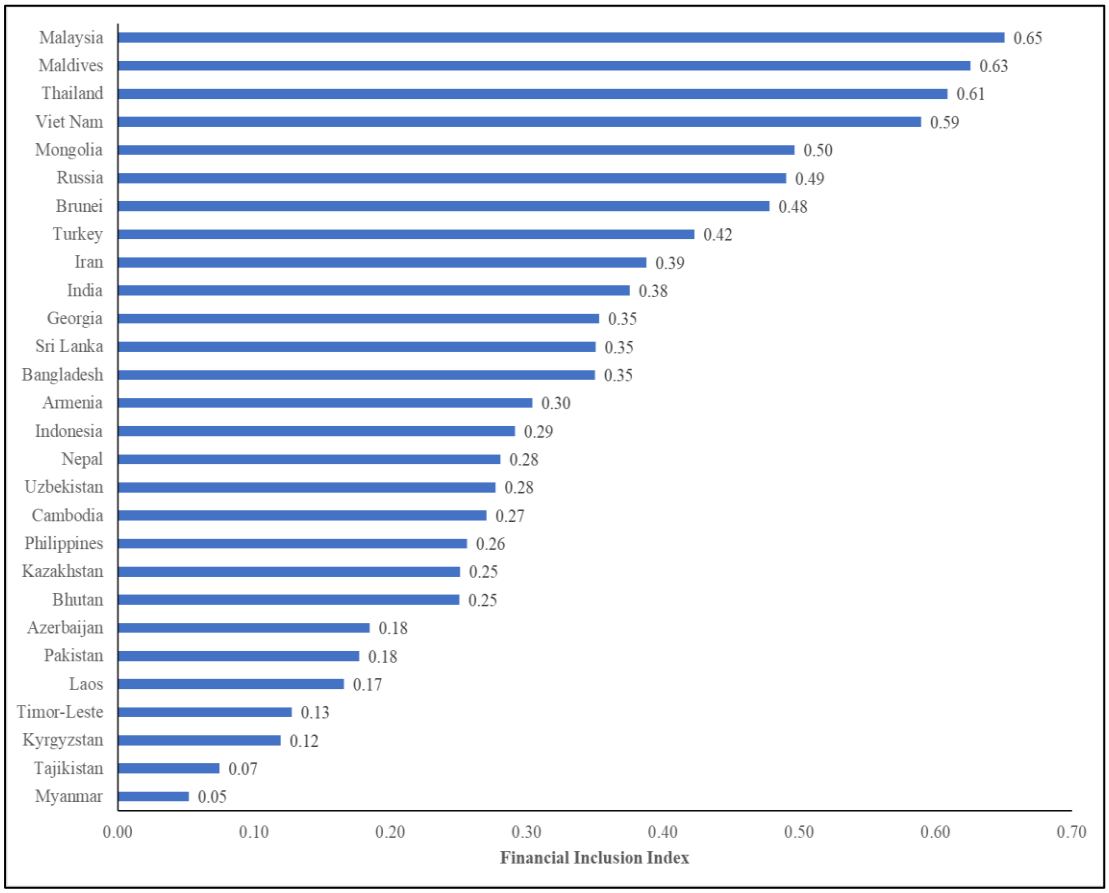

Figure 2. *Financial Inclusion Index, 28 Asian Countries*

Source: FAS (2020) database, International Monetary Fund

Table 1 presents the mean values of the overall financial inclusion (FI) index as well as the indices for the two dimensions of financial inclusion, outreach, and usage, in 28 Asian countries from 2004-2019, along with the ranking to identify the most financially inclusive and financially exclusive countries. As can be seen from the table, considering the overall FII, Malaysia, Maldives, Thailand, and Vietnam are the most financially inclusive countries, while Timor-Leste, Kyrgyzstan, Tajikistan, and Myanmar are the financially exclusive countries. However, when considering the outreach dimension, Maldives, Russia, Mongolia, and Thailand show the highest financial outreach, whereas Vietnam, Malaysia, and Thailand show the highest financial Usage.

The data in Table 1 are depicted in Figure 3, which gives a visual understanding of the behaviour of overall financial inclusion and its dimensions in each country.

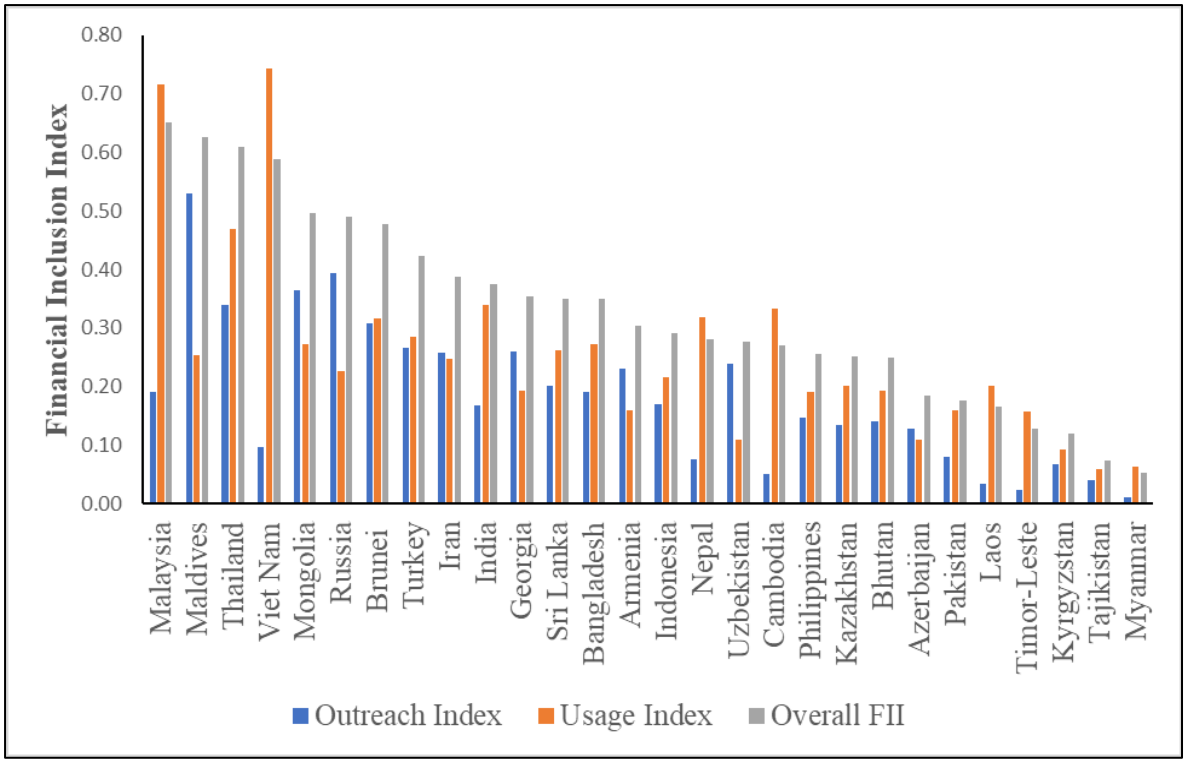

Figure 3. *Financial Inclusion Index, Asian Countries (At sample means)*

Source: FAS (2020) database, International Monetary Fund

Table 1

Overall Financial Inclusion Index and its dimensions, 28 Asian countries, 2004-2019

Country	Overall, FII Index	Rank	FI-Outreach Index	Rank	FI- Usage Index	Rank
Armenia	0.30	14	0.23	10	0.16	22
Azerbaijan	0.18	22	0.13	19	0.11	24
Bangladesh	0.35	13	0.19	12	0.27	9
Bhutan	0.25	21	0.14	17	0.19	19
Brunei	0.48	7	0.31	5	0.32	7
Cambodia	0.27	18	0.05	24	0.33	5
Georgia	0.35	11	0.26	7	0.19	18
India	0.38	10	0.17	15	0.34	4
Indonesia	0.29	15	0.17	14	0.22	15
Iran	0.39	9	0.26	8	0.25	13
Kazakhstan	0.25	20	0.13	18	0.20	16
Kyrgyzstan	0.12	26	0.07	23	0.09	26
Laos	0.17	24	0.03	26	0.20	17
Malaysia	0.65	1	0.19	13	0.72	2
Maldives	0.63	2	0.53	1	0.25	12
Mongolia	0.50	5	0.36	3	0.27	10
Myanmar	0.05	28	0.01	28	0.06	27
Nepal	0.28	16	0.07	22	0.32	6
Pakistan	0.18	23	0.08	21	0.16	21
Philippines	0.26	19	0.15	16	0.19	20
Russia	0.49	6	0.39	2	0.23	14
Sri Lanka	0.35	12	0.20	11	0.26	11
Tajikistan	0.07	27	0.04	25	0.06	28
Thailand	0.61	3	0.34	4	0.47	3
Timor-Leste	0.13	25	0.02	27	0.16	23
Turkey	0.42	8	0.27	6	0.29	8
Uzbekistan	0.28	17	0.24	9	0.11	25
Vietnam	0.59	4	0.10	20	0.74	1

Figure 4 exhibits the trends in financial inclusion in the Asian region during the period of 2004-2019.

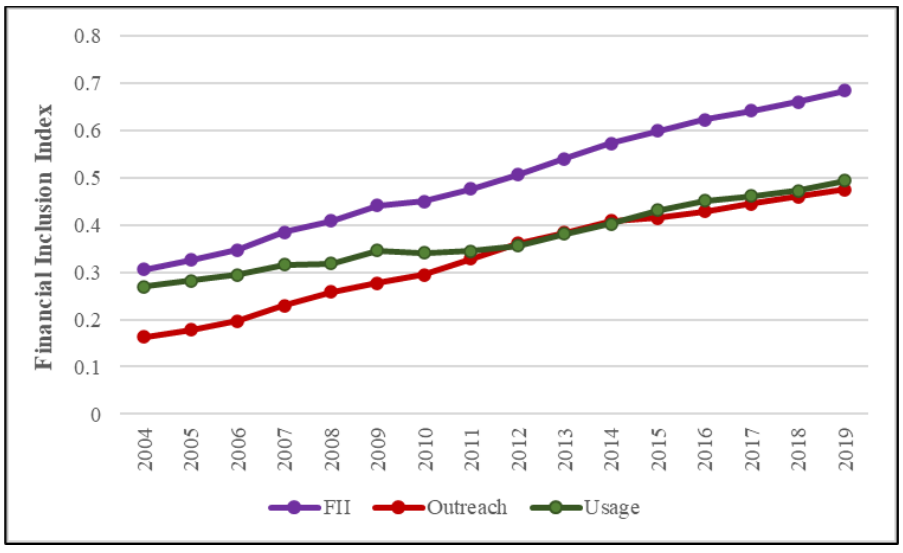

Figure 4. *Average Financial Inclusion Trends in Asian Region, 2004-2019*

Source: FAS (2020) database, International Monetary Fund

As can be seen from Figure 4, the financial inclusion index for the usage dimension outperforms that of the outreach dimension. Also, all the overall financial inclusion, financial outreach, and usage indices show an upward trend over the period of 2004-2019 in the Asian region. It has been stated that financial account ownership has increased while reducing the equity gaps over the years (Demirgüç-Kunt et al., 2022). Also, the goal of financial inclusion is to benefit the account owners through the use of accounts. There are success stories in Asian countries such as India, Bangladesh, Malaysia, and Indonesia in which different segments have benefitted from having an account in formal financial institutions. At the same time, the share of adults borrowing formally on average is low in developing countries compared to developed countries. However, the share has increased over the last decade. Thus, altogether, the increase in account ownership and formal borrowing should support the increase of financial usage in Asian countries.

5.2. Descriptive Statistics

Table 2 depicts the descriptive statistics for GDPPC, Overall FII, Outreach index, Usage index, Secondary school enrolment, Gross capital formation, and population growth for 28 Asian countries over the period of 2004-2019. Accordingly, the mean of the Real GDPPC (in natural logarithm values) for the sample is 7.94, with a minimum of 6.18 and a maximum of 10.48. The outreach dimension index has a mean of 0.18, with a minimum of 0 and a maximum of 1. The usage dimension index has a mean of 0.26, with a minimum of 0 and a maximum of 1. The mean of the overall FII is 0.33, with a minimum of 0 and a maximum of 1. The secondary school enrolment (as % of gross enrolment) has a mean of 80.12, with a minimum of 24.69 and a maximum of 120.65. The gross capital formation (in the natural logarithm of values) has a mean of 21.81, with a minimum of 4.33 and a maximum of 27.50. Lastly, the annual population growth rate has a mean of 1.28%, with a minimum of -0.89% and a maximum of 4.57%.

Table 2
Descriptive statistics

Variable	Observation	Mean	Standard Deviation	Minimum	Maximum
GDP Per Capita *	448	7.94	0.95	6.18	10.48
Outreach Index	448	0.18	0.15	0.00	1.00
Usage Index	448	0.26	0.17	0.00	1.00
Overall FII	448	0.33	0.19	0.00	1.00
School Enrolment (%)	448	80.12	19.77	24.69	120.65
Gross Capital Formation*	448	21.81	5.23	4.33	27.50
Population Growth (%)	448	1.28	0.81	-0.89	4.57

* Natural logarithm values

5.3. Empirical Results

5.3.1. Financial Inclusion and Economic Growth

To see visually whether financial inclusion and economic growth are linearly related, in Figure 5, we plot economic growth against financial inclusion of 28 Asian countries. The upward-sloping line shows a positive relationship between financial inclusion and economic growth. This justifies that the higher the level of financial inclusion is, the higher the economic growth of the respective country.

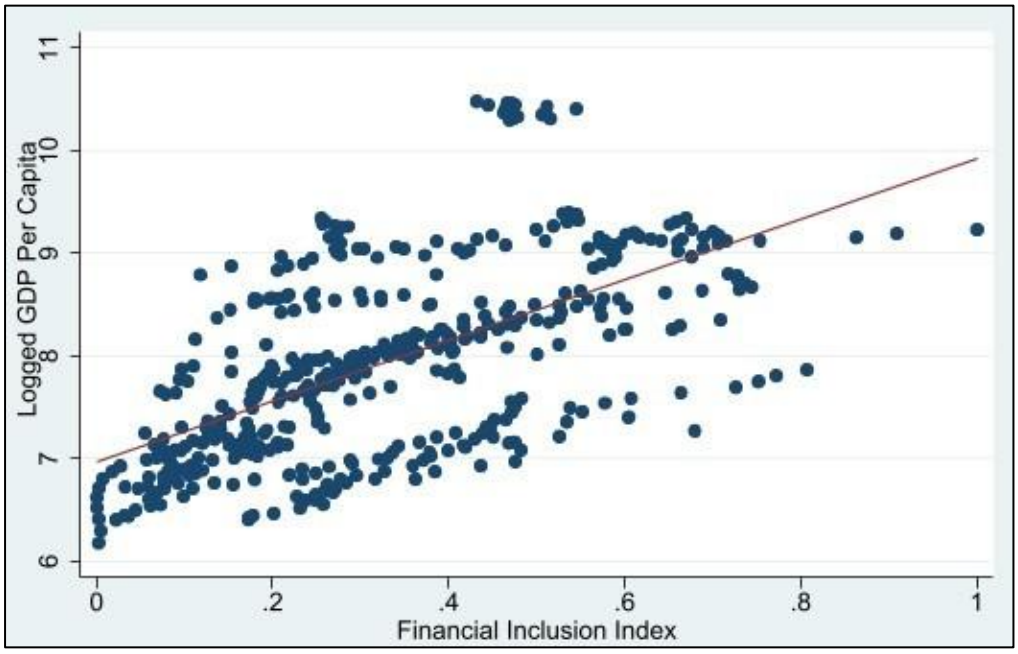

Figure 5. *Financial inclusion vs Economic growth*

The impact of financial inclusion on economic growth in 28 Asian countries, using the constructed overall FII, is presented in Table 3. To select the suitable model for the analysis, the fixed effect and random effect models were estimated to see the impact of financial inclusion on economic growth. The corresponding equation is:

$$lnGDPPC_{i,t} = \alpha_0 + \beta_1\, lnFII_{i,t} + \beta_2\, PopGrowth_{i,t} + \beta_3\, SchlEnrolment_{i,t} + \beta_4\, lnGrossCap_{i,t} + \epsilon_{i,t} \quad (7)$$

In Table 3, Fixed Effect (FE) model estimation results are presented in column (2) and Random Effect (RE) model results are presented in column (3).

Table 3

Panel model estimation results with fixed effect and random effect

Variable (1)	Fixed Effect model (2)	Random Effect model (3)
Financial Inclusion Index (FII)	0.251***	0.273***
	(13.11)	(14.04)
Population Growth	-0.0241	-0.0179
	(-1.49)	(-1.07)
School Enrolment	0.005***	0.006***
	(5.30)	(7.06)
Gross Capital formation	0.106***	0.078***
	(9.15)	(7.16)
Constant	5.499***	6.064***
	(21.94)	(22.12)
N	448	448
R-Squared	0.771	
Adjusted R-Squared	0.754	

Notes: The t statistics values are in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

Test of restrictions: fixed vs random effect - Sargan-Hansen statistic 38.449; $\chi 2$ (4); p-value=0.000

The Hausman test performed as shown above gives a Sargan Hansen statistic of 38.449 associated with a $\chi 2$ p-value of 0.000, which is less than 0.01. Therefore, the null hypothesis is rejected, assuming FE is preferred over RE.

Table 4 depicts the estimation results of the FE regression model. As can be seen, financial inclusion, outreach, and usage have a positive and highly significant (at a 1% level) effect on economic growth. The percentage of secondary school enrolment seems to have a

significant positive impact on economic growth, except for the model for financial outreach is considered. Similarly, gross capital formation has a significant positive influence on economic growth. However, human capital proxied by population growth rate seems to have a negative and insignificant impact towards economic growth in the context of Asia.

Table 4
Panel estimation results of fixed effect regression model

Variable	Overall FII	FI-Outreach	FI-Usage
(1)	(2)	(3)	(4)
Financial Inclusion Index	0.251***		
	(4.50)		
Population Growth	-0.0241	-0.015	-0.004
	(-0.68)	(-0.37)	(-0.10)
School Enrolment	0.005**	0.004	0.006***
	(2.97)	(1.58)	(3.73)
Gross Capital formation	0.106**	0.111**	0.137***
	(2.84)	(2.67)	(4.47)
Outreach		0.201***	
		(3.97)	
Usage			0.183***
			(4.22)
Constant	5.499***	5.509***	4.653***
	(4.70)	(5.59)	(6.84)
R-Squared	0.771	0.752	0.758
Adjusted R-Squared	0.769	0.750	0.756

Notes: The t statistics values are in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

Further to this, as a robustness check, the dynamic FE model was performed using lagged GDPPC as an independent variable. The corresponding equation is:

$$lnGDPPC_{i,t} = \alpha_0 + \beta_1 lnGDPPC_{i,t-1} + \beta_2\, lnFII_{i,t} + \beta_2\, PopGrowth_{i,t} + \beta_3\, SchlEnrolment_{i,t} + \beta_4\, lnGrossCap_{i,t} + \epsilon_{i,t}$$

Table 5 presents the estimation results of the dynamic model. The table presents the effect of overall financial inclusion on economic growth in column (2) as well as the effect of the two dimensions of financial inclusion, financial outreach in column (3) and financial usage in column (4). As can be seen from Table 5, with the lagged GDPPC as an explanatory

variable, financial inclusion has a significant positive impact on economic growth. Financial outreach and financial usage dimensions also show a positive and significant impact on economic growth. The lagged GDPPC shows a positive and significant impact towards economic growth in all three circumstances. School enrolment shows a significant positive impact on economic growth except for the model for financial outreach is considered. Gross capital formation has a significant positive impact, while population growth shows a negative and insignificant impact.

Table 5

Panel estimation results of fixed effect dynamic regression model

Variable	Overall FII	FI-Outreach	FI-Usage
(1)	(2)	(3)	(4)
$GDPPC_{(t-1)}$	0.051**	0.048**	0.059**
	(2.55)	(2.21)	(2.64)
Financial Inclusion Index	0.242***		
	(4.52)		
Population Growth	-0.027	-0.018	-0. 009
	(-0.77)	(-0.45)	(-0.24)
School Enrolment	0.004**	0.004	0.006***
	(2.60)	(1.49)	(3.29)
Gross Capital formation	0.109**	0.115**	0.140***
	(2.87)	(2.71)	(4.41)
Outreach		0.191***	
		(4.03)	
Usage			0.178***
			(4.25)
Constant	5.004***	5.051***	4.178***
	(5.67)	(4.90)	(5.67)
R-Squared	0.777	0.758	0.768
Adjusted R-Squared	0.774	0.755	0.765

Notes: The t statistics values are in parentheses. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

5.3.2. System Generalised Method of Moments for Robustness Check

A robustness assessment was undertaken by employing the System Generalized Method of Moments (System GMM) as an alternative to the fixed effect regression. The fixed effect model is designed to mitigate endogeneity stemming from the association between time-invariant unobserved variables and the error term. However, it is important to note that the fixed effect regression model does not comprehensively address the issue of endogeneity arising from measurement errors, omitted variable bias, and reverse causality. Consequently, this study utilizes the System GMM not only to address the endogeneity concern but also as a rigorous examination to ascertain the influence of financial inclusion on economic growth.

Table 6 presents the estimation outcomes derived from the application of the System Generalized Method of Moments. As depicted in Table 6, the results reveal a statistically significant positive effect of financial inclusion on economic growth, consistently aligning with the findings obtained through the fixed effect dynamic regression analysis. This reinforces the validity of the results obtained in the baseline analysis and supports the assumption that endogeneity has been adequately addressed. Furthermore, in accordance with the Hansen test, the instruments employed are valid, and the model's specification is accurate. The results of the AR serial correlation diagnostic test affirm the absence of serial correlation in the model.

Table 6

Estimation results of System Generalised Method of Moments

Variables	Estimated Coefficients
$GDPPC_{(t-1)}$	0.246*
	(0.135)
Financial Inclusion Index	0.420***
	(0.115)
Population Growth	0.047
	(0.112)
School Enrolment	0.012***
	(0.004)
Gross Capital Formation	-0.028**
	(0.014)
Number of Groups	28
AR (1)	0.537

AR (2)	0.267
Hansen test	0.331

Notes: The standard errors are in parentheses. The values of AR (1), AR (2), Sargan and Hansen test are the p-values.

*, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

The results in this paper show that financial inclusion influences economic growth in Asia. These findings are consistent with past studies in the literature (e.g., Ali & Khan, 2020; Islam, 2016; Sethi & Acharya, 2018; Van et al., 2021). Accordingly, the positive impact of financial inclusion towards economic growth in the context of Asian countries tends to contribute towards SDG 8, Promoting sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work. Nevertheless, eliminating extreme poverty (SDG 1), Reducing hunger and promoting food security (SDG 2), achieving good health and well-being (SDG 3), Promoting gender equality (SDG 5) and Reducing income inequality within and among countries (SDG 10) are also leading the way towards more financial inclusion. Therefore, enhanced access to financial services would be a major enabler for many of them.

6. Conclusion and Recommendation

This paper developed an FII to measure financial inclusion with a multidimensional nature. Mainly, it uses four indicators representing the outreach dimension and two indicators representing the usage dimension, from which the overall financial inclusion is made. PCA was conducted to develop the index following the normalisation of the respective indicators. The constructed FII was used to identify the impact of financial inclusion on economic growth, considering 28 Asian countries. Using the fixed effects dynamic regression with a robust error of heteroskedasticity and autocorrelation, the study estimated the influence of financial inclusion on economic growth, and the empirical results support that there is a significant impact of financial inclusion on economic growth. The System-GMM was performed to check the robustness of the baseline analysis, and it confirmed that the baseline results are robust as the results discovered a positive and significant impact of financial inclusion on economic growth.

Hence, the findings of this paper support the view that financial inclusion is one of the main drivers of economic growth. The goal of financial inclusion is to extend financial services

to the “unbanked” population to improve their living standards, which leads to general economic development and growth. Accordingly, policymakers must pay attention to financial sector reforms to boost economic growth. Moreover, governments and policymakers need to bring solutions to enhance the financial accessibility to disadvantaged people in society to stimulate economic growth. Similarly, it should be noted that poverty, income inequality, and economic growth are interconnected. Therefore, implementing effective and efficient programs to expand financial access and usage will reduce income inequality and, thereby, poverty, which will, in turn, increase economic growth. Consequently, this will help achieve SDGs.

The findings of the study contribute to public good theory as improving financial inclusion enables access to financial products and services for everyone in the economy. It contributes to dissatisfaction theory and vulnerable group theory as the effective and efficient programmes to expand financial services should be targeted at members who left the formal financial sector first and then the vulnerable members of the society, including women, poor, young, and elderly people. As the financial inclusion outcomes are achieved through the existing economy of a particular country, it contributes to the system theory. Finally, achieving the financial inclusion of a country should be a collaborative intervention of multiple stakeholders such as the central bank, commercial banks, government, regulators, and policymakers. Therefore, it essentially contributes to the collaborative intervention theory.

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Appendix A

Table A.1
Variables and sources

Variables	Description	Source
Financial outreach dimension		
ATMperPoP	ATMs per 100,000 adults	FAS, 2020
ATMperkm2	ATMs per 1,000 km^2	FAS, 2020
BranchesperPop	Branches of commercial banks per 100,000 adults	FAS, 2020
Branchesperkm2	Branches of commercial banks per 1,000 km^2	FAS, 2020
Usage dimension		
Deposit	Outstanding deposits with commercial banks (% of GDP)	FAS, 2020
Loan	Outstanding loans from commercial banks (% of GDP)	FAS, 2020
Dependent variable		
GDPPC	GDP Per Capita (constant US$ 2015)	WDI, 2022
Control variables		
Population Growth	Population Growth (% annual)	WDI, 2022
School enrolment	School enrolment, secondary (% gross enrolment)	WDI, 2022
Gross Capital Formation	Gross capital formation (current US$)	WDI, 2022

Source: Financial Access Survey, (2020) and World Development Indicators, (2022)

Table A.2
Country classification, the Asian region

Sub Region	Countries
East and North-East Asia (ENEA)	Mongolia
North and Central Asia (NCA)	Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Russia, Tajikistan, Uzbekistan
South-East Asia (SEA)	Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Thailand, Timor-Leste, Vietnam
South and South-West Asia (SSWA)	Bangladesh, Bhutan, India, Iran, Maldives, Nepal, Pakistan, Sri Lanka, Turkey

*Source***:** United Nations Economic and Social Commission for Asia and the Pacific

Table A.3

Results of PCA for outreach index

Number of observations = 448
Number of components = 4
Rho = 1.000

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.757	0.319	0.439	0.439
Comp2	1.439	0.795	0.360	0.799
Comp3	0.644	0.483	0.161	0.960
Comp4	0.161	.	0.040	1.000

Principal components (eigenvectors)

Variable	Comp 1	Comp 2	Comp 3	Comp 4	Unexplained
ATMKM2	-0.017	0.721	-0.602	0.343	0
ATMPOP	0.700	0.177	-0.188	-0.666	0
BRANCHKM2	-0.099	0.667	0.726	-0.133	0
BRANCHPOP	0.707	-0.064	0.274	0.649	0

Table A.4

Results of PCA for usage index

Number of observations = 448
Number of components = 2
Rho = 1.000

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.865	1.729	0.932	0.932
Comp2	0.135	.	0.068	1.000

Principal components (eigenvectors)

Variable	Comp 1	Comp 2	Unexplained
Loans	0.707	0.707	0
Deposit	0.707	-0.707	0

Table A.5

Results of PCA for financial inclusion index

Number of observations = 448
Number of components = 2
Rho = 1.000

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.232	0.463	0.616	0.616
Comp2	0.768	.	0.384	1.000

Principal components (eigenvectors)

Variable	Comp 1	Comp 2	Unexplained
Outreach	0.707	0.707	0
Usage	0.707	-0.707	0