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The Composition of Financial Inclusion in ASEAN and East Asia: A New Hybrid Index and Some Stylised Facts

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Abstract: *The paper provides an overview of the existing measures of financial inclusion and critically evaluates the two widely used existing methodologies to measure the dimensions – the principal component analysis (PCA) method and the Distance method, respectively. We subsequently propose a new hybrid financial inclusion index, which draws on the strengths of existing measures. We propose four key stylised facts by critically evaluating three dimensions of financial inclusion – access, usage, and quality in 22 Asian countries in the period 2004-2015. Utilising PCA scores, we identify the top two indicators under each dimension and by country, which are directly relevant for policy perspectives. An important finding is that the top five and the bottom five countries are the same under all three methodologies. There is a pattern across countries in adopting usage, access, and quality dimensions of financial inclusion over time. We also find that the top two indicators appear to play a significant role across all developing countries in the sample.*

Keywords: Financial inclusion, Asia, index of financial inclusion
JEL Classification: G20, O53, O57

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1. Introduction

The Global Partnership for Financial Inclusion (GPFI) was launched by the G20 leaders at the Seoul Summit in 2010 to support financial inclusion amongst developing countries. Financial inclusion is broadly defined as a continuous development process for all members of an economy that provides greater ease of access, availability, and efficient usage of the formal financial system (Sarma, 2016). The above definition exhibits three key characteristics or dimensions necessary for the successful realisation of financial inclusion: access, usage, and quality of available financial services. The same three dimensions were also identified by the GPFI at the St. Petersburg Summit in 2013 and later refined at the China Summit in 2016 (GPFI, 2016). Whilst access refers to how widely and what proportion of the population in an economy has access to financial services, usage refers to the volume and frequency of these financial services used by the population. On the other hand, quality refers to the level of financial knowledge and the quality of the products and the service delivery of these financial services.

The effect of financial inclusion on economic development has received ongoing attention from both academics and policymakers; however, a clear limitation to date is that there is no consistency in measuring financial inclusion. For instance, Sarma (2008) defined the dimensions of financial inclusion as comprising penetration, availability, and usage. In contrast, Camara and Tuesta (2014) defined them as usage, access, and barriers, respectively. Whilst usage is the common dimension in these studies, barriers are defined as financial exclusiveness where some sections of the population do not have access to financial services. Furthermore, there is no consistency regarding the definition of a dimension as studies used their preferred indicator to define a dimension. For example, Honohan (2008) measured access to financial inclusion by the fraction of the adult population using formal financial intermediaries, which is calculated by combining information on account numbers at banks and microfinance institutions with estimates from household surveys for a set of countries. Interestingly, Honohan (2008) defined the dimension as access but the measure was calculated based on the use of accounts by households. Other studies considered statistics on financial service use to measure financial inclusion in general, such as accounts penetration

measured by automated teller machines per 100,000 adults; bank branches per 100,000 adults; savings, credit, insurance, and life insurance premium volume to GDP (Van der Werff et al., 2013; Demirgüç-Kunt and Klapper, 2012; Kim et al., 2018). These differences in measures adopted make it even more difficult to compare findings from studies that use a wide range of countries in their sample.

Another measurement issue is where studies use multiple indicators to create a dimension or an aggregate measure. There is an ongoing debate regarding the choice of methodology to calculate an aggregate financial inclusion index. Two prominent methodologies are widely used in the literature to calculate an aggregate financial inclusion index from a group of indicators. They are Euclidian distance–based measure introduced by Sarma (2008) and principal component analysis (PCA)–based measure used by Camara and Tuesta (2014) and Park and Mercado (2018b). Other similar methodologies used to calculate an aggregate financial inclusion index are factor analysis (Mialou et al., 2017) and multiple correspondence analysis (Dungey et al., 2018). These methodologies claim that they are superior to others and more comprehensively measure financial inclusion in developing countries.

An obvious concern amongst researchers is to find a reliable way of measuring financial inclusion that captures a wide variety of indicators. Unless we have a consistent approach to measuring financial inclusion that is widely applicable across countries, it would be difficult to assess its effect on various economic development outcomes – which is a priority for all policymakers at the macroeconomic level. In this context, our methodology performs two main tasks. First, based on the G20 report or the G20 Financial Inclusion Indicators (GPFI, 2016), we collected data on 22 Asian countries in the period 2004–2015 and, utilising the most comprehensive set of indicators to date, systematically constructed three dimensions of financial inclusion – access, usage, and quality, respectively. Second, we empirically analysed the two most prominent methodologies used, i.e. the Euclidian distance–based and the PCA methods, to calculate an aggregate financial inclusion index. Subsequently, we constructed a hybrid financial inclusion index, which draws on the strengths of the above two methodologies. Third, we ranked all 22 countries under all three methodologies and

compared their relative rankings. We also identified the two most prominent indicators by country and by year under each dimension of financial inclusion to highlight its policy importance.

Based on the above analysis, we presented four stylised facts that showed various characteristics of the indicators and dimensions of financial inclusion. Our main finding is that the relative rankings of top and bottom financially inclusive countries do not vary significantly under all three methodologies, but they do differ to some degree concerning the middle-ranked countries. Several studies recognised that middle-income countries vary greatly in their institutional capacity to manage reforms and stimulate economic growth (Demetriades and Law, 2006; Subramanian et al., 2002). These countries face significant challenges to sustain higher economic growth and alleviate poverty and income inequality at the same time. Thus, in the context of financial inclusion, the implications are significant as their effect on various economic development may not be uniform across these middle income–ranked countries. The hybrid index of financial inclusion proposed here utilises a broad range of indicators across three dimensions of financial inclusion and draws on the strengths of the previously constructed indices in the literature. It is concluded that researchers go beyond competing methodologies by analysing the nexus between index, dimensions, and indicators of financial inclusion and their effect on particular development outcomes.

The paper is organised as follows. The next section briefly discusses the broad dimensions and indicators of financial inclusion typically used in the literature. Section 2.3 focuses on the Euclidian distance–based measure and the PCA method and constructs the hybrid index. Section 2.4 presents the rankings of 22 countries and compares them under all three methodologies. We also present the top two indicators by country and by year based on the PCA scores used to construct the hybrid index. Based on the empirical findings, we present four stylised facts. Finally, Section 2.5 provides a concluding discussion and identifies areas of future research.

2. Related Literature

Most studies found that financial inclusion represents an important mechanism to reduce poverty and income inequality and promote economic development in poor countries (see Park and Mercado, 2016 for a broad overview). However, whilst measuring financial inclusion, the studies differed significantly regarding the type of indicators used, the definition of dimensions used to construct an aggregate index, and the methodology chosen to create such an index. At the country level, the Global Findex data set was the primary source to collect indicators on financial inclusion (Demirgüç-Kunt and Klapper, 2013). The data set considered multiple indicators covering three broad dimensions: a set of indicators showing the ownership and use of an account at a formal financial institution, a second set of indicators on saving patterns, and a final set of indicators showing their borrowing behaviours. Other studies that used similar indicators on penetration, savings, access to credit, loans, and insurance are by Van der Werff et al. (2013), Allen et al. (2016), Zins and Weill (2016), Kim et al. (2018). Some studies also defined a lack of financial inclusion as financial exclusion, which is a barrier to economic development for some groups and individuals when they are denied access to formal financial systems (Sinclair, 2001; Amidžić et al., 2014; Camara and Tuesta, 2014). Thus, the higher the extent of financial exclusiveness, the lower is the economic development in that country. In a multi-country study, Honohan (2008) considered household access to financial services as a single measure of financial inclusion and estimated what fraction of the adult population is using formal financial intermediaries in 160 countries. Similarly, at the industry level, Chauvet and Jacolin (2017) measured financial inclusion as the share of firms with access to credit, i.e. having a loan from a financial institution.

Although the above studies used a range of indicators, no attempt was made to combine these indicators into a single aggregate measure. Sarma (2008) argued that a robust and comprehensive measure that includes multiple dimensions of financial inclusion is helpful to demonstrate the current state of financial inclusion in an economy, to monitor the progress of the policy initiatives, and to compare its development with other countries over time. To create such a single index of financial inclusion, Sarma (2008) defined three dimensions of financial inclusion:

banking penetration (dimension 1), availability of banking services (dimension 2), and usage (dimension 3). Banking penetration is defined as an inclusive financial system that has a wide range of users and penetrates widely amongst its users. The dimension is measured by the number of bank accounts as a proportion of the total population. Next, the availability of banking services is defined by an inclusive financial system that is easily available to its users. The dimension is measured by the number of bank branches per 1,000 population. Finally, following Kempson et al. (2004), usage dimension was defined by the notion of underbanked or marginally banked people.

Whilst these measures were comprehensive, unlike Demirgüç-Kunt and Klapper (2012), each dimension was based on a single indicator. In other words, three specific indicators were used to create the aggregate financial inclusion index. Sarma (2008) used a multivariate multidimensional approach of index construction like the approach of the United Nations Development Programme (UNDP) to calculate the human development index (HDI). However, unlike the UNDP that used simple arithmetic or geometric mean of all sub-indices to calculate the HDI, Sarma (2008) utilised a normalised inverse of the Euclidean distance method. The distance was computed from a reference ideal point and then normalised by the number of dimensions included in the aggregate index. However, whilst calculating the aggregate financial inclusion index, all dimensions were assigned equal weights due to the unavailability of data for all countries. A similar methodology was adopted by Yorulmaz (2013) in the context of financial inclusion in Turkey, and Park and Mercado (2018a) to show the effect of financial inclusion on poverty and income inequality in 176 countries.

Amidžić et al. (2014) argued that when a composite index is computed using various indicators, some variables may possess attributes of multiple dimensions, thereby making it difficult to assign the weights adequately. Thus, assigning equal weights to all dimensions could potentially lead to measurement bias. Using factor analysis method to assign weights, the authors came up with three dimensions: (i) outreach (geographic and demographic penetration); (ii) usage (deposit and lending); and (iii) quality of financial services (disclosure requirement, dispute resolution, and cost of usage). In contrast, Camara and Tuesta (2014) and Park and

Mercado (2018b) used two-stage PCA to calculate the aggregate financial index. In the first stage, the PCA was run on a group of indicators within each dimension to assign weights on indicators. Camara and Tuesta (2014) came up with three dimensions – usage, access, and barrier to financial inclusion. However, Park and Mercado (2018b) followed Sarma (2008) and defined the dimensions as access, availability, and usage, respectively. In the second stage, the PCA was run again to assign weights on all three dimensions. The advantage of using this kind of methodology is that the data using the PCA scores dictates the relative weights on each indicator and subsequently the weights on each dimension to calculate the aggregate index. Thus, unlike Sarma (2008), the methodology avoids assigning arbitrary weights to indicators and dimensions when calculating the aggregate index. The next section discusses in more detail the Euclidean distance–based method of Sarma (2008) and the double PCA method of Camara and Tuesta (2014) and Park and Mercado (2018b).

3. Construction of a Hybrid Index of Financial Inclusion

We constructed the hybrid index of aggregate financial inclusion by combining two existing methodologies, the Euclidean distance–based method of Sarma (2008) and the double PCA method of Camara and Tuesta (2014) and Park and Mercado (2018b). First, we discussed the strengths and weaknesses of these two methodologies and then explained the steps to construct the hybrid index.

Euclidean distance and double PCA methodologies

The Euclidean distance–based method is a multidimensional method, which aggregates information on various forms of financial inclusion into a single index (Sarma, 2016). Sarma (2016) showed that it is important the final index satisfies four mathematical properties, as follows:

1) It must be a unit-free measure such that the values can be compared across countries and over time.
2) The final index must be a bounded function, where the lower bound characterises the least financially inclusive system and the upper bound

characterises the most financially inclusive system. In most common scenarios, this can be described as a value between 0 and 1.

3) The value of the final index should be an increasing function of its dimensions. Thus, any improvements in financial inclusion indicators within each dimension appropriately reflect a higher value in the aggregate financial index. Mathematically, the index satisfies the monotonicity function.

4) The index must also satisfy the homogeneity function. In other words, all dimensions are expressed as a constant return to scale to the aggregate index, where an equal increase in all dimensions will result in an equal change in the final number.

A normalised inverse of Euclidean distance method is used to aggregate the dimensions where the distance is computed as an average distance from the best and worst possible outcomes. A lower distance would indicate a higher value of the financial inclusion index and vice versa. Each dimension index, d_i, is computed as:

$$d_i = w_i \frac{A_i - m_i}{M_i - m_i} \qquad (2.1)$$

where w_i refers to the weight attached to dimension i, A_i is the actual value, m_i is the lower bound value, and M_i is the upper bound value of dimension i, respectively. Although theoretically, the value of w_i could range between 0 and 1, Sarma (2016) assigned equal weights to all three dimensions, arguing that all three dimensions are equally important for the aggregate index. Thus, w_i was set to 1. Regarding the choice of upper and lower-bound values, m_i was set to 0 and M_i was the observed 90th percentile of the distribution of dimension i. Sarma (2016) considered three dimensions: banking penetration (dimension 1), measured by the number of deposit bank accounts per 1,000 adult population; availability (dimension 2), measured by a combined index of the number of bank branches and the number of ATMs per 100,000 adults; and usage (dimension 3), measured by a combined value of credit volume to the private sector and deposit mobilised from the private sector as a proportion of the country's GDP.

Since all three dimensions were weighted equally, the aggregate financial inclusion index in a special form was calculated as follows[1]:

$$FI = \frac{1}{2}\left[\frac{\sqrt{d_1^2 + d_2^2 + \ldots + d_n^2}}{\sqrt{n}} + \left(1 - \frac{\sqrt{(1-d_1)^2 + (1-d_2)^2 + \ldots + (1-d_n)^2}}{\sqrt{n}}\right)\right] \quad (2.2)$$

where *FI* stands for financial inclusion index, and *n* is the total number of dimensions. Sarma (2016) assigned weight 1 to dimension 1 and 0.5 to dimensions 2 and 3, respectively. The study argued that the weights are based on the availability of data of each dimension for the countries in the sample and discussion with banking sector experts and other relevant researchers.

In contrast, Park and Mercado (2018b) criticised the methodology of Sarma (2008, 2016) on the ground of assigning arbitrary weights and, following Camara and Tuesta (2014), adopted a two-stage PCA method to assign weights to indicators and all dimensions, respectively.[2] In the first stage, all indicators were standardised following equation (2.1) above. It is important to note that Sarma (2016) had limited indicators and often considered a single indicator as a measure of a dimension; thus, a standardised value of a dimension would reflect the value of an indicator itself. In contrast, Park and Mercado (2018b) considered multiple indicators drawn from the Global Findex database and constructed three dimensions – access, availability, and usage, respectively. Consequently, the PCA was first used to derive weights for the standardised indicators within each dimension:

$$= \frac{\Sigma_{j,k=1}^{p} \lambda_j P_k}{\Sigma_{j=1}^{p} \lambda_j} d_i \quad (2.3)$$

where d_i stands for the index of dimension *i* derived from the PCA scores; $P_k = X\lambda_j$, where λ_j is the variance of the k[th] principal component representing their

[1] For detailed discussion on how the Euclidian distance method is applied using a normalised inverse of Euclidean distance, see Sarma (2016).

[2] Principal component analysis (PCA) is an empirical technique that helps researchers reduce the dimensionality of large data sets and increases the interpretability of such dimensions without considerable reduction in information loss. This is an adaptive data analysis technique, which creates new uncorrelated variables that successively maximise variance (see Joliffe and Cadima, 2016).

corresponding weights; and X is the number of indicator matrix. In the second stage, the PCA was again applied on all dimensions to assign weights:

$$= \frac{\sum_{j=1}^{p} \lambda_j P_{ki}}{\sum_{j=1}^{p} \lambda_j} \quad FI \qquad (2.4)$$

where similar to the previous stage, $P_k = X\lambda_j$, where λ_j is the variance of the k^{th} principal component representing their corresponding weights, and X is the number of dimensions matrix. The advantage of this methodology is that it does not assign an arbitrary weight to indicators to create the dimension indices and to create the final financial inclusion index.

However, Sarma (2016) argued that the double PCA method may not be the best methodology to consider because of the following reasons. First, the PCA method works best to compute an index when the final index is based on a linear combination of the dimensions, such that the weights reflect the variance–covariance structure of the dimensions. As a result, the final index would capture the first moments of the level data but not the second-order moments, which are more useful for this kind of analysis. Furthermore, unlike the Euclidian distance–based method, the PCA-based financial index would not satisfy all four necessary mathematical properties as mentioned above.

The above discussion reveals the strengths and weaknesses of both methodologies. Whilst the Euclidian distance–based method is easy to compute and satisfies all mathematical properties of a robust and comprehensive financial inclusion index, it suffers from an arbitrary weighting scheme assigned to dimensions and indicators. On the other hand, the double PCA approach overcomes the arbitrary weighting issue by using the principal component scores as corresponding weights. The final index suffers from not satisfying all the four main properties required to compute a robust index. In this study, we constructed a hybrid index to overcome the limitations of both methodologies.

Construction of a hybrid index

We followed the latest update of the G20 report to define the dimensions and the corresponding indicators in each dimension (GPFI, 2016). We collected 23 indicators and grouped them into three dimensions of financial inclusion: usage, access, and quality, respectively. To our knowledge, this study incorporates the most extensive array of indicators to date. Multiple data sources were used to collect the indicators across 22 Asian countries in the period 2004–2015. Appendix 2.1 presents details of all indicators including the dimensions and corresponding data sources, and Appendix 2.2 presents the list of countries considered in this study. Usage is measured by 13 indicators, e.g. use of mobile phones, use of the Internet, use of credit cards, use of deposit accounts, etc. Similarly, access is measured by seven indicators, such as the number of bank branches, number of ATMs, number of POS terminals, access to mobile phones and the Internet, etc. Finally, the quality of financial services in these countries is measured by three indicators – emergency fund from savings, financial knowledge, and distance to the frontier of financial knowledge. Whilst financial knowledge measures the basic financial understandings of people in these countries – such as inflation, interest rate, money illusion, risk diversification, insurance premiums, and others – distance to the frontier of financial knowledge is a credit barrier measure, which measures the distance of each economy to the 'frontier' on the strength of their credit reporting systems and absolute level of regulatory performance (GPFI, 2016).

We implemented a two-stage procedure to construct the hybrid index. In the first stage, we considered all the indicators of financial inclusion and standardised them using equation (2.1) following the method of Sarma (2008, 2016). All the standardised indicators are grouped under three dimensions. Next, following equation (2.3) of Park and Mercado (2018b), we ran a PCA on all 13 indicators to assign weights on each indicator and constructed the usage dimension. Similarly, a PCA was run on all seven indicators to construct the access dimension and on three indicators to construct the quality dimension. Thus, instead of assigning arbitrary weights, we utilised the data to dictate the weights on each indicator to construct the dimension indices. However, in the second stage, instead of running the PCA method again, we used the Euclidian distance–based method of Sarma (2008, 2016)

on all three dimensions to construct the final index of financial inclusion. The equal weighting scheme on each dimension was applied following equation (2.2) to construct the final index of financial inclusion.

The hybrid index is superior due to the following reasons: first, our hybrid index of financial inclusion uses many more indicators (23 indicators) than the previous studies of Sarma (2008, 2016), Camara and Tuesta (2014), and Park and Mercado (2018b). Thus, the hybrid index is comprehensive and captures a broad range of characteristics of the financial inclusion in developing countries in the period 2004–2015. Second, the construction of the hybrid index used the PCA to assign weights on dimensions but retained all four mathematical properties of the distance method in the final index. Thus, we drew on the strengths of both methodologies to create the hybrid index. It is also important to note that we could have followed the alternative method of adopting distance method in the first stage to create the dimension indices and then run the PCA in the second stage to create the final index. However, we considered this method inappropriate since there were 27 indicators in the first stage, and assigning equal weights to all of them would make the dimension indices biased and incorrectly reflect the importance of indicators in each dimension. After the dimension indices were settled using the PCA method and the error of arbitrary weighting scheme was minimised, adoption of the Euclidian distance–based method would consider the second-order moments of the dimensions to construct the final index and provided a more robust and comprehensive financial inclusion index. We followed the same procedure to create the hybrid financial inclusion index for all 22 Asian countries on an annual basis during the period 2004–2015. For comparison purposes, we also created two additional indices following the Euclidian distance–based method of Sarma (2008, 2016) and the double PCA method of Park and Mercado (2018b). The results are presented in the next section.

4. Empirical Analysis and Stylised Facts

Rankings of countries

Table 1 presents the rankings on the financial inclusion of 22 Asian countries in 2004–2015 for all three methodologies: double PCA method of Park and Mercado (2018b), Euclidian distance–based method of Sarma (2008, 2016), and the hybrid index. Although all three indices are calculated for every year from 2004 to 2015 for all countries, Table 1 shows the rankings of all countries in 2004, 2011, and 2015, respectively.

In Table 1, the top rankings indicate more financially inclusive countries and lower rankings indicate those less financially inclusive. For 2004, we find that Japan ranked first and the Republic of Korea (henceforth Korea) second under all three methodologies. China ranked third in the PCA and the distance method but ranked fifth in the hybrid method; whilst Hong Kong ranked fifth in the first two methodologies and ranked third in the hybrid method. However, we find that the top five countries are the same under all three methodologies. They are Japan, Korea, China, Singapore, and Hong Kong. A similar pattern is observed for the five bottom-ranked countries under all three methodologies in 2004. They are the Lao PDR, Macau, Brunei, Myanmar, and Nepal. When we looked at the middle-ranked countries, the rankings differed on occasions based on the methodology chosen. For example, Viet Nam ranked 16th and the Philippines ranked 14th under all three methodologies. However, whilst Thailand ranked 9th under the double PCA and distance-based measures, under the hybrid methodology the rank was marginally higher (10th). Similarly, India ranked 10th under double PCA and 8th under the distance-based measure but ranked 11th under the hybrid methodology in 2004.

Table 1: Rankings on Financial Inclusion of Countries

Country	Double PCA Method			Distance Method			Hybrid Method		
	2004	2011	2015	2004	2011	2015	2004	2011	2015
Bangladesh	12	14	13	10	12	14	11	18	19
Brunei	20	20	21	19	18	21	20	21	21
Cambodia	17	18	18	17	17	18	15	13	18
China	3	5	5	3	3	3	4	5	5
Hong Kong	5	4	4	5	5	5	5	3	4
India	10	12	12	8	10	11	12	11	15
Indonesia	11	10	11	11	11	10	8	8	13
Japan	1	1	2	1	1	2	1	1	2
Korea, Rep. of	2	2	1	2	2	1	2	2	3
Lao PDR	22	21	22	22	22	22	22	22	22
Macau	21	22	20	21	21	20	19	19	12
Malaysia	7	9	9	7	7	9	7	9	8
Mongolia	8	8	7	12	8	7	9	6	7
Myanmar	19	19	19	20	20	19	21	20	20
Nepal	18	16	17	18	19	17	16	16	17
Pakistan	15	15	14	13	16	15	13	14	11
Philippines	14	13	16	14	14	16	14	12	16
Singapore	4	3	3	4	4	4	3	4	1
Sri Lanka	13	11	10	15	13	12	17	17	10
Taiwan	6	6	6	6	9	6	6	7	6
Thailand	9	7	8	9	6	8	10	10	9
Viet Nam	16	17	15	16	15	13	18	15	14

PCA = principal component analysis. Green indicates top-ranked countries and red indicates bottom-ranked countries.
Source: Authors' own calculation.

We observed a similar pattern in the rankings of 2011 and 2015 in Table 1. The top-five and the bottom-five countries mostly had the same rank under all three methodologies. Interestingly, the same set of countries in 2004 that were in the top five were the same across the years, including in 2011 and 2015, respectively. As noted for 2015, these were Singapore, Korea, Japan, Hong Kong, and China. Bottom five countries – the Lao PDR, Nepal, Cambodia, Myanmar, and Brunei – consistently ranked in the lowest group of countries both over time, 2004–2015, and across the three methods. As for 2004, there were some occasional differences between the three methods in 2011 and 2015 amongst the middle-ranked countries as well as across time. For example, in 2015, Bangladesh ranked 19th under the hybrid method but 13th and 14th under the PCA and distance methods, respectively. Similarly, in 2015, Indonesia ranked 13th under the hybrid method and 11th and 10th under the PCA and distance methods, respectively. Also, India ranked 12th under the PCA method, 11th under the distance method, and 15th under the hybrid methodology. Thus, middle-ranked countries represented a source of interest in that not only was their rank ordering slightly sensitive to the methodological approach adopted but also their relative rankings tended to fluctuate more compared to the bottom-ranked countries. In this context, the hybrid method offered the opportunity to provide an additional lens for examining how middle-ranked countries performed.

Comparing the three methodologies, we find that they are consistent with the rankings of countries. Although the hybrid methodology is superior in the way it has been constructed by drawing on the strengths of the two previous methodologies and capturing a broad range of indicators, researchers should pay less attention to the debate on competing methodologies and focus more on the policy perspectives in respective countries. Thus, based on the observations, we formulated the following two stylised facts:

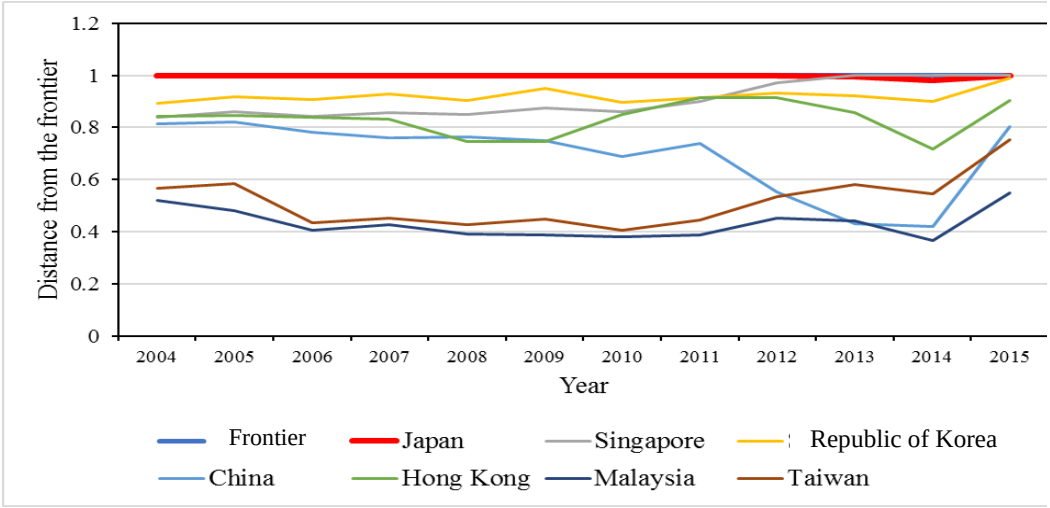
***Stylised fact #1*:** The ranking of countries is broadly consistent under all three methodologies.

***Stylised fact #2*:** The top- and bottom-ranked countries remain unchanged over time under all three methodologies, but some differences are observed with middle-ranked countries.

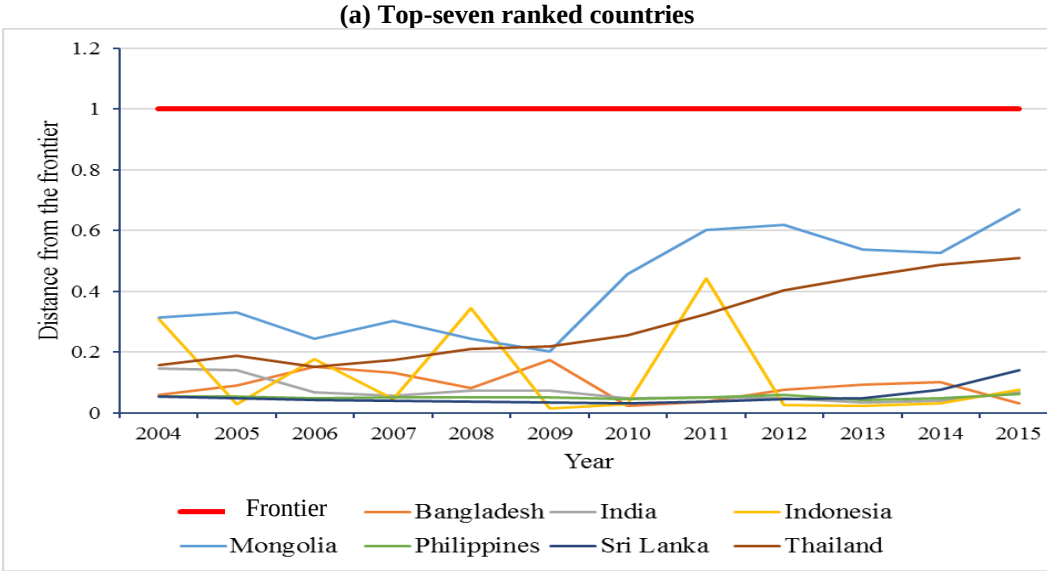
Distance from the frontier

To check if the gap between the middle-ranked, bottom-ranked, and the top-ranked countries is closing over time, based on the newly constructed hybrid index, we plotted the distance from the frontier of each country in the period 2004–2015. Since Japan ranked first in 2004 and ranked second in 2015, all countries were benchmarked against Japan, which was the frontier country in the sample.

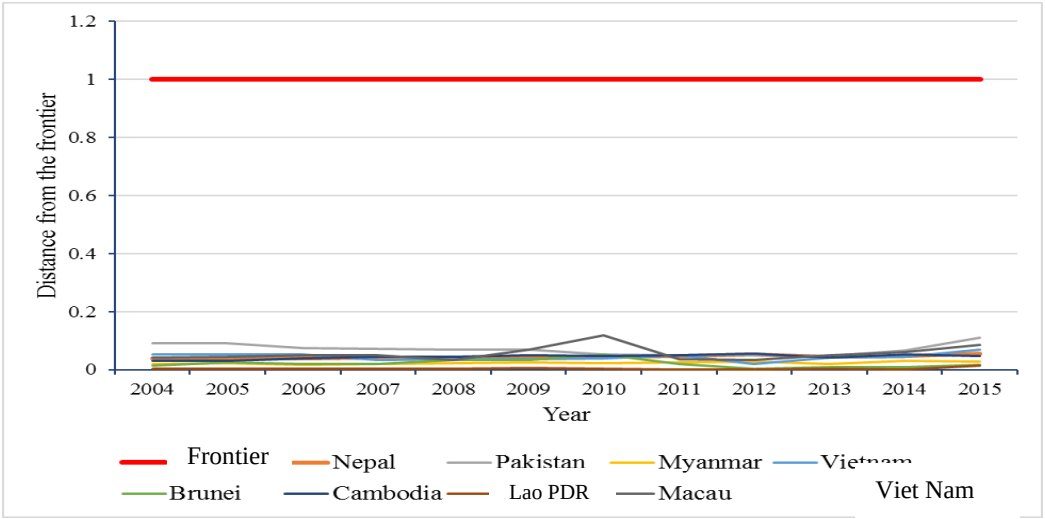
Figure 2.1: Distance from the Frontier



(a) Top-seven ranked countries



(b) Middle-ranked countries



(c) Bottom-seven ranked countries

Whilst panel (a) shows the distance from the frontier of the top seven countries, panels (b) and (c) show the same for middle-ranked and bottom seven–ranked countries, respectively. We find that amongst the top-ranked countries, although the relative position of countries such as Malaysia and Hong Kong have fluctuated since 2011, most countries are converging in recent years. Singapore's level of financial inclusion converged with Japan in 2012 and, by 2015, the country had exceeded the frontier level. However, there is no evidence of a convergence in the bottom-ranked countries in panel (c). All seven countries display a very flat pattern compared to the frontier level. Finally, there is mixed evidence of convergence amongst the middle-ranked countries in panel (b). Whilst there is clear evidence that for Thailand and Mongolia, the gap between their level of financial inclusion and the frontier level is closing, others do not show any significant level of convergence. It is also important to note that Figure 1 shows the relative ratio of financial inclusion between countries and not an absolute value. Thus, although financial inclusion may be increasing over time in the absolute sense, at an individual country level, however, such as India and Bangladesh, this is not necessarily reflected in the relative ranks.

***Stylised fact #3*:** Over 2004–2015, the top- and a few middle-ranked countries were converging to the frontier but there was no evidence of convergence amongst the bottom-ranked countries.

Top two indicators by country and year

Next, we utilised the PCA scores[5] from the first stage of the hybrid index construction to compare the frequencies of the indicators that received higher weightings for each country and year. Tables 2 and Table 3, respectively, present the top two indicators by country and by year.

Table 2: Top Two Indicators of Financial Inclusion by Country

Panel A: Usage dimension

Country	Top Two Indicators	Weight	Frequency
Bangladesh	*E-money accounts per 1,000 adults*	0.4078	6
	Percentage of adults who report having an account (by themselves or with someone else) with a formal financial institution or a mobile money provider	0.3981	5
Brunei	*Percentage of adults using a transaction account (with a bank or other formal financial institution or mobile money provider) to make or receive a digital financial payment*	0.4375	1
	Outstanding loans per 1,000 adults	0.3345	8
Cambodia	*Percentage of adults who receive wages or government transfers into an account*	0.4348	6
	Percentage of adults using a debit card to directly make a payment from an account (with a bank or other formal financial institution)	0.4348	2
China	*Retail cashless transactions per 1,000 adults*	0.4097	5
	Percentage of adults who saved in a bank or other formal financial institution in the past year	0.3730	6
Hong Kong	*Retail cashless transactions per 1,000 adults*	0.4352	5
	Outstanding loans per 1,000 adults	0.4348	8
India	*Percentage of adults who saved in a bank or other formal financial institution in the past year*	0.3800	6
	Percentage of adults using the Internet to pay bills, make purchases, or send money online	0.3785	1
Indonesia	*Outstanding loans per 1,000 adults*	0.4679	8
	Percentage of adults who receive wages or government transfers into an account	0.4678	6
Japan	*Outstanding loans per 1,000 adults*	0.4094	8
	Percentage of adults who receive wages or government transfers into an account	0.4078	6
Korea, Republic of	*Percentage of adults who receive wages or government transfers into an account*	0.4342	6
	Percentage of adults who saved in a bank or other formal financial institution in the past year	0.2758	6
Lao PDR	*E-money accounts per 1,000 adults*	0.4460	6
	Retail cashless transactions per 1,000 adults	0.4455	5
Macau	*Deposit accounts per 1,000 adults*	0.5031	4
	E-money accounts per 1,000 adults	0.5028	6

[5] All indicators were standardised before the PCA methodology was adopted. We utilised the data to dictate the weights on each indicator to construct the dimension indices. Since the PCA methodology avoids assigning arbitrary weights, we adopted the PCA scores to find the top two indicators.

Malaysia	*Percentage of adults using a debit card to directly make a payment from an account (with a bank or other formal financial institution)*	0.4304	2
	Percentage of adults who saved in a bank or other formal financial institution in the past year	0.4209	6
Mongolia	*Percentage of adults who report having an account (by themselves or with someone else) with a formal financial institution or a mobile money provider*	0.3954	5
	Deposit accounts per 1,000 adults	0.3857	4
Myanmar	*Outstanding loans per 1,000 adults*	0.4407	8
	Percentage of adults who receive wages or government transfers into an account	0.4407	6
Nepal	*Deposit accounts per 1,000 adults*	0.4473	4
	Percentage of adults who report having an account (by themselves or with someone else) with a formal financial institution or a mobile money provider	0.3862	5
Pakistan	*Percentage of adults who saved in a bank or other formal financial institution in the past year*	0.3899	6
	Percentage of adults who receive wages or government transfers into an account	0.3800	6
Philippines	*Percentage of adults who saved in a bank or other formal financial institution in the past year*	0.4040	6
	Outstanding loans per 1,000 adults	0.3793	8
Singapore	*Percentage of adults who report having an account (by themselves or with someone else) with a formal financial institution or a mobile money provider*	0.3656	5
	Outstanding loans per 1,000 adults	0.3579	8
Sri Lanka	*Retail cashless transactions per 1,000 adults*	0.4267	5
	Outstanding loans per 1,000 adults	0.4223	8
Taiwan	*Percentage of adults who report having an account (by themselves or with someone else) with a formal financial institution or a mobile money provider*	0.4147	5
	E-money accounts per 1,000 adults	0.3954	6
Thailand	*Retail cashless transactions per 1,000 adults*	0.4057	5
	E-money accounts per 1,000 adults	0.4050	6
Viet Nam	*E-money accounts per 1,000 adults*	0.4439	6
	Deposit accounts per 1,000 adults	0.4332	4

Panel B: Access dimension

Country	Top Two Indicators	Weight	Frequency
Bangladesh	*Number of ATMs per 100,000 adults*	0.5296	6
	Number of branches per 100,000 adults	0.5290	16
Brunei	*Number of branches per 100,000 adults*	0.5226	16
	Number of POS terminals per 100,000 adults	0.5182	6
Cambodia	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.4932	15
	Number of branches per 100,000 adults	0.4899	16
China	*Number of ATMs per 100,000 adults*	0.4792	6
	Number of POS terminals per 100,000 adults	0.4723	6
Hong Kong	*Number of branches per 100,000 adults*	0.5263	16
	Percentage of adults with access to a mobile phone or device or the Internet in the home	0.5055	15

India	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.4551	15
	Number of POS terminals per 100,000 adults	0.4371	6
Indonesia	*Number of branches per 100,000 adults*	0.4797	16
	Percentage of adults with access to a mobile phone or device or the Internet in the home	0.4680	15
Japan	*Number of branches per 100,000 adults*	0.5836	16
	Percentage of adults with access to a mobile phone or device or the Internet in the home	0.5412	15
Korea, Republic of	*Number of branches per 100,000 adults*	0.5275	16
	Number of mobile agent outlets per 100,000 adults	0.5153	1
Lao PDR	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.5709	15
	Number of branches per 100,000 adults	0.5681	16
Macau	*Number of branches per 100,000 adults*	0.6138	16
	Number of ATMs per 100,000 adults	0.5715	6
Malaysia	*Number of POS terminals per 100,000 adults*	0.4836	6
	Percentage of adults with access to a mobile phone or device or the Internet in the home	0.4675	15
Mongolia	*Number of branches per 100,000 adults*	0.4847	16
	Number of POS terminals per 100,000 adults	0.4697	6
Myanmar	*Number of ATMs per 100,000 adults*	0.4934	6
	Percentage of adults with access to a mobile phone or device or the Internet in the home	0.4851	15
Nepal	*Number of POS terminals per 100,000 adults*	0.5066	6
	Percentage of adults with access to a mobile phone or device or the Internet in the home	0.4994	15
Pakistan	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.4946	15
	Number of branches per 100,000 adults	0.4786	16
Philippines	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.4714	15
	Number of ATMs per 100,000 adults	0.4643	6
Singapore	*Number of branches per 100,000 adults*	0.6028	16
	Percentage of adults with access to a mobile phone or device or the Internet in the home	0.5499	15
Sri Lanka	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.5306	15
	Number of branches per 100,000 adults	0.4874	16
Taiwan	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.6562	15
	Number of branches per 100,000 adults	0.5920	16
Thailand	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.5304	15
	Number of branches per 100,000 adults	0.4893	16
Viet Nam	*Number of branches per 100,000 adults*	0.5487	16
	Number of ATMs per 100,000 adults	0.5067	6

Panel C: Quality dimension

Country	Top Two Indicators	Weight	Frequency
In all countries	*Percentage of adults who responded 'savings' to the question: If you had an emergency that required [$10, or 1/25 of GDPPC] urgently, where would you get the money? (i) borrow from friends/relatives; (ii) work more; (iii) sell assets; (iv) savings; (v) loan from savings club; (vi) loan from bank; (vii) would not be able to find it*	0.7071	1
	Getting credit: the strength of credit reporting systems and the effectiveness of collateral and bankruptcy laws in facilitating lending.	0.7071	1

ATM = automatic teller machine, GDPPC = gross domestic product per capita, POS = point of sale.
Source: Authors' own calculation.

Table 2 shows the top two indicators by country. For example, the top two indicators of Japan in the usage dimension (ranked first in 2004 and ranked second in 2015 in the hybrid method) are outstanding loans per 1,000 adults (with a 0.4094 weight) and percentage of adults who receive wages or government transfers into an account (with a 0.4078 weight). In the access dimension, the top indicators are the number of branches per 100,000 adults (with a 0.5836 weight) and percentage of adults with access to a mobile phone or device or the Internet in the home (with a 0.5412 weight). In contrast, for Korea (ranked second in 2004 and third in 2015 in hybrid method), the top two most effective indicators in the usage dimension are the percentage of adults who receive wages or government transfers into an account (with 0.4342 weight) and percentage of adults who saved in a bank or other formal financial institution in the past year (with a 0.2758 weight). In the access dimension, the top indicators are the number of branches per 100,000 adults (with a 0.5275 weight) and the number of mobile agent outlets per 100,000 adults (with a 0.5153 weight). The top two indicators are again different in the bottom five countries. Thus, the top two indicators in each dimension vary significantly across countries and provide important policy implications for individual countries.

Taken together, in the usage dimension, the top indicator is outstanding loans per 1,000 adults, which appear eight times as the top two indicators amongst the sample of countries. This is followed by three indicators in the second position, each appearing as the top two indicators six times in the sample (Table 2). They are (i) e-money accounts per 1,000 adults, (ii) percentage of adults who saved in a bank or other formal financial institution in the past year, and (iii) percentage of adults

who receive wages or government transfers into an account. In the access dimension, we find the number of branches per 100,000 adults as the top indicator, which received the highest scoring 16 times from various countries in the sample. In the second position is the percentage of adults with access to a mobile phone or device or the Internet in the home, which received a high PCA score on 15 occasions. Amongst the three indicators in the quality dimension, the top-ranked indicator is the use of savings as a source of emergency funding followed by strength of credit reporting systems and the effectiveness of collateral and bankruptcy laws in facilitating lending.

Table 3: Top Two Indicators by Years

Panel A: Usage dimension

Years	Top Two Indicators	Weight	Frequency
2004	*Percentage of adults who receive wages or government transfers into an account*	0.3653	11
	Percentage of adults using a debit card to directly make a payment from an account (with a bank or other formal financial institution)	0.3609	5
2005	*Percentage of adults who receive wages or government transfers into an account*	0.3650	11
	Percentage of adults using a debit card to directly make a payment from an account (with a bank or other formal financial institution)	0.3606	5
2006	*Percentage of adults who receive wages or government transfers into an account*	0.3652	11
	Percentage of adults using a debit card to directly make a payment from an account (with a bank or other formal financial institution)	0.3607	5
2007	*Percentage of adults who receive wages or government transfers into an account*	0.3664	11
	Percentage of adults who saved in a bank or other formal financial institution in the past year	0.3557	2
2008	*Percentage of adults who receive wages or government transfers into an account*	0.3695	11
	Percentage of adults who report having an account (by themselves or with someone else) with a formal financial institution or a mobile money provider	0.3559	3
2009	*Percentage of adults who receive wages or government transfers into an account*	0.3726	11
	Percentage of adults who report having an account (by themselves or with someone else) with a formal financial institution or a mobile money provider	0.3559	3
2010	*Percentage of adults who receive wages or government transfers into an account*	0.3752	11
	Percentage of adults who report having an account (by themselves or with someone else) with a formal financial institution or a mobile money provider	0.3693	3

2011	*Percentage of adults who receive wages or government transfers into an account*	0.3731	11
	Outstanding loans per 1,000 adults	3124	1
2012	*Percentage of adults who receive wages or government transfers into an account*	0.3727	11
	Percentage of adults using a debit card to directly make a payment from an account (with a bank or other formal financial institution)	0.3655	5
2013	*Percentage of adults who saved in a bank or other formal financial institution in the past year*	0.3655	2
	Percentage of adults using a transaction account (with a bank or other formal financial institution or mobile money provider) to make or receive a digital financial payment	0.3631	2
2014	*Percentage of adults who receive wages or government transfers into an account*	0.3707	11
	Percentage of adults using a transaction account (with a bank or other formal financial institution or mobile money provider) to make or receive a digital financial payment	0.3624	2
2015	*Percentage of adults using a debit card to directly make a payment from an account (with a bank or other formal financial institution)*	0.3821	5
	Percentage of adults who receive wages or government transfers into an account	0.3784	11

Panel B: Access dimension

Years	Top Two Indicators	Weight	Frequency
2004	*Number of debit cards per 1,000 adults*	0.5477	6
	Percentage of adults with access to a mobile phone or device or the Internet in the home	0.5272	12
2005	*Number of debit cards per 1,000 adults*	0.5482	6
	Percentage of adults with access to a mobile phone or device or the Internet in the home	0.5248	12
2006	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.5487	12
	Number of ATMs per 100,000 adults	0.3932	4
2007	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.5540	12
	Number of ATMs per 100,000 adults	0.3827	4
2008	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.5575	12
	Number of debit cards per 1,000 adults	0.5249	6
2009	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.5607	12
	Number of debit cards per 1,000 adults	0.5252	6
2010	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.5625	12
	Number of ATMs per 100,000 adults	0.4068	4
2011	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.5423	12
	Number of ATMs per 100,000 adults	0.4998	4
2012	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.5359	12

	Agents of payment service providers per 100,000 adults	0.4472	1
2013	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.5332	12
	Number of debit cards per 1,000 adults	0.4829	6
2014	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.5654	12
	Number of debit cards per 1,000 adults	0.4467	6
2015	*Percentage of adults with access to a mobile phone or device or the Internet in the home*	0.5643	12
	Number of POS terminals per 100,000 adults	0.3630	1

Panel C: Quality dimension

Years	Top Two Indicators	Weight	Frequency
In all years	*Getting credit: the strength of credit reporting systems and the effectiveness of collateral and bankruptcy laws in facilitating lending.*	0.6491	1
	Financial knowledge score (i.e. arithmetic score which sums up correct responses to questions about basic financial concepts, such as (i) inflation, (ii) interest rate, (iii) compound interest, (iv) money illusion, (v) risk diversification, (vi) main purpose of insurance)	0.5790	1

ATM = automatic teller machine, POS = point of sale.
Source: Authors' own calculation.

In Table 3, we followed the same procedure of implementing the PCA scoring to find out the top indicators over time, keeping the country list fixed. For example, in 2004, the top two indicators in the usage dimension were the percentage of adults who receive wages or government transfers into an account (with a 0.3653 weight) and the percentage of adults using a debit card to directly make a payment from an account with a bank or other formal financial institution (with a 0.3609 weight). In contrast, in 2011, the top two indicators in the usage dimension were the percentage of adults who receive wages or government transfers into an account (with a 0.3731 weight) and outstanding loans per 1,000 adults (with a 0.3124 weight). In 2015, the top two indicators in the usage dimension were the percentage of adults using a debit card to directly make a payment from an account (with a bank or other formal financial institution) (with a 0.3821 weight) and percentage of adults who receive wages or government transfers into an account (with a 0.3784 weight). Thus, there is a significant variation amongst the top two weighted indicators over time. We found similar evidence for the top two indicators in access and quality dimension.

Again, taken together, the top two indicators in the usage dimension were (i) percentage of adults who receive wages or government transfers into an account,

which appeared 11 times as one of the top two indicators, and (ii) percentage of adults using a debit card to directly make a payment from an account (with a bank or other formal financial institution), with a frequency of 6 times. Similarly, in the access dimension, the top two indicators were the percentage of adults with access to a mobile phone or device or the Internet in the home (frequency = 12) and the number of debit cards per 1,000 adults (frequency = 6), respectively. Finally, in the quality dimension, the top two indicators were the strength of credit reporting systems and the effectiveness of collateral and bankruptcy laws in facilitating lending and financial knowledge score, respectively.

When we compared the results of Tables 2.2 and 2.3, we observed a clear pattern amongst the top two indicators in each dimension across countries and over time. At least one common indicator appeared most frequently as one of the top two indicators based on the PCA scoring adjusted by country or year. In the usage dimension, we found the percentage of adults who receive wages or government transfers into an account as the most common indicator in both Tables 2.2 and 2.3 irrespective of whether the PCA scoring was by country or by year. Similarly, the percentage of adults with access to a mobile phone or device or the Internet at home was a common top indicator in the access dimension, and the strength of credit reporting systems and the effectiveness of collateral and bankruptcy laws in facilitating lending was a common top indicator in the quality dimension. Thus, these three indicators, each corresponding to a single dimension, appeared most frequently as one of the top two indicators for all countries and over time. From a policy perspective, these three indicators would be very important in promoting financial inclusion in Asia. Based on this observation, we formulated the following stylised fact:

Stylised fact #4: There are clear similarities across the developing countries in how each of the three dimensions of financial inclusion –access, usage, and quality – is adopted over time.

5. Conclusion and Policy Implications

The paper overviews the existing dimensions of financial inclusion and critically evaluates the two widely used existing methodologies to measure these dimensions, the PCA and the Euclidian distance methods, respectively. We subsequently proposed a new hybrid financial inclusion index, which draws on the strengths of existing measures and consistent with the ranking order of countries. Whilst the hybrid index overcomes the limitations of the previously constructed indices in the literature, it captures a broad range of indicators for developing countries in the sample. We proposed four key stylised facts by critically evaluating three dimensions of financial inclusion – access, usage, and quality – in 22 Asian countries in the period 2004–2015.

Under all three methodologies, we did not find significant differences in rankings amongst the set of top- and bottom-ordered countries. The top five and the bottom five countries under all three methodologies are virtually the same. Moreover, we found that the set of top- and bottom-tiered countries remain relatively unchanged over time. Related to this, a significant gap exists between the bottom-ranked countries and the distance to the frontier, and this gap has changed little over time. However, some occasional differences in rank orderings can be found across the three methodologies amongst middle-ranked countries. There are also greater fluctuations in ranking over time, including some countries demonstrating convergence with the top-ranked countries (Figure 1) but these tend to be sporadic and not uniform. More research focusing on these differences is required.

From a policy perspective, at least one indicator received the highest weighting (PCA scoring) under both country and time variations. We also showed the top two indicators of financial inclusion by each country and year. These indicators require more attention from policymakers for the successful realisation of financial inclusion in these countries. Also, notwithstanding the theoretically appealing nature in constructing a hybrid aggregate financial index, policymakers should give attention to the dimensions and indicators in respective countries and how they influence specific development outcomes. The next paper examines these relationships in more detail by deploying the hybrid index measure and utilising the top two indicators and dimensions, separately, to test their relationship with certain development outcomes.

References

Allen, F., A. Demirguc-Kunt, L. Klapper, and M.M. Peria (2016), 'The Foundations of Financial Inclusion: Understanding Ownership and Use of Formal Accounts', *Journal of Financial Intermediation*, 27(1), pp.1–30.

Amidžic, G., A. Massara, and A. Mialou (2014), 'Assessing Countries' Financial Inclusion Standing: A New Composite Index', *IMF Working Paper* number 14/36, Washington, DC: International Monetary Fund.

Camara, N. and D. Tuesta (2014), 'Measuring Financial Inclusion: A Multidimensional Index', *BBVA Research Paper* number 14/26.

Chauvet, L. and L. Jacolin (2017), 'Financial Inclusion, Bank Concentration, and Firm Performance', *World Development*, 97, pp.1–13.

Demetriades, P. and S.H. Law (2006), 'Finance, Institutions and Economic Development', *International Journal of Finance & Economics*, 11(3), pp.245–60.

Demirgüç-Kunt, A. and L. Klapper (2012). Measuring Financial Inclusion: The Global Findex Database. Washington, DC: The World Bank.

Demirgüç-Kunt, A. and L. Klapper (2013), 'Measuring Financial Inclusion: Explaining Variation in Use of Financial Services across and within Countries', *Brookings Papers on Economic Activity*, 2013(1), pp.279–340.

Dungey, M., F.D. Tchatoka, and M.B. Yanotti (2018), 'Using Multiple Correspondence Analysis for Finance: A Tool for Assessing Financial Inclusion', *International Review of Financial Analysis*, 59, pp.212–22.

Global Partnership for Financial Inclusion (2016), G20 Financial Inclusion Indicators. https://databank.worldbank.org/data/download/g20fidata/G20_Financial_Inclusion_Indicators.pdf (accessed 20.01.2019).

Honohan, P. (2008), 'Cross-Country Variation in Household Access to Financial Services', *Journal of Banking & Finance*, 32(11), pp.2493–500.

Jolliffe, I.T. and J. Cadima (2016), 'Principal Component Analysis: A Review and Recent Developments', *Philosophical Transactions of the Royal Society A Mathematical, Physical and Engineering Sciences*, 374(2065), 20150202, April 2016.

Kempson, E., A. Atkinson, and O. Pilley (2004), Policy Level Response to Financial Exclusion in Developed Economies: Lessons for Developing Countries. Report of Personal Finance Research Centre. Bristol: University of Bristol.

Kim, D.W., J.S. Yu, and M.K. Hassan (2018), 'Financial Inclusion and Economic Growth in OIC Countries', *Research in International Business and Finance*, 43, pp.1–14.

Mialou, A., G. Amidžić, and A. Massara (2017), 'Assessing Countries' Financial Inclusion Standing – A New Composite Index', *Journal of Banking and Financial Economics*, 2(8), pp.105–26.

Park, C.Y. and R. Mercado (2016), 'Does Financial Inclusion Reduce Poverty and Income Inequality in Developing Asia?, in S. Gopalan and T. Kikuchi (eds.), *Financial Inclusion in Asia: Issues and Policy Concerns*. London: Palgrave Macmillan. pp.61–92.

Park, C.Y. and R. Mercado (2018a), 'Financial Inclusion, Poverty, and Income Inequality', *The Singapore Economic Review*, 63(01), pp.185–206.

Park, C.Y. and R. Mercado (2018b), Financial Inclusion: New Measurement and Cross-Country Impact Assessment. Available at SSRN: http://dx.doi.org/10.2139/ssrn.3199427.

Sarma, M. (2008), 'Index of Financial Inclusion', *Working Paper* No. 215, New Delhi: Indian Council for Research on International Economic Relations (ICRIER).

Sarma, M. (2016), 'Measuring Financial Inclusion for Asian Economies', in S. Gopalan and T. Kikuchi (eds.), *Financial Inclusion in Asia: Issues and Policy Concerns*. London: Palgrave Macmillan. pp.3–34.

Sinclair, S.P. (2001), Financial Exclusion: An Introductory Survey. Edinburgh: CRSIS College of Art/Heriot Watt University.

Subramanian, M.A., M.F. Trebbi, and M.D. Rodrik (2002), Institutions Rule: The Primacy of Institutions over Integration and Geography in Economic Development (No. 2-189). Washington, DC: International Monetary Fund.

Van der Werff, A.D., J.M. Hogarth, and N.D. Peach (2013), 'A Cross-Country Analysis of Financial Inclusion within the OECD', *Consumer Interest Annual*, 59, pp.1–12.

Yorulmaz, R. (2013), 'Construction of a Regional Financial Inclusion Index in Turkey', *Journal of BRSA Banking and Financial Markets*, 7(1), pp.79–101.

Zins, A. and L. Weill (2016), 'The Determinants of Financial Inclusion in Africa', *Review of Development Finance*, 6(1), pp.46–57.

Appendix 2.1: Financial Inclusion Indicators and Data Sources

Indicators	Sources
Usage dimension	
Percentage of adults who report having an account (by themselves or with someone else) with a formal financial institution or a mobile money provider	WB Global Findex
Percentage of adults using a transaction account (with a bank or other formal financial institution or mobile money provider) to make or receive a digital financial payment	WB Global Findex
Deposit accounts per 1,000 adults	IMF Financial Access Surveys
E-money accounts per 1,000 adults	WB Global Payments Systems
Retail cashless transactions per 1,000 adults	WB Global Payments Systems
Outstanding loans per 1,000 adults	IMF Financial Access Surveys
Percentage of adults who receive wages or government transfers into an account (with a bank or other formal financial institution or mobile money provider)	WB Global Findex
Percentage of adults using a debit card to directly make a payment from an account (with a bank or other formal financial institution)	WB Global Findex
Payment using a mobile phone (from an account)	WB Global Findex
Payments using the Internet	WB Global Findex
Percentage of adults with at least one loan outstanding from a bank or other formal financial institution	WB Global Findex
Percentage of adults that saved at a bank or other formal financial institution in the past year	WB Global Findex
Number of mobile money transactions per 100,000 adults	IMF Financial Access Surveys
Access dimension	
Number of branches per 100,000 adults	IMF Financial Access Surveys
Number of ATMs per 100,000 adults	IMF Financial Access Surveys
Number of POS terminals per 100,000 adults	WB Global Payments Systems
Number of mobile agent outlets per 100,000 adults	IMF Financial Access Surveys
Number of debit cards per 1,000 adults	WB Global Payments Systems
Percentage of adults with access to a mobile phone or device or the Internet in the home	Gallup World Poll
Agents of payment service providers per 100,000 adults	WB Global Payments Systems

Quality dimension	
Financial knowledge score	WB Financial Capability Surveys and OECD National Financial Literacy and Inclusion Surveys
Use of savings for emergency funding	WB Global Findex
Distance to frontier	WBG Doing Business

IMF = International Monetary Fund, OECD = Organisation for Economic Co-operation and Development, WB = World Bank, WBG = World Bank Group.
Source: Authors' own calculation.

Appendix 2.2: List of Countries Considered for Financial Inclusion Rankings

(in alphabetical order)

Bangladesh
Brunei
Cambodia
China
Hong Kong
India
Indonesia
Japan
Lao PDR
Macau
Malaysia
Mongolia
Myanmar
Nepal
Pakistan
Philippines
Korea, Rep. of
Singapore
Sri Lanka
Taiwan
Thailand
Viet Nam

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