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To cite this article: Linh Bun & Nirvikar Singh (2016): Heterogeneous Patterns of Financial Development: Implications for Asian Financial Integration, International Economic Journal, DOI: 10.1080/10168737.2016.1148424

To link to this article: <http://dx.doi.org/10.1080/10168737.2016.1148424>



Published online: 04 Mar 2016.



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# Heterogeneous Patterns of Financial Development: Implications for Asian Financial Integration

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## ABSTRACT

This paper analyzes detailed differences in patterns of financial development across the major Asian economies, including three of the region's largest economies (China, Japan and South Korea), to understand how these differences might affect possibilities for greater regional financial integration. In particular, the paper argues that heterogeneous patterns of financial development, and not just differences in levels of financial development, may present an economic challenge to regional financial integration efforts, aside from possible political challenges. The paper provides background on the case for financial openness, Asian experiences with financial integration, and regional economic responses to external shocks. It also discusses policy options, including regulatory reform and coordination, and possible risk management policies and institutions, in the context of heterogeneous patterns of financial development.

## ARTICLE HISTORY

Received 1 November 2015  
Accepted 18 January 2016

## KEYWORDS

Financial development;  
financial integration; Asia  
Pacific; East Asia

## JEL CLASSIFICATIONS

F30; F55; G10; G20; O16

## 1. Introduction

The rapid post-war rise of Japan to developed country status, followed by economies such as South Korea, Taiwan, Hong Kong and Singapore, began a process of making East (and Southeast) Asia a significant contributor to global economic activity. Even as Japanese growth slowed, the regional process has been accelerated by the growth of China, and the creation of regional production networks that include many smaller economies such as Malaysia and Vietnam in essential ways. These production networks have been an important aspect of openness to trade that characterized much of the region and contributed to economic growth.<sup>1</sup>

Strong real growth has not been immune to normal business cycle fluctuations, as well as to the negative impacts of international financial crises. The Asian financial crisis of 1997–1998 called attention to the differences between openness to trade and openness to capital, and produced a particular set of policy responses in the region, including ‘self-insurance’ through international reserve accumulation.<sup>2</sup> The global financial crisis of

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<sup>1</sup> On regional production networks, trade, and growth, see Athukorala (2014) and Kaur (2014), as two examples of a large and growing literature.

<sup>2</sup> See Aizenman, Chinn and Ito (2013) as one of several articles by those authors that document and analyze this reserve accumulation.

2007–2009 had an unavoidable negative impact on East Asia as well, but it is arguable that the lessons of 1997–1998 permitted the region to be better prepared for this second, larger shock.

One of the issues brought to the fore by the global crisis was the benefits and costs of financial openness and financial integration. Openness and integration can cover several different aspects of economic interaction. The obvious example of financial openness is liberalization of capital flows between countries. Integration has several connotations beyond openness, including harmonization of institutions such as financial market trading rules, and policy coordination for managing risks and instabilities that are potentially associated with financial openness. The theoretical justification for financial openness has been questioned much more than in the case of openness to trade, but it remains a reality that has to be analyzed and managed. The last decade, before and after the global financial crisis, has seen continued academic and policy engagement with these questions.

A key complement to financial integration is the nature of domestic financial development. It has been argued that financial openness and integration are more likely to have positive outcomes in cases where the economies involved have adequate levels of financial development.<sup>3</sup> However, financial development is itself a multi-dimensional concept. For example, it can include various kinds of financial market institutions such as banks and stock markets, but also broader legal and regulatory frameworks that create the environment for financial decision-making by firms and households. This paper is motivated by debates about financial integration and policy coordination in East Asia, but focuses on financial development as a precondition for financial integration. In particular, it analyzes differences in patterns of financial development across the major East Asian economies, including three of the largest economies of the region (China, Japan and South Korea). In addition to differences in levels of financial development, differences in patterns of financial development may present an economic challenge to regional financial integration efforts.

The next section briefly reviews arguments for and against financial openness, the East Asian experience with financial crises and with financial integration, and how economies in the region have responded to external shocks. It also considers the possible connection between financial integration and financial development. Section 3 discusses data and measurement of patterns of financial development, as well as overall levels. A key idea here is that differences in various dimensions of financial development can be relevant for financial integration, as well as differences in overall levels of financial development. Section 4 presents the results of the paper, analyzing levels and patterns for 14 economies in the region. A key finding is that comparisons of overall levels of financial development convey somewhat different information than comparisons of patterns of financial development. This is borne out in a cluster analysis, which also provides some direct insights on possibilities for future financial integration. Section 5 concludes, offering some possible implications of the analysis for future thinking about financial integration in the region.

## 2. Financial Integration and Financial Development

The core aspect of financial integration is openness on the capital account, so that international capital flows are unrestricted. In practice, a completely open capital account does not

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<sup>3</sup> Arguments for this view are taken up in the next section, where references are provided.

lead to perfect financial integration, in the sense of unified financial markets. An important reason for this imperfection is home bias in investment, reflected in a positive correlation between domestic savings and investment (Feldstein & Horioka, 1980). Investors do not view foreign and domestic assets as perfect substitutes, even when they have the same objective characteristics. This can be due to regulatory differences, tax treatment, asymmetries of information, and other kinds of market or institutional imperfections. Nevertheless, despite these perceptual and institutional barriers to complete financial integration, the main defining feature of modern-day globalization has been liberalization of restrictions on capital flows, allowing large amounts of capital to move swiftly between different countries. Furthermore, these capital flows now mainly consist of private capital, rather than official government flows. Large flows of capital, whether inward or outward, create challenges for the conduct of domestic macroeconomic policies,<sup>4</sup> and these are compounded by the volatility of these flows.

The post-Second World War global economy was initially one of fixed exchange rates, capital controls and monetary policy autonomy. This regime broke down in the 1970s, and since then theory and practice have swung back and forth between different policy combinations. At one stage, the orthodoxy had coalesced on the desirability of flexible exchange rates and openness of the capital account, the idea being that markets would equilibrate to allocate resources efficiently around the globe. Few countries adopted this policy mix, however, instead pursuing various combinations of partial capital controls, partial exchange rate flexibility and partial monetary autonomy. The latest financial crisis finally pushed the weight of expert opinion away from full capital account openness.<sup>5</sup> One of the most striking examples of this change was the near reversal of the International Monetary Fund's position on capital account liberalization, after the global financial crisis.

Even before the global financial crisis of 2007–2009, there was evidence that full capital account openness did not have identifiable positive effects on economic performance. While the earlier 1997–1998 financial crisis was still unfolding, Dani Rodrik (1998) argued against full capital account convertibility, pointing out that financial markets are far from the textbook model of perfection, and subject to bubbles, panics and herd behavior in general, so that the theoretical case for capital account openness is difficult to make convincingly.<sup>6</sup> Looking at empirical evidence, Rodrik concluded, 'There is no evidence

<sup>4</sup> The main challenge for macroeconomic policy is encapsulated in the idea of the policy 'trilemma,' or 'impossible trinity,' based on the Mundell-Fleming model of an open economy macroeconomic framework. In the model, it is impossible for a government to simultaneously have monetary policy autonomy (and hence the ability to control the domestic inflation rate) and a fixed exchange rate when the capital account is completely unrestricted. Attempts to conduct an independent monetary policy will drive a wedge between foreign and domestic interest rates, leading to continued capital inflows or outflows (depending on the direction of the interest differential) in the absence of an equilibrating mechanism such as exchange rate adjustment. Rey (2013) has advanced the proposition that the weight of capital flows in the context of non-conventional monetary policies (essentially, what is known as QE or Quantitative Easing) makes exchange rate flexibility insufficient for domestic inflation control unless there are also controls on international capital flows. The theory and empirics of this view are still being debated. Aizenman, Chinn and Ito (2013) have been among the originators of quantitative approaches to measuring policy stances with respect to the trilemma.

<sup>5</sup> For an academic statement of the changed thinking, see Ostry, Ghosh, Chamon, and Qureshi (2012). Ghosh et al. (2008) provide an earlier, more policy-focused take with the same perspective, also from the IMF.

<sup>6</sup> Other prominent arguments against full capital account liberalization include Bhagwati (1998), Cooper (1999), Obstfeld (2009), and Stiglitz (2003).

in the data that countries without capital controls have grown faster, invested more, or experienced lower inflation.<sup>7</sup>

More recently, Obstfeld (2009, pp. 104–105) offered a similarly cautious assessment, after an extensive literature review, ‘Financial openness is not a panacea – and it could be poison. The empirical record suggests that its benefits are most likely to be realized when implemented in a phased manner, when external balances and reserve positions are strong, and when complementing a range of domestic policies and reforms to enhance stability and growth.’<sup>8</sup> Addressing the obverse of the issue, Aizenman, Pinto and Radziwill (2007) found evidence that domestic financial development might be more important for higher growth than foreign capital. They constructed a self-financing measure, which was positively correlated with growth, after controlling for the quality of domestic institutions. Even earlier, Eichengreen (2003) had emphasized the importance of domestic financial development, making that case in the context of criticizing the Chiang Mai Initiative (CMI) – designed in 2000 to provide regional swap lines – as a means of preserving fixed exchange rates among the CMI group.

Despite the cautions emerging from work such as discussed above, financial integration, especially in East Asia as an economically dynamic region of growing importance, has continued to receive considerable attention. Borensztein and Loungani (2011) used cross-border equity and bond holdings, as well as equity returns and interest rates, to argue that Asian (chiefly East Asian) financial integration had increased, but that extra-regional connections remained stronger than intra-regional measures of integration. These results echoed earlier, similar studies (Fung, Tam, & Yu, 2008; Garcia-Herrero, Yang, & Wooldridge, 2008), with the latter paper providing an explanation of limited Asian financial integration in terms of low liquidity in the region’s financial markets. Another recent study (Lee, Park, & Yi, 2013) found no evidence for increased Asian financial integration after the global crisis, but an up-to-date survey (Financial Services Institute of Australasia, 2015) suggested that regional financial integration has increased. This is also the conclusion of a recent IMF study (IMF, 2015), which measures this increase in terms of intraregional financial flows, but nevertheless also concludes that ‘Home bias . . . is particularly strong in Asia, limiting cross-border financial transactions within the region’ (IMF, 2015, p. 94).

Aside from measuring trends in financial integration, various studies have also tried to estimate the potential costs and benefits. Hoxha, Kalemli-Ozcan, and Vollrath (2009) analyzed international financial integration, measured as foreign capital flows, and estimated that these flows had had significant positive impacts on consumption and welfare. Unfortunately, this analysis was performed before the global financial crisis. From a somewhat different welfare perspective, Pongsaparn and Unteroberdoerster (2011) estimated that greater financial integration in Asia would support global rebalancing, and hence financial stability. Park and Lee (2011) also implicitly assumed benefits from greater financial integration in ‘emerging Asia,’ through greater allocative efficiency, but emphasized

<sup>7</sup> Kaur and Singh (2014) provide a detailed review of the empirical evidence on how different East Asian economies reacted to the financial crises of 1997–1998 and 2007–2009, and the impacts of different policy mixes with respect to financial openness.

<sup>8</sup> There is also evidence that the specific nature of capital flows matters. For example, equity flows have a positive short-run impact on the host economy (Henry, 2007; Kose, Prasad, & Terrones, 2009), as does foreign direct investment (e.g., Kose et al, 2009).

the need for ‘more effective financial supervisory and regulatory mechanisms,’ as well as improvements in various dimensions of financial development.

There is a large empirical literature on the impacts of financial development, with the recent focus, post-global-crisis, being on the possibility that ‘too much finance’ is inimical to economic growth. A common approach in this literature is to use a quadratic term for the measure of financial development: Arcand, Berkes, and Panizza (2015a) provide the most recent example of this specification. On the other hand, Law and Singh (2014) used an endogenous threshold model to allow for negative effects of financial development on growth.<sup>9</sup> The typical conceptualization of financial development is in terms of financial depth, measured as a credit-to-GDP ratio, and the presumed channel of negative impacts of financial depth on growth is volatility or financial crises (Schularick & Taylor, 2012).<sup>10</sup> Arcand et al. (2015a) used the ratio of total private sector credit to GDP as the measure of financial depth, but their results are robust to using bank credit or household credit instead. Law and Singh used private sector credit, liquid liabilities and domestic credit as three possible measures of financial depth, with similar results.

Law, Azman-Saini, and Ibrahim (2013) examined the possibility that the finance-growth nexus depends on institutional quality, and find that this is the case using a threshold model. The institutional quality measures are generic – capturing control of corruption, rule of law and government effectiveness – and not specific to the financial sector. Earlier, Demetriades and Law (2006) had explored a similar connection between financial depth and institutional quality, using a specification with interactions, and a similar exercise is carried out by Arcand et al. (2015a).

Most relevant to the current context, Herwartz and Walle (2014) examined the impacts of trade openness and financial openness on the finance-growth linkage. They found that greater trade openness strengthened this linkage, whereas greater financial openness eroded it. Their result is interpreted as providing a caution to the Rajan and Zingales (2003) analysis that openness would promote financial development by overcoming the resistance of domestic interest groups, since the financial development achieved would come at the cost of a weaker finance-growth relationship. As in most other studies, Herwartz and Walle (2014) measure financial development as financial depth, specifically, the private-sector credit-to-GDP ratio.

Outside this large literature on financial integration and financial development, and their economic impacts, there has been some attention paid to the issue that financial development is broader than just financial depth. From 2009–2012, the World Economic Forum (WEF) produced a Financial Development Index with seven components, as the basis for its annual Financial Development Reports (FDRs), and the approach in that exercise will be the starting point for the analysis of the current paper. Since 2013, the World BankF has published annual Financial Development Reports, which are quite different from the WEF’s documents, being focused on specific themes such as the role of the State in finance (World Bank, 2013) and financial inclusion (World Bank, 2014). These FDRs do not have

<sup>9</sup> Arcand et al. (2015a) also test a piecewise linear model with exogenous thresholds of financial depth.

<sup>10</sup> Law and Singh (2014) survey other possible explanations for the negative impact of financial depth on growth. Cline (2015) argues that all these results are merely a statistical artifact, and claims that the results are explained by slower growth at higher per capita income levels, but this claim seems to have been answered effectively by Arcand, Berkes, and Panizza (2015b).



an index of financial development, but they identify and provide data for four components or dimensions of overall financial development: depth, access, efficiency and stability.

Adnan (2011), building on the work of Saci and Holden (2008), constructed an index of financial development based on data for the banking and insurance sectors, as well as stock and bond markets. Thirteen variables were used, capturing depth and efficiency, with more in the former category. However, the index itself was derived using principal components analysis. No further analysis was performed, beyond the construction of the index.

More recently, Sahay et al. (2015) constructed an index of financial development that captured financial markets as well as financial institutions, and access and efficiency as well as depth. The authors used six indicators, with weights derived from principal components analysis, to construct the index. They confirmed the non-linear, sign-changing relationship between finance and growth, earlier found just for financial depth, but now extended to this broader measure of financial development. However, their results suggested that the 'too much finance' result is driven by financial deepening rather than greater efficiency or access, which is a plausible conclusion.

Another significant recent paper is by Aizenman, Jinjark, and Park (2015), who distinguished between quantity and quality of financial intermediation, measuring the former by financial depth (private bank credit to GDP ratio) and the latter by the lending-deposit interest rate spread. They examined sectoral growth impacts, and found that quantity and quality each had positive, negative or non-linear impacts, depending on the sector and region considered. Their results, unlike Sahay et al. (2015), suggested that even 'quality' might have a non-linear impact in some circumstances.

The approach taken in the current paper also tries to decompose financial development into its different aspects, but in a different manner than the Sahay et al. and Aizenman et al. papers. In particular, it tries to isolate differences in patterns of financial development across countries. The methodology and results are described in the next two sections.

### 3. Measuring Financial Development: Levels and Patterns

The motivation for the analysis in this section and the next is the idea that possibilities for successful financial integration are a function of similarities in financial development among the countries that are integrating. This is not the only way to think about pre-conditions for successful financial integration. For example, dissimilarities in financial development may also be positive in some circumstances: if one country in a region has strong stock markets, they may serve the whole region better as financial integration progresses. Nevertheless, proceeding with the idea of comparing financial development across countries in a region such as East Asia, which is contemplating or pursuing greater financial integration, it is straightforward to use a single measure or an index of financial development as a basis for comparison.

As first suggested in Kaur and Singh (2014), however, comparing levels of financial development via a single index misses possible differences across countries in the various components of the index. One can compare levels of different components as well, but this just generates additional information on level differences. Kaur and Singh (2014) suggested a summary measure of differences in patterns of financial development. The idea in this case is that financial development is inherently multidimensional, and comparing a vector

of indicators of financial development across countries can tell one something about how similar or different the patterns of financial development are.

To illustrate, we use some of the calculations in Kaur and Singh (2014). They used indices constructed from the WEF FDR of 2012. In the WEF methodology, the Financial Development Index (FDIndex) was constructed from seven underlying indicators, each of which was itself built up from numerous base measures. The seven dimensions of financial development in this framework were institutional environment, business environment, banking financial services, non-banking financial services, financial stability, financial markets and financial access. Each dimension was scaled from 1 to 7, and the overall index was an average of these seven numbers. Thus, the FDIndex was 5.10 for Singapore, 5.01 for Australia, 4.90 for Japan and 4.42 for South Korea, providing a numerical scaling as well as a ranking of levels of overall financial development.

Kaur and Singh proposed complementing this comparison of levels with a comparison of patterns of financial development, as follows. Each country could be thought of as characterized by a seven-dimensional vector of different aspects of financial development. Calculating a correlation coefficient between these vectors for two countries could then be a measure of how similar the two vectors were, and therefore a measure of similarity in patterns of financial development.<sup>11</sup> The correlation coefficient uses deviations from the mean (the overall FDIndex for that country), so it would not be affected by the similarity or difference of overall levels. For example, Singapore and Japan had a correlation coefficient of 0.64, while Australia and Japan, slightly closer in level terms than Singapore and Japan, had a correlation of 0.54. Korea had a correlation coefficient of 0.13 with Japan, but a higher correlation of 0.22 with Australia, which was slightly further away than Japan in level terms. In fact, Korea and China stood out among the 11 countries considered, for having patterns of financial development relatively different from other countries in the group. This idea of comparing patterns as well as levels is taken further in the analysis of this paper. The data are described next, followed by a mathematical statement of the concepts used.

### 3.1. Data

The WEF did not publish a FDR after 2012. Instead, we use data from the WEF Global Competitiveness Report, which calculates a Global Competitiveness Index. This index includes a FDIndex as one of its components,<sup>12</sup> but it is quite different from the one used in the FDR. There are eight components, listed in Table 1. As in the FDR, each component is scaled from 1 to 7. Besides being narrower than the index constructed in the FDR (something we address in our calculations), the indicators in Table 1 rely heavily on survey evaluations, rather than being constructed primarily from quantitative measures (e.g., the percentage of households with bank accounts for measuring the availability of financial services). Reported numbers are averages across a range of respondents. In terms of the Aizenman et al. (2015) dichotomy between ‘quality’ and ‘quantity’ of financial services, all the components in Table 1 are primarily quality indicators, although factors such as availability of financial services could be viewed as being closer to measures of ‘quantity.’

<sup>11</sup> The interpretation of this calculation is discussed in more detail later in this section.

<sup>12</sup> More specifically, the term used is Financial Market Development, and it is one of 12 ‘pillars’ of the GCI.



**Table 1.** Components of FDIIndex, WEF global competitiveness report.

Category	Indicator
Efficiency	Affordability of financial services
	Availability of financial services
	Financing through local equity market
	Ease of access to loans
	Venture capital availability
Trustworthiness and confidence	Soundness of banks
	Regulation of securities exchanges
	Legal rights of investors

**Table 2.** Economies in the analysis.

Australia	New Zealand
Cambodia	Philippines
China	Singapore
Hong Kong	South Korea
Indonesia	Taiwan
Japan	Thailand
Malaysia	Vietnam

The GCI data is available from 2006–2007 to 2014–2015, but the earliest year with all eight of the components that are listed in Table 1 is 2010–2011. Henceforth, we refer to years by their first year. Hence, 2010–2011 is termed 2010. Since there is no discernible trend in the data over the period 2010 to 2014, we report calculations only for the first and last years for which there is complete comparable data, 2010 and 2014.

While the index constructed from the eight components listed in Table 1 has a much narrower scope than the FDI index, the GCI database includes several variables that are the same as, or close to, those used in the FDI index. We therefore constructed two additional potential components for the FDIIndex, capturing institutional environment and business environment. The underlying variables for these two additional components are provided in the Appendix. The GCI data did not provide variables to capture financial stability, or enable distinguishing of banking and non-banking financial services, so even with the additional two variables, substantial differences remain from the FDI index, leading to somewhat different results. These differences do not affect the validity of the methodology – they merely highlight the sensitivity of comparisons among countries to how financial development is conceived of and measured. We also constructed four other indices, measuring openness, technological sophistication, business sophistication and other aspects of institutional environment. Calculations involving these four indices or components of financial development are reported in the Appendix.

Finally, with respect to the data, we focus on 14 economies from the Asia Pacific, or East Asia region, and compare financial development across these economies. They are listed in Table 2, and include developed as well as emerging economies, with seven economies in each of those two broad categories. In fact, the variation in per capita GDP among these countries is substantial, with the richest being 15 times as well-off as the poorest, even at purchasing power parity. The set includes all eight economies that were analyzed in the ‘East Asian Miracle’ study of the World Bank (1993), as well as all 11 economies considered in Kaur and Singh (2014).

### 3.2. Methodology

We will denote the value of an indicator  $n$  for country  $i$  by  $x_{in}$ . An indicator here refers to a potential component of a financial development index (FDIndex), and we assume that all indicators have already been converted to a common scale (1–7 in the case of our data). For example, a weighted average of the components will yield an index defined by:

$$\bar{x}_i(w) = \sum_1^N w_n x_{in} \quad (1)$$

where the weights are assumed to sum to one. The left-hand side of this equation therefore measures the level of financial development for country  $i$ , based on the index formula chosen.

In this case, the *Level Distance* between country  $i$  and country  $j$  is simply  $\bar{x}_i(w) - \bar{x}_j(w)$ . This number may be positive or negative, of course. When considering regional financial integration, we may be interested in how close a single economy in the region is to the other economies in that region, in terms of financial development. Note that we are not measuring integration, but rather financial development as a precursor for integration. With 14 economies in our set of analysis, we would have 13 bilateral Level Distances. It is reasonable to summarize this information with an average over the 13 distance measures. Simply summing the individual distances and averaging will cancel out positives and negatives. In order to avoid this, one can use absolute values or squares, prior to summing up. We choose the latter, giving the general formula as below, with  $I = 14$  for the calculations performed here.

$$\overline{LD}_i = \frac{1}{I-1} \sqrt{\sum_{j \neq i} [\bar{x}_i(w) - \bar{x}_j(w)]^2} \quad (2)$$

Hence, economies in the region with higher values of this measure are, on average, further in levels of financial development from their regional counterparts.

In constructing this measure of average Level Distance, differences in patterns are irrelevant, since they disappear into the aggregation. Instead, consider the entire vector of indicators for economy  $i$ , before any aggregation. Denote this by  $x_i = (x_{i1}, \dots, x_{iN})$ . Differences in these vectors across countries can be thought of as capturing differences in patterns of financial development. Therefore, we define the *Pattern Distance* between two economies by:

$$PD_{ij} = 1 - \text{corr}(x_i, x_j) \quad (3)$$

In terms of the concept of distance, a higher correlation denotes a lower pattern distance.<sup>13</sup> Hence, if two economies have a correlation of 1 in their vector measures of financial development, their pattern difference would be the lowest possible. This is incorporated into our formula by subtracting the correlation from 1: the pattern distance measure therefore ranges from 0 to 2. Note that using the correlation coefficient removes the simple mean of the components of the vector. If the level index is constructed with equal weights, the index is the simple average of the components of the vector of financial development measures.

<sup>13</sup> Implicitly, this calculation treats all the components of the index as having equal weights. This is not an issue in our calculations, since the index we use weights components equally.

If we average across all such transformed correlations for country  $i$ , we obtain the average Pattern Distance for country  $i$ . Note that the correlation coefficient does not have the interpretation usually associated with random variables – it is simply a convenient summary measure.<sup>14</sup> For this calculation to make sense, all the components should be on the same scale, which is the case with the GCI data. Also, the calculation here can be contrasted with the correlations which are part of principal components analysis, since those are calculated between vectors of individual components, so that each country's value for that component is an element of the I-vector of country values. Therefore, differences in patterns of financial development, as calculated here are capturing something quite different from anything associated with principal components.

## 4. Results

We begin by reporting the levels of financial development for the 14 countries in the analysis. The individual country levels are reported in Table 3, for two years (2010 and 2014) and four different specifications of the financial development index. FDIndex8 is a slight modification of the measure of financial market development that is used in the GCI report, with equal weights for all eight components, rather than the two-tier weighting scheme used in that report. FDIndex7 removes Legal Rights of Investors from the index calculation. FDIndex10 adds our measures of business environment and institutional environment to the original eight components, while FDIndex9 adds these two to the seven components, excluding legal rights.<sup>15</sup> All the sub-components or variables included in these two additional components used in FDIndex10 and FDIndex9 are listed in tables in the Appendix. Removing the legal rights component reduces the financial development index levels slightly, on average, but adding the two 'environment' components does not affect the overall levels. The range of variation of the index levels across countries is not much affected by the differences in choice of components, across the four indices.

The relative and absolute levels of financial development in Table 3 are not surprising. Overall values of the index are in a tight range, quite far from the extremes of 1 and 7. There are strong associations between levels of financial development and GDP per capita, although Korea stands out as a considerable exception on the low side, while Malaysia has exceptionally high measures of financial development. Japan also has somewhat of a low score, given its high-income status. We will not go into the contribution of different components of the indices to the variations observed in the levels in Table 3. We mainly want to emphasize that the levels are fairly constant over this short span of time, and especially that they are not much affected by changes in the composition of the index, at least for the four alternatives considered here. However, it is useful to illustrate the patterns of financial development graphically, which we do in Figures 1 and 2, for FDIndex8 for 2014: Figure 1 shows the seven advanced economies of the region in our sample, and Figure 2 shows the other seven.<sup>16</sup> As noted, Korea stands out in the first case, while Malaysia is an outlier in

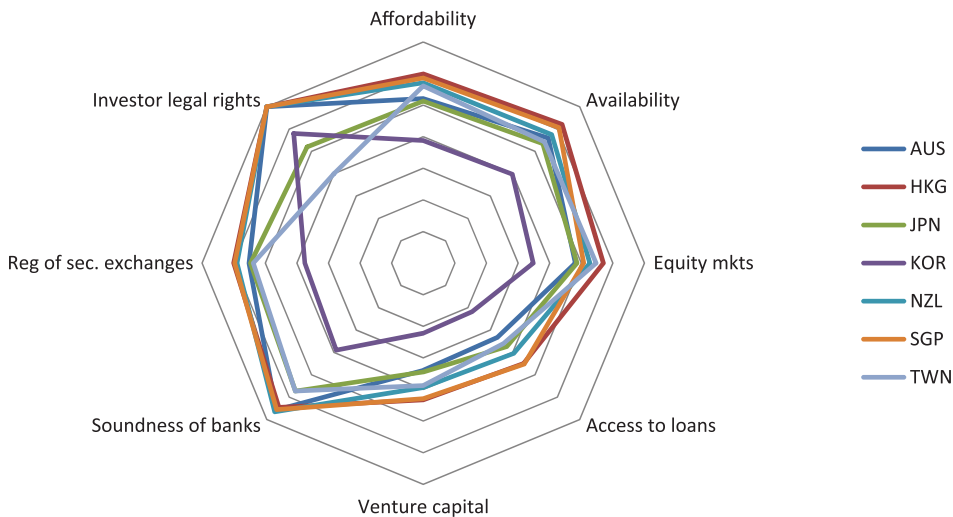
<sup>14</sup> In other words, the components of the vector are not draws from a single distribution, since they are measures of different aspects of financial development.

<sup>15</sup> The legal rights measure is actually included in the institutional environment component, but is only one of several institutional factors in that case.

<sup>16</sup> We are indebted to our discussant, Siu Fung Yiu, for suggesting construction of these graphs.

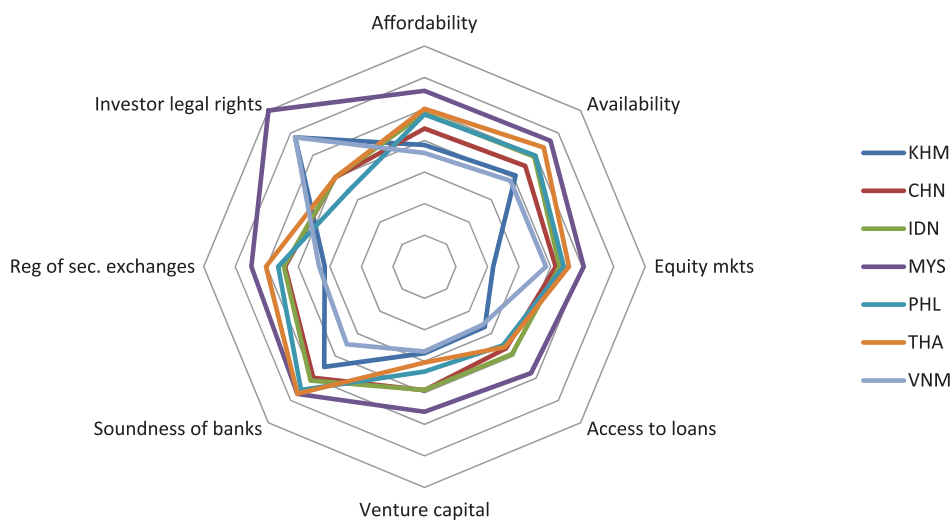
**Table 3.** Financial development index levels.

	FDIndex8		FDIndex7		FDIndex10		FDIndex9	
	2010	2014	2010	2014	2010	2014	2010	2014
AUS	5.24	5.18	5.07	4.92	5.27	5.20	5.14	5.00
CHN	4.22	4.26	4.17	4.29	4.17	4.21	4.12	4.23
HKG	5.60	5.77	5.41	5.60	5.56	5.74	5.40	5.60
IDN	4.23	4.44	4.43	4.50	4.14	4.35	4.29	4.39
JPN	4.44	4.86	4.33	4.82	4.53	4.94	4.46	4.91
KHM	3.63	3.63	3.31	3.32	3.54	3.55	3.29	3.30
KOR	3.75	3.65	3.54	3.34	3.90	3.83	3.75	3.61
MYS	5.22	5.48	4.97	5.26	5.09	5.39	4.88	5.21
NZL	4.91	5.53	4.70	5.32	5.05	5.58	4.90	5.42
PHL	3.94	4.33	4.11	4.46	3.82	4.24	3.93	4.33
SGP	5.51	5.67	5.30	5.48	5.55	5.68	5.39	5.54
THA	4.35	4.54	4.49	4.62	4.27	4.43	4.37	4.48
TWN	4.73	4.88	4.92	5.01	4.76	4.91	4.92	5.02
VNM	4.03	3.65	3.77	3.35	3.96	3.63	3.75	3.39

**Figure 1.** Patterns of financial development, developed economies, 2014.

the second set, although overall the emerging economies seem to show greater variation in their financial development patterns.

We next turn to the measurement of distances between economies of levels and patterns of financial development. Each pair of the 14 economies can be compared in terms of each of these measures, which implies 91 numbers for each measure. We report instead the average for each economy, of 13 pairwise distances with the other economies in the region that are in our set of analysis. Prior to examining these country averages, regional averages are reported in Table 4. For the region as a whole, the first index suggests that distances in financial development levels did not vary too much across countries and years. However, average distances in patterns of financial development, while similar when averaging across the region, showed considerably greater variation across economies for FDIndex7 in 2014 versus 2010, as evidenced in the higher range. Removing the legal rights component from the index had small effects on level distances, but large impacts on pattern distances – the



**Figure 2.** Patterns of financial development, emerging economies, 2014.

**Table 4.** Regional summary statistics.

Year	Level distance				Pattern distance			
	Average	Range	Min	Max	Average	Range	Min	Max
FDIndex8								
2010	0.25	0.17	0.18	0.35	0.37	1.35	0.01	1.36
2014	0.29	0.16	0.21	0.37	0.35	1.06	0.00	1.06
FDIndex7								
2010	0.24	0.20	0.18	0.38	0.09	0.34	0.01	0.35
2014	0.30	0.21	0.22	0.43	0.11	0.63	0.01	0.64
FDIndex10								
2010	0.26	0.16	0.19	0.35	0.40	1.24	0.02	1.26
2014	0.29	0.17	0.22	0.39	0.39	1.03	0.02	1.05
FDIndex9								
2010	0.25	0.20	0.18	0.38	0.20	0.73	0.02	0.95
2014	0.29	0.21	0.22	0.43	0.22	0.71	0.02	0.93

Source: The World Economic Forum, Global Competitiveness Index Report, 2015

latter were much lower on average (as a result of higher average correlations), and especially in the lower tail of the regional distribution.<sup>17</sup> Interestingly, adding in the two components measuring business environment and institutional environment had small impacts on pattern distances in the case where the legal rights index was included (FDIndex10), but large impacts when it was excluded (FDIndex9). However, the pattern distances in the case of FDIndex9 are lower than in the case of FDIndex8, implying that the differences in measured patterns of financial development are driven significantly by the single component of legal rights of investors.

Tables 5 through 8 provide economy-level averages for the level and pattern distances, for each of the four financial development indices. The average level distances depend

<sup>17</sup> In this context, the observations of the IMF (2015) report are of interest, ‘Differences in financial regulation between countries are important determinants of financial integration, as investors may be reluctant to carry out financial transactions with entities in countries whose regulations and institutions are very different from their own.’

**Table 5.** Level and pattern differences FDIndex8.

Country	Level distance				Pattern distance			
	Average	Range	Min	Max	Average	Range	Min	Max
Year 2010								
AUS	0.27	1.98	−0.37	1.61	0.24	0.96	0.02	0.98
CHN	0.21	1.98	−1.38	0.59	0.22	0.68	0.08	0.76
HKG	0.35	1.89	0.09	1.98	0.26	1.09	0.04	1.13
IDN	0.20	1.98	−1.38	0.60	0.90	1.18	0.18	1.36
JPN	0.18	1.98	−1.16	0.82	0.23	0.76	0.06	0.82
KHM	0.32	1.85	−1.98	−0.13	0.37	1.31	0.05	1.36
KOR	0.29	1.98	−1.85	0.13	0.26	1.04	0.03	1.07
MYS	0.26	1.98	−0.38	1.59	0.34	1.30	0.03	1.33
NZL	0.21	1.98	−0.69	1.29	0.27	1.04	0.02	1.06
PHL	0.25	1.98	−1.66	0.32	0.42	0.68	0.01	0.69
SGP	0.33	1.98	−0.09	1.89	0.29	1.20	0.03	1.23
THA	0.19	1.98	−1.25	0.72	0.40	0.68	0.01	0.69
TWN	0.19	1.98	−0.87	1.11	0.58	0.81	0.10	0.91
VNM	0.24	1.98	−1.58	0.40	0.33	1.24	0.03	1.27
Year 2014								
AUS	0.25	2.14	−0.59	1.55	0.23	0.53	0.00	0.53
CHN	0.25	2.14	−1.52	0.62	0.39	0.84	0.07	0.91
HKG	0.37	2.04	0.10	2.14	0.22	0.5	0.01	0.51
IDN	0.22	2.14	−1.34	0.80	0.44	0.95	0.04	0.99
JPN	0.21	2.14	−0.91	1.23	0.22	0.38	0.09	0.47
KHM	0.37	2.12	−2.14	−0.02	0.43	0.89	0.08	0.97
KOR	0.37	2.14	−2.12	0.02	0.33	0.78	0.03	0.81
MYS	0.31	2.14	−0.29	1.85	0.37	0.87	0.03	0.9
NZL	0.32	2.14	−0.24	1.90	0.22	0.51	0.00	0.51
PHL	0.24	2.14	−1.44	0.70	0.48	1.02	0.04	1.06
SGP	0.35	2.14	−0.10	2.04	0.23	0.54	0.02	0.56
THA	0.22	2.14	−1.23	0.91	0.35	0.79	0.04	0.83
TWN	0.22	2.14	−0.89	1.25	0.48	0.90	0.07	0.97
VNM	0.37	2.14	−2.12	0.02	0.49	1.01	0.05	1.06

Source: The World Economic Forum, Global Competitiveness Index Report, 2015

on where the economy is in the ranking of levels, with high and low levels of financial development tending to have higher average distances. However, the average distance also depends on the overall distribution. Thus, in Table 5, Korea has a higher average level distance than Indonesia, even though its level of financial development is higher. This is because Indonesia is part of a cluster of economies in this regional group with relatively low levels of financial development. If we look at average level distances (again using Table 5 to illustrate), Indonesia was similar to several other economies on this measure (China, Japan, New Zealand, Taiwan, and Thailand), but very much an outlier in its pattern distance, which was much greater than any of the other economies in the set. This illustrates a key general point, that economies can be similar in levels of financial development, or in their closeness of levels on average, but quite different in their specific patterns of financial development. This point is explored further later in this section, through an explicit cluster analysis.

The pattern differences in Table 5 are not as large, on the whole, as those measured in Kaur and Singh (2014), using data from the WEF FDR. This reflects the different composition of the indices, based on different data and a somewhat different conceptualization of financial development. Significantly, when only one of the components, the index of



**Table 6.** Level and Pattern Differences FDIndex7.

Country	Level distance				Pattern distance			
	Average	Range	Min	Max	Average	Range	Min	Max
Year 2010								
AUS	0.25	2.09	−0.33	1.76	0.08	0.20	0.78	0.98
CHN	0.20	2.09	−1.24	0.85	0.07	0.14	0.83	0.97
HKG	0.32	1.99	0.10	2.09	0.07	0.09	0.89	0.98
IDN	0.18	2.09	−0.98	1.11	0.13	0.30	0.65	0.95
JPN	0.18	2.09	−1.07	1.02	0.08	0.19	0.78	0.97
KHM	0.38	1.86	−2.09	−0.23	0.17	0.26	0.65	0.91
KOR	0.32	2.09	−1.86	0.23	0.08	0.24	0.75	0.99
MYS	0.23	2.09	−0.44	1.65	0.06	0.10	0.89	0.99
NZL	0.19	2.09	−0.70	1.39	0.11	0.27	0.71	0.98
PHL	0.21	2.09	−1.30	0.79	0.06	0.11	0.88	0.99
SGP	0.30	2.09	−0.10	1.99	0.08	0.15	0.82	0.97
THA	0.18	2.09	−0.92	1.17	0.06	0.13	0.86	0.99
TWN	0.22	2.09	−0.48	1.61	0.14	0.24	0.71	0.95
VNM	0.27	2.09	−1.63	0.46	0.09	0.24	0.75	0.99
Year 2014								
AUS	0.24	2.28	−0.68	1.60	0.07	0.24	0.75	0.99
CHN	0.23	2.28	−1.30	0.97	0.11	0.31	0.66	0.97
HKG	0.36	2.16	0.12	2.28	0.06	0.31	0.68	0.99
IDN	0.22	2.28	−1.10	1.18	0.09	0.22	0.74	0.96
JPN	0.23	2.28	−0.78	1.50	0.08	0.33	0.66	0.99
KHM	0.43	2.26	−2.28	−0.02	0.29	0.53	0.36	0.89
KOR	0.42	2.28	−2.26	0.02	0.09	0.34	0.64	0.98
MYS	0.29	2.28	−0.33	1.94	0.08	0.24	0.74	0.98
NZL	0.30	2.28	−0.28	2.00	0.07	0.27	0.72	0.99
PHL	0.22	2.28	−1.13	1.14	0.06	0.22	0.77	0.99
SGP	0.33	2.28	−0.12	2.16	0.08	0.28	0.70	0.98
THA	0.22	2.28	−0.98	1.29	0.07	0.26	0.73	0.99
TWN	0.25	2.28	−0.59	1.69	0.12	0.44	0.54	0.98
VNM	0.42	2.28	−2.25	0.03	0.25	0.55	0.36	0.91

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*Excludes: Legal Right Index of the 8th Pillar*

legal rights of investors, is removed, the pattern distances almost disappear, as can be seen in Table 6. Even when broader measures of institutional environment and business environment are included, to bring the index somewhat closer to that calculated in the FDR, the pattern distances are higher than in the case of the original eight components, although higher than the narrowest index of seven components (Tables 7 and 8). In all of these cases, level distances are relatively insensitive to changes in the index construction, just as was the case for the levels themselves (Table 3), although there are exceptions.

Figures 3 through 10 are useful in visualizing and summarizing the data in the tables. Each figure displays the combinations of level distance and pattern distance for the economies in the regional group. Figures 3 and 4 present the results for FDIndex8, corresponding to the data in Table 1. Clearly, Indonesia is an outlier in 2010, but its pattern distance changes dramatically in 2014. Figure 4, in particular, drives home the point that there is no obvious relationship between distances in levels of financial development and distances in patterns of financial development. Thus, while Vietnam is clearly furthest from other countries in the region on average, in both dimensions, Hong Kong and Singapore, while having the highest levels of financial development, and thus the greatest average

**Table 7.** Level and pattern differences FDIndex10.

Country	Level distance				Pattern distance			
	Average	Range	Min	Max	Average	Range	Min	Max
AUS	0.28	2.01	−0.29	1.73	0.27	0.95	0.00	0.95
CHN	0.22	2.01	−1.39	0.62	0.26	0.58	0.31	0.89
HKG	0.35	2.01	0.00	2.01	0.29	1.02	−0.07	0.95
IDN	0.22	2.01	−1.42	0.59	0.89	1.03	−0.26	0.77
JPN	0.19	2.01	−1.02	0.99	0.28	0.79	0.11	0.90
KHM	0.34	1.74	−2.01	−0.27	0.39	1.20	−0.26	0.94
KOR	0.26	2.01	−1.66	0.35	0.38	1.08	−0.18	0.90
MYS	0.24	2.01	−0.47	1.55	0.38	1.12	−0.17	0.95
NZL	0.24	2.01	−0.50	1.51	0.34	1.07	−0.12	0.95
PHL	0.28	2.01	−1.74	0.27	0.44	0.63	0.35	0.98
SGP	0.35	2.01	0.00	2.01	0.32	1.14	−0.21	0.93
THA	0.20	2.01	−1.29	0.72	0.42	0.64	0.34	0.98
TWN	0.20	2.01	−0.79	1.22	0.62	0.79	0.04	0.83
VNM	0.25	2.01	−1.60	0.41	0.35	1.14	−0.19	0.95
Year 2014								
AUS	0.26	2.18	−0.54	1.64	0.26	0.53	0.45	0.98
CHN	0.25	2.18	−1.53	0.65	0.41	0.83	0.10	0.93
HKG	0.37	2.13	0.05	2.18	0.24	0.47	0.50	0.97
IDN	0.23	2.18	−1.38	0.80	0.48	0.93	0.03	0.96
JPN	0.22	2.18	−0.80	1.38	0.28	0.40	0.50	0.90
KHM	0.39	2.11	−2.18	−0.08	0.44	0.90	0.01	0.91
KOR	0.33	2.18	−1.91	0.27	0.47	0.80	0.04	0.84
MYS	0.29	2.18	−0.35	1.83	0.41	0.86	0.05	0.91
NZL	0.33	2.18	−0.16	2.02	0.26	0.53	0.45	0.98
PHL	0.25	2.18	−1.50	0.68	0.49	1.01	−0.05	0.96
SGP	0.35	2.18	−0.05	2.13	0.26	0.57	0.41	0.98
THA	0.22	2.18	−1.31	0.88	0.38	0.78	0.18	0.96
TWN	0.22	2.18	−0.82	1.36	0.52	0.84	0.01	0.85
VNM	0.37	2.18	−2.11	0.08	0.51	0.92	−0.05	0.87

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distances from the other countries, have low levels of average distance in patterns of financial development. Taiwan and the Philippines, on the other hand, have low average level distances, but high average pattern distances.

Figures 5 and 6 provide the scatter plot for the data from Table 6, where the index of legal rights of investors has been removed from the overall index of financial development. In this case, the pattern distance collapses for most of the countries in the regional set (except for Cambodia and Vietnam). However, without these two outliers, there is again no clear relationship between distance in levels and distance in patterns of financial development. The increase in pattern distance from 2010 to 2014 for Cambodia and Vietnam is noteworthy in the context of increasing financial flows in the region over this time period.

The scatter plots for the data in Tables 7 and 8 are presented in Figures 7 through 10. The results for these measures of financial development, using broader sets of components, are somewhere in between the earlier two cases (Figures 3 and 4 versus Figures 5 and 6), and provide similar visualizations of the central point, that measuring and comparing patterns of financial development provides different information than comparing levels of financial development. Figures 9 and 10, based on FDIndex9, displays increases in pattern distances

**Table 8.** Level and pattern differences FDIndex9.

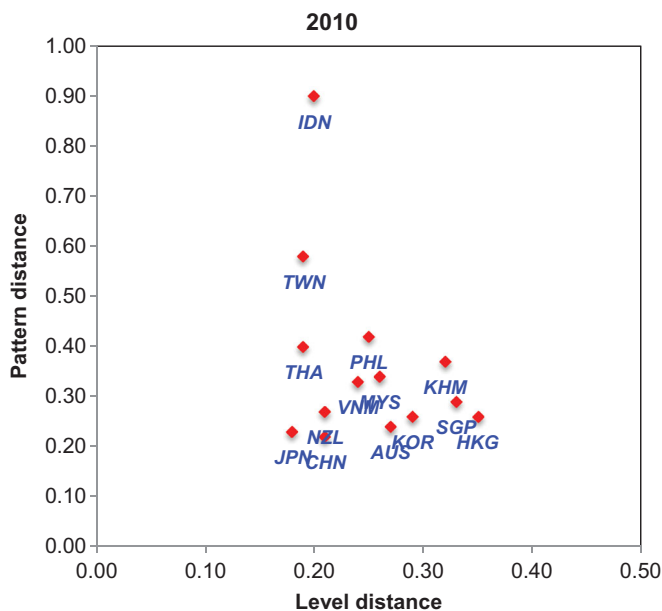
Country	Level distance				Pattern distance			
	Average	Range	Min	Max	Average	Range	Min	Max
Year 2010								
AUS	0.27	2.10	−0.25	1.85	0.16	0.40	0.54	0.94
CHN	0.21	2.10	−1.28	0.82	0.14	0.27	0.69	0.96
HKG	0.32	2.10	0.00	2.10	0.12	0.27	0.69	0.96
IDN	0.19	2.10	−1.11	0.99	0.40	0.58	0.25	0.83
JPN	0.18	2.10	−0.93	1.17	0.18	0.43	0.48	0.91
KHM	0.38	1.64	−2.10	−0.46	0.22	0.37	0.54	0.91
KOR	0.28	2.10	−1.64	0.46	0.30	0.65	0.25	0.90
MYS	0.22	2.10	−0.52	1.59	0.16	0.41	0.56	0.97
NZL	0.22	2.10	−0.49	1.61	0.24	0.59	0.35	0.94
PHL	0.24	2.10	−1.47	0.64	0.17	0.37	0.61	0.98
SGP	0.32	2.10	0.00	2.10	0.18	0.49	0.44	0.93
THA	0.18	2.10	−1.03	1.07	0.14	0.31	0.67	0.98
TWN	0.22	2.10	−0.48	1.62	0.24	0.33	0.54	0.87
VNM	0.27	2.10	−1.64	0.46	0.14	0.19	0.74	0.93
Year 2014								
AUS	0.24	2.29	−0.60	1.69	0.15	0.25	0.72	0.97
CHN	0.24	2.29	−1.37	0.92	0.22	0.60	0.35	0.95
HKG	0.36	2.23	0.06	2.29	0.12	0.28	0.68	0.96
IDN	0.22	2.29	−1.20	1.09	0.24	0.69	0.27	0.96
JPN	0.23	2.29	−0.69	1.60	0.17	0.35	0.63	0.98
KHM	0.43	2.21	−2.29	−0.08	0.34	0.48	0.34	0.82
KOR	0.36	2.29	−1.99	0.30	0.42	0.52	0.27	0.79
MYS	0.28	2.29	−0.39	1.90	0.22	0.60	0.33	0.93
NZL	0.32	2.29	−0.18	2.11	0.16	0.28	0.70	0.98
PHL	0.23	2.29	−1.27	1.02	0.18	0.58	0.40	0.98
SGP	0.34	2.29	−0.06	2.23	0.15	0.29	0.69	0.98
THA	0.22	2.29	−1.12	1.17	0.17	0.48	0.50	0.98
TWN	0.25	2.29	−0.58	1.71	0.20	0.43	0.51	0.94
VNM	0.41	2.29	−2.21	0.08	0.32	0.56	0.34	0.90

for Korea as well as Cambodia and Vietnam, and a decrease for Indonesia. These heterogeneous movements in patterns of financial development could have implications for further financial integration in the region.

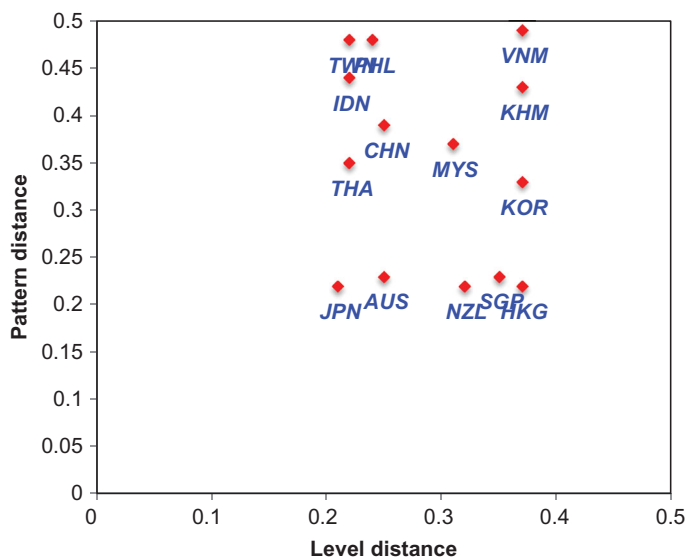
It is also helpful to illustrate the variations in level distance and pattern distance against the actual levels of financial development.<sup>18</sup> Since, as noted earlier, these levels are quite insensitive to the choice of year of components of the index, we only provide scatter plots for the case of eight index components, and the year 2014. Figure 11 shows how average level distances vary with levels for 2014: the pattern mostly reflects the fact that economies with low or high levels of financial development tend to be further away from their regional counterparts on average, as compared to economies with intermediate levels of financial development.

Figure 12 shows how average pattern distances vary with levels, for FDIndex8 in 2014. There is some clustering of average pattern distances for five of the advanced economies in the region, but the other nine economies have higher average pattern distances, and there is no relationship between the pattern distances and the overall levels of financial development for these economies. This reinforces the basic idea that collapsing different

<sup>18</sup> We are again indebted to our discussant, Siu Fung Yiu, for suggesting construction of these figures.



**Figure 3.** Level and pattern distance, FDIndex8. 2010.

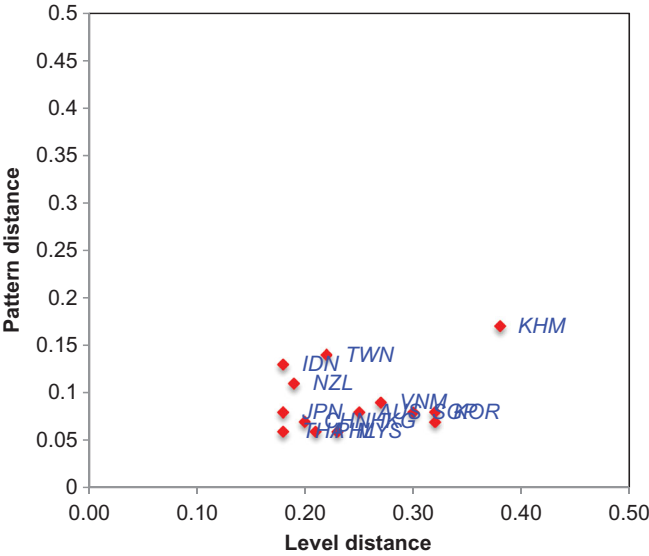


**Figure 4.** Level and Pattern Distance, FDIndex8, 2014.

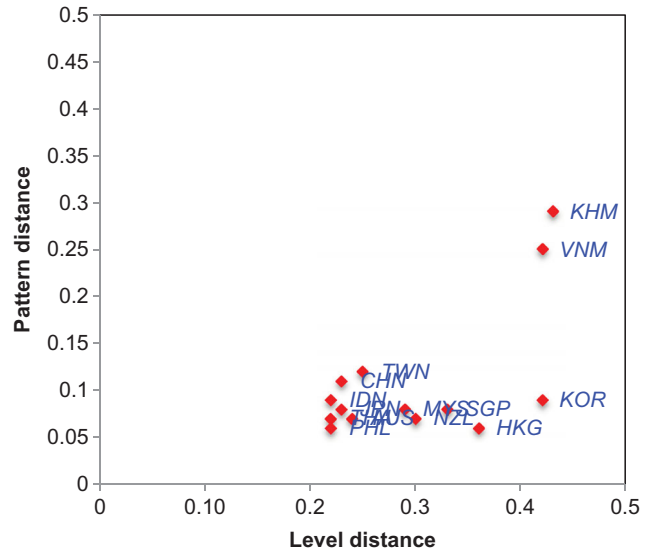
dimensions of financial development into a single index can hide underlying differences in financial development across economies.

As a final exercise, we conduct a cluster analysis to examine how closeness in levels and patterns of financial development emerges among subgroups of the set of 14 countries.<sup>19</sup>

<sup>19</sup> Once more, we are indebted to our discussant, Siu Fung Yiu, for suggesting that we conduct a cluster analysis.



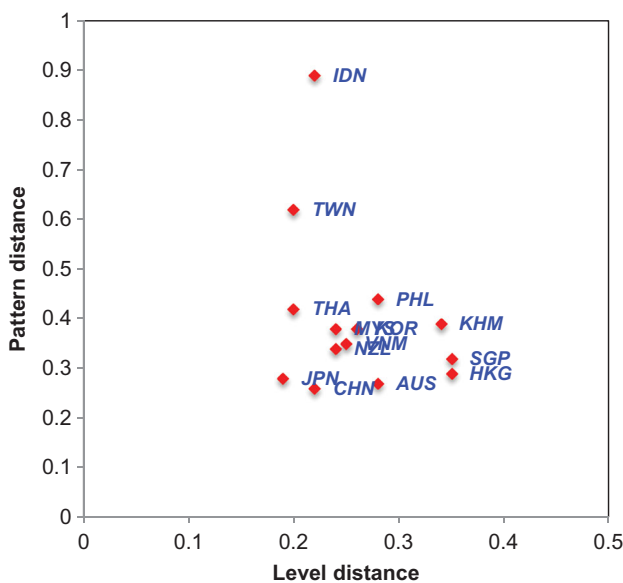
**Figure 5.** Level and pattern distance, FDIndex7, 2010.



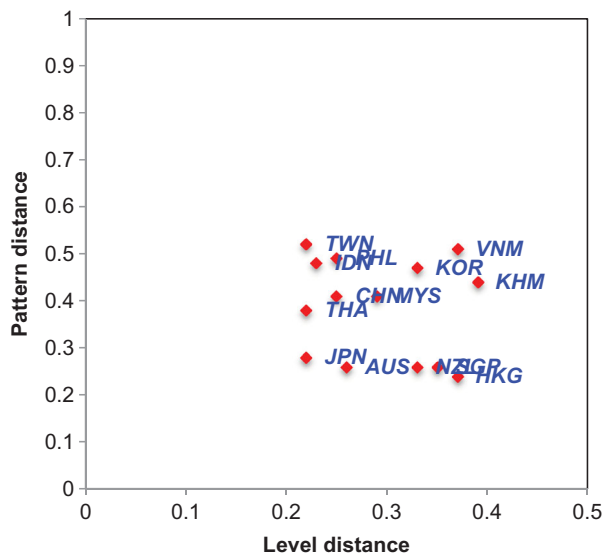
**Figure 6.** Level and pattern distance, FDIndex7, 2014.

This is particularly pertinent for thinking about financial integration, although the precise implications of closeness in financial development for financial integration depend on the specifics of each: in some cases, specialization in aspects of finance may support integration, whereas, in other dimensions, integration may best occur when financial development is similar across countries.

Our application of clustering analysis uses bilateral differences in levels and patterns of financial development, rather than trade intensity or FDI intensity, which have been used



**Figure 7.** Level and pattern distance, FDIndex10, 2010.

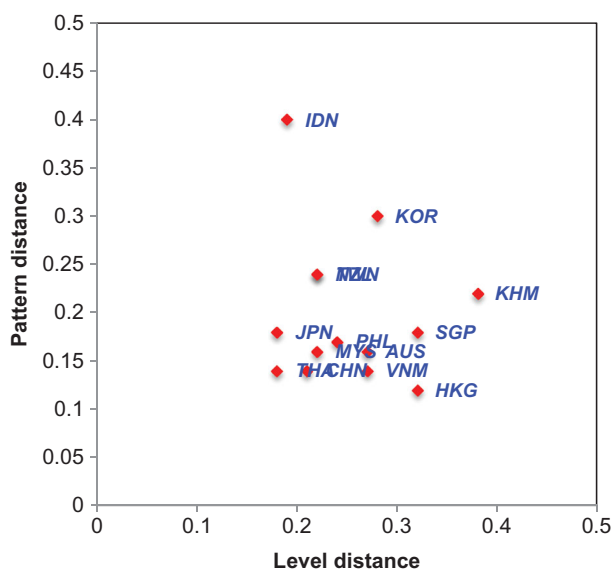


**Figure 8.** Level and pattern distance, FDIndex10, 2014.

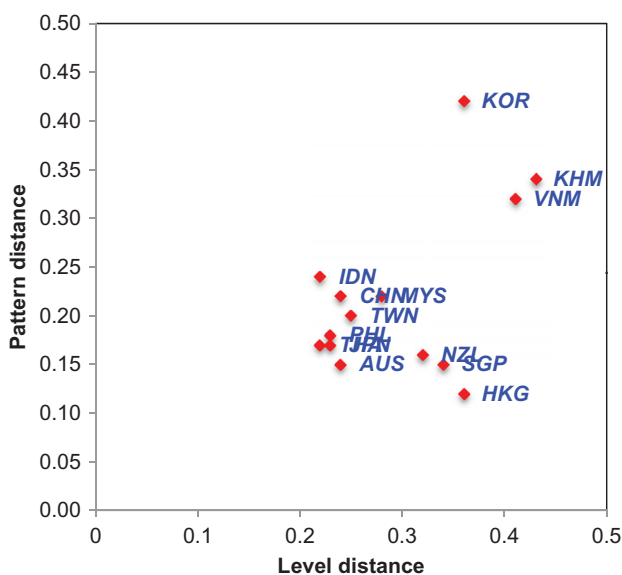
in previous applications.<sup>20</sup> Otherwise, the procedure is the same: at the first step, the two economies that are closest in distance are combined into a cluster, and this cluster is treated as a single observation (with averaged values) for the second step. At the next stage, either another economy is added to this cluster, or a second cluster is formed, and so on. The sequence of steps is shown in Tables 9 and 10, for levels and patterns, respectively.

<sup>20</sup> For cluster analysis based on trade intensity, see Huang, Huang and Sun (2006); for analysis based on FDI intensity, see Yang and Huang (2014).



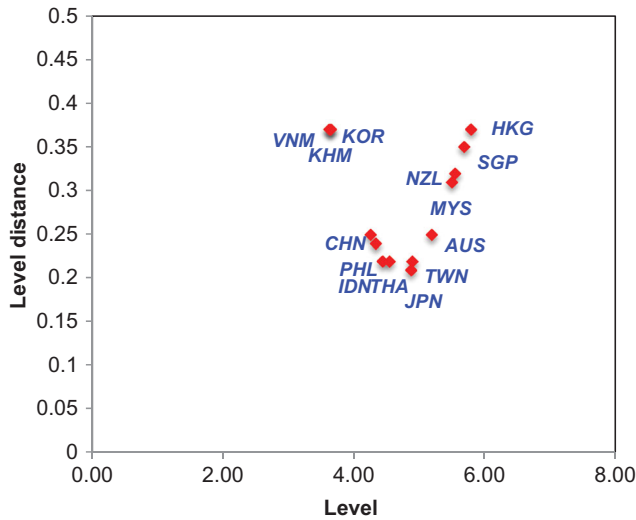


**Figure 9.** Level and Pattern Distance, FDIndex9, 2010.

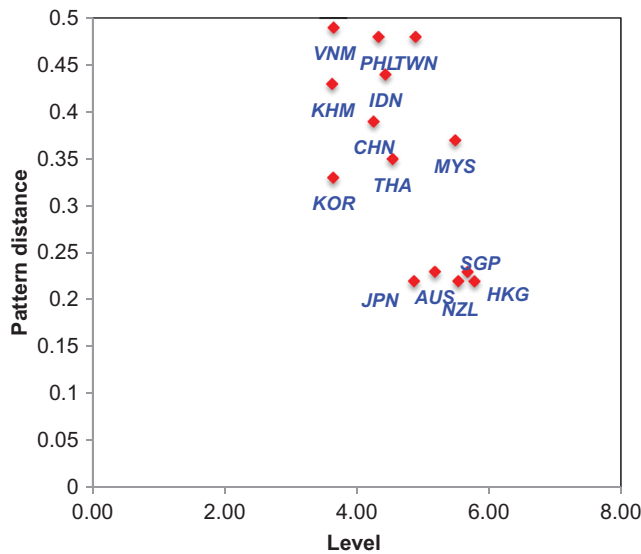


**Figure 10.** Level and pattern distance, FDIndex9, 2014

The process of creating clusters based on levels of financial development is initially as one would expect, with economies with high, medium and low levels of financial development tending to be assigned to the same clusters (Table 9). The initial exceptions to these clusters lining up with per capita incomes are the outliers, Korea and Malaysia. The initial clusters tend to emerge in the middle and lower end of the distribution of levels of financial development, with the most financially developed economies, Hong Kong and Singapore, being clustered only in the seventh step of the process. At the end, the final two clusters



**Figure 11.** Level distances vs. levels, FDIndex8, 2014.



**Figure 12.** Pattern distances vs. levels, FDIndex8, 2014.

are quite heterogeneous, in per capita incomes as well as levels of financial development. Of course, the entire exercise can be very sensitive to the choice of measure of financial development.<sup>21</sup>

In the case of patterns of financial development (Table 10), the manner in which clustering proceeds is quite different. The first three steps involve a clustering of Australia,

<sup>21</sup> For example, we discovered that the clustering was quite sensitive to the way in which the original measure of investor legal rights was converted to the 1–7 scale.

**Table 9.** Clustering based on Levels of Financial Development.

AUS	AUS	AUS	AUS	AUS	AUS	AUS	AUS	AUS	AUS					
KHM	KHM	KHM												
CHN	CHN	CHN	CHN	CHN	CP	CP	CP	CPITh	CPITh	CPITh				
HKG	HKG	HKG	HKG	HKG	HKG	HKG	HS	HS						
IDN	IDN	IDN	IDN	IDN	IDN	ITh	ITh							
JPN	JPN	JTw	JTw	JTw	JTw	JTw	JTw	JTw	JTw	JTw	JTwA	JTwACPITh	JTwACPIThMNHS	
KOR	KoV	KoV	KoVKh	KoVKh	KoVKh	KoVKh	KoVKh	KoVKh	KoVKh	KoVKh	KoVKh	KoVKh	KoVKh	
MYS	MYS	MYS	MYS	MN	MN	MN	MN	MN	MN	MNHS	MNHS	MNHS		
NZL	NZL	NZL	NZL											
PHL	PHL	PHL	PHL	PHL										
SGP	SGP	SGP	SGP	SGP	SGP	SGP								
TWN	TWN													
THA	THA	THA	THA	THA	THA									
VNM														

**Table 10.** Clustering based on patterns of financial development.

AUS	AN	ANS	ANSH	ANSH	ANSH	ANSH	ANSH	ANSH	ANSH	ANSH	ANSHJ	ANSHJkoMV	ANSHJkoMVKh	
KHM	KHM	KHM	KHM	KHM	KHM	KHM	KHM	KHM	KHM	KHM	KHM	KHM	KHM	
CHN	CHN	CHN	CHN	CHN	CHN	CHN	CHN	CHN						
HKG	HKG	HKG												
IDN	IDN	IDN	IDN	IP	IP	IPTh	IPTh	IPThC	IPThCTw	IPThCTw	IPThCTw	IPThCTw	IPThCTw	
JPN	JPN	JPN	JPN	JPN	JPN	JPN	JPN	JPN	JPN	JPN				
KOR	KOR	KOR	KOR	KOR	KoM	KoM	KoMV	KoMV	KoMV	KoMV	KoMV			
MYS	MYS	MYS	MYS	MYS										
NZL														
PHL	PHL	PHL	PHL											
SGP	SGP													
TWN	TWN	TWN	TWN	TWN	TWN	TWN	TWN	TWN						
THA	THA	THA	THA	THA	THA	THA								
VNM	VNM	VNM	VNM	VNM	VNM	VNM	VNM							

New Zealand, Singapore and Hong Kong. However, the similarity of patterns of financial development creates clusters that are quite different from those involving similarity of levels, so that Korea and Malaysia are clustered,<sup>22</sup> and Taiwan is added at step nine to a cluster of economies with lower per capita incomes and lower financial development measures. Japan, however, ends up in the higher income cluster, but the final two clusters of economies with similar patterns of financial development are somewhat different than those based on similarities of levels.

## 5. Conclusion

Even after the global financial crisis, which included financial contagion across national boundaries, there is a continued interest in financial integration, especially in East Asia or the Asia Pacific region. Recent empirical analyses suggest that financial integration within the region has been increasing, but still remains below what might be most beneficial. It is difficult to weigh benefits and risks of financial integration, so assertions of ‘too much’ or ‘too little’ financial integration have to be very tentative.

<sup>22</sup> Vietnam, which is initially clustered with Korea in the levels analysis, later gets added to this cluster based on patterns. Sahay et al. (2015) also discuss the comparison of South Korea and Vietnam, where both countries have similar private credit but differ strongly along the financial access dimension.

The literature on financial integration does make reference to the need for adequate levels of financial development, especially in the case of financial market regulation, but typically does not go further in empirically associating financial integration and financial development. On the other hand, there is a large literature on financial development and its impacts, especially on economic growth. This literature has tended to measure financial development simply as financial depth, but recently broader-based indices of financial development have begun to be constructed. In some cases, such as Aizenman et al. (2015) and Sahay et al. (2015), there have been attempts to differentiate between different dimensions of financial development, such as quantity versus quality, or depth versus efficiency and access.

In this paper, we have argued that even a sophisticated index is limited because it seeks to reduce the complexities of financial development to a single dimension. As an alternative, we have proposed and constructed a measure of differences in patterns of financial development, and compared measured differences in patterns with differences in levels of financial development. Note that our measure is only operative in capturing the distance between two economies, as opposed to an index (or vector) that measures financial development in a single economy. Measuring differences in patterns of financial development (as opposed to differences in levels) extends the multidimensional approach to characterizing financial development. One could potentially apply a measure of pattern difference to components of financial development that capture quantity versus those that capture quality. This would refine the idea of measuring patterns of financial development, and remains an avenue of future research.

For 14 economies of the Asia Pacific region, we have calculated differences in levels and patterns of financial development for different years and different vectors of components of overall financial development. We also illustrated how groupings of countries can be constructed through cluster analysis, and how the clustering differed when based on patterns versus levels of financial development. We suggest that these kinds of calculations can be a useful preliminary tool for assessing prospects for beneficial financial integration among a given set of economies. In particular, since the components of financial development include various aspects of financial market institutions, as well as regulatory and governance institutions, focusing on patterns and sub-patterns of financial development provides a more systematic way of assessing potential regulatory reform and coordination, and possible regional risk management policies and institutions, both as precursors to, and aspects of, financial integration. Developing these linkages analytically might contribute to regional policy efforts to develop bond markets in various regional member economies (e.g., Lim & Lim, 2012), and to assess the balance between bank and non-bank financing channels, for example.

## Acknowledgements

This is a revised version of a paper presented at the Inaugural International Conference on Evolving Finance, Trade and Investment in Asia, held at the Centre on Asia and Globalisation, Lee Kuan Yew School of Public Policy, National University of Singapore, on 16–17 September 2015. We are grateful to conference participants, and particularly to Siu Fung Yiu, our discussant, for extremely valuable comments and suggestions. We are also grateful to the conference co-organizer and special issue editor, Tomoo Kikuchi, for valuable help. All remaining shortcomings are solely our responsibility.

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## Appendices

**Table A1.** Institutional environment.

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Efficacy of corporate boards
Reliance on professional management
Willingness to delegate authority
Strength of auditing and reporting standards
Ethical behavior of firms
Protection of minority shareholders' interests
Burden of government regulation
Regulation of securities exchanges
Property rights
Intellectual property protection
Diversion of public funds
Public trust in politicians
Legal rights index
Judicial independence
Irregular payments and bribes

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**Table A2.** Business environment.

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Quality of management schools
Quality of math and science education
Extent of staff training
Availability of research and training services
Secondary education enrollment, gross %
Tertiary education enrollment, gross %
Quality of the education system
Quality of overall infrastructure
Quality of electricity supply
Individuals using Internet, %
Fixed broadband Internet subscriptions/100 pop.
Fixed telephone lines/100 pop.
Mobile telephone subscriptions/100 pop.
No. procedures to start a business
No. days to start a business

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**Table A3.** Additional components and variables.

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Business sophistication
Local supplier quantity
Local supplier quality
State of cluster development
Nature of competitive advantage
Value chain breadth
Control of international distribution
Production process sophistication
Extent of marketing
Technology sophistication
Int'l Internet bandwidth, kb/s per user
Mobile broadband subscriptions/100 pop.
Openness
Prevalence of trade barriers
Trade tariffs, % duty
Prevalence of foreign ownership
Business impact of rules on FDI
Burden of customs procedures
Imports as a percentage of GDP
Institutional environment <sup>2</sup>
Favoritism in decisions of government officials
Wastefulness of government spending
Efficiency of legal framework in settling disputes
Efficiency of legal framework in challenging regs
Transparency of government policymaking
Effect of taxation on incentives to invest
Total tax rate, % profits

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**Table A4.** Level and pattern differences FDIndex14.

Country	Level distance				Pattern distance			
	Average	Range	Min	Max	Average	Range	Min	Max
Year 2010								
AUS	0.24	1.93	−0.42	1.51	0.28	0.73	0.20	0.93
CHN	0.20	1.93	−1.35	0.58	0.25	0.44	0.42	0.86
HKG	0.33	1.93	−0.04	1.89	0.30	0.86	0.07	0.93
IDN	0.21	1.93	−1.39	0.54	0.72	0.91	−0.10	0.81
JPN	0.18	1.93	−0.91	1.01	0.33	0.52	0.38	0.90
KHM	0.32	1.74	−1.93	−0.18	0.40	1.01	−0.10	0.91
KOR	0.23	1.93	−1.52	0.41	0.36	0.75	0.15	0.90
MYS	0.21	1.93	−0.59	1.34	0.35	0.83	0.09	0.92
NZL	0.22	1.93	−0.54	1.39	0.35	0.91	0.02	0.93
PHL	0.27	1.93	−1.74	0.18	0.39	0.58	0.40	0.98
SGP	0.34	1.89	0.04	1.93	0.33	0.99	−0.06	0.93
THA	0.19	1.93	−1.29	0.64	0.38	0.59	0.39	0.98
TWN	0.19	1.93	−0.76	1.16	0.53	0.72	0.14	0.86
VNM	0.24	1.93	−1.57	0.36	0.32	0.89	0.04	0.93
Year 2014								
AUS	0.22	2.06	−0.63	1.43	0.26	0.41	0.55	0.96
CHN	0.23	2.06	−1.46	0.60	0.40	0.77	0.14	0.91
HKG	0.35	2.03	0.03	2.06	0.26	0.38	0.57	0.95
IDN	0.22	2.06	−1.35	0.71	0.41	0.81	0.13	0.94
JPN	0.22	2.06	−0.68	1.38	0.35	0.37	0.40	0.77
KHM	0.36	2.01	−2.06	−0.05	0.47	0.71	0.10	0.81
KOR	0.27	2.06	−1.69	0.37	0.52	0.62	0.12	0.74
MYS	0.26	2.06	−0.42	1.64	0.36	0.48	0.35	0.83
NZL	0.29	2.06	−0.27	1.79	0.30	0.43	0.52	0.95
PHL	0.24	2.06	−1.48	0.58	0.44	0.89	0.07	0.96
SGP	0.34	2.06	−0.03	2.03	0.29	0.51	0.45	0.96
THA	0.21	2.06	−1.30	0.76	0.36	0.69	0.27	0.96
TWN	0.20	2.06	−0.81	1.25	0.45	0.78	0.10	0.88
VNM	0.35	2.06	−2.01	0.05	0.49	0.74	0.07	0.81

The World Economic Forum: Global Competitiveness Index

Includes: All Eight Sub-Index of the 8th Pillar, Includes: Six Additional Index

**Table A5.** Level and pattern differences FDIndex13.

Country	Level distance				Pattern distance			
	Average	Range	Min	Max	Average	Range	Min	Max
Year 2010								
AUS	0.23	1.98	−0.41	1.58	0.20	0.26	0.65	0.91
CHN	0.19	1.98	−1.27	0.71	0.17	0.22	0.70	0.92
HKG	0.31	1.98	−0.04	1.94	0.17	0.26	0.66	0.92
IDN	0.18	1.98	−1.17	0.81	0.34	0.49	0.40	0.89
JPN	0.17	1.98	−0.85	1.14	0.26	0.29	0.61	0.90
KHM	0.34	1.60	−1.98	−0.39	0.28	0.38	0.49	0.87
KOR	0.23	1.98	−1.50	0.49	0.30	0.42	0.48	0.90
MYS	0.19	1.98	−0.63	1.35	0.18	0.35	0.60	0.95
NZL	0.20	1.98	−0.54	1.45	0.28	0.52	0.40	0.92
PHL	0.24	1.98	−1.56	0.43	0.17	0.32	0.66	0.98
SGP	0.32	1.94	0.04	1.98	0.22	0.46	0.46	0.92
THA	0.18	1.98	−1.11	0.87	0.16	0.31	0.67	0.98
TWN	0.20	1.98	−0.54	1.44	0.23	0.29	0.57	0.86
VNM	0.25	1.98	−1.60	0.39	0.16	0.16	0.75	0.91
Year 2014								
AUS	0.21	2.12	−0.68	1.45	0.21	0.33	0.61	0.94
CHN	0.22	2.12	−1.34	0.79	0.29	0.73	0.20	0.93
HKG	0.34	2.10	0.03	2.12	0.20	0.41	0.51	0.92
IDN	0.21	2.12	−1.22	0.90	0.28	0.72	0.23	0.95
JPN	0.22	2.12	−0.59	1.53	0.28	0.38	0.47	0.85
KHM	0.38	2.07	−2.12	−0.06	0.46	0.33	0.39	0.72
KOR	0.29	2.12	−1.72	0.40	0.55	0.61	0.14	0.75
MYS	0.25	2.12	−0.45	1.67	0.31	0.79	0.14	0.93
NZL	0.28	2.12	−0.29	1.84	0.26	0.53	0.41	0.94
PHL	0.22	2.12	−1.31	0.81	0.21	0.63	0.34	0.97
SGP	0.33	2.12	−0.03	2.10	0.24	0.41	0.53	0.94
THA	0.20	2.12	−1.17	0.95	0.21	0.53	0.44	0.97
TWN	0.22	2.12	−0.64	1.48	0.22	0.44	0.45	0.89
VNM	0.37	2.12	−2.07	0.06	0.39	0.42	0.40	0.82

The World Economic Forum: Global Competitiveness Index

Excludes: Legal Right Index of the 8th Pillar, Includes: Six Additional Index