

An Index Based Approach to Assess the Development of Small and Medium Enterprises: A Case from 32 Asian Countries

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ABSTRACT

Small and Medium Enterprises (SMEs) have been recognized as important to the economy in terms of their considerable contribution to GDP, employment generation, regional development and poverty reduction. Firms in SME sector are less dynamic and underdeveloped as against large scale enterprises in the Asian Countries. This creates the need for more efficient and professional government policies for SMEs to upgrade and strengthen this sector to meet the expectations of the countries in the region. In this study, the levels of SME development in Asian countries were measured under six core policy intervention areas; enabling environment, modern appropriate technology, culture and skills development, access to finance, market facilitation and infrastructure development, by developing six indices. Secondary data for SMEs in 32 Asian countries were collected from the World Bank's Enterprise Survey and indices were constructed using Principal Component Analysis. Results mainly highlighted that most of the Asian countries have well developed business enabling environment, infrastructure and satisfactory levels of access to finance. However, the usage of modern technology by SMEs was found wanting. Culture and skills development and market facilitation were critical in most countries. On that account, the governments of developing nations in the Asian region should conceive better policies for SMEs to uplift marketing facilities, to strengthen the culture and skills of employees working in SMEs and also to provide better knowledge on modern technology. When considering the overall development of SMEs, China was the leading country closely followed by Thailand and Malaysia. Yemen was the country with least developed environment for the SME to thrive.

KEYWORDS: Asian region, Principal component analysis, SME policies

Introduction

Small and medium enterprises (SMEs) have been recognized as important to the economy in terms of their considerable contribution to GDP, employment generation, regional development and poverty reduction. With the globalization trend, the SME sector is not merely seen as a sector for "protection and promotion" but, more importantly as driving force for "growth and development" (Anon, 2015). Small and Medium Enterprises are perceived as the seedbed for indigenous entrepreneurship, and

thus, must be nurtured to ensure they blossom into vibrant enterprises (Atawodi and Ojeka, 2012). The SME sector is envisaged to contribute to transform lagging regions into emerging regions of prosperity. Therefore, enhancing national and international competitiveness is fundamentally important for this sector to face the emerging challenges and develop SMEs as a thriving sector.

Nations and governments all over the world, whether developed, developing or underdeveloped have continuously shown keen interest in entrepreneurship development. This is done through public policy. Public policy is an effective tool for business and economic planning. These policies are attempts by the relevant actors in a political system to cope with and to transform their environment by deliberate measures which may involve the commitment of physical or symbolic resources (Dibie, 2000). Government policies on development of SMEs and economic growth are positively related with each other. Therefore, policies to promote the development of SMEs are common in both developed and developing countries (Storey, 1994; Levitsky, 1996; Hallberg, 2000). In the case of developing economies, policies designed to assist SMEs have been an important aspect of industrial policy and multilateral aid programmes (Levitsky, 1996). The SME policy framework aims to improve business environment of SMEs by accessing to modern technology, developing skills, accessing to finance and market facilitation, allowing them to realize their full potentials in today's globalized economy. Although SMEs are critical for the growth of countries, firms in the SME sector are less dynamic and underdeveloped as against large-scale enterprises in the Asian Countries (Wignaraja, 2013). The development of SMEs in Asian region has not been studied previously in comparison. This study was carried out with the aim of providing monitoring tools to see whether the broad environment within which the SMEs are supportive for the development of SMEs in the Asian region.

Methodology

Theoretical Framework

The major areas of government policies on entrepreneurship development are: enabling environment (EE), modern appropriate technology (MAT), culture and skills development (CSD), access to finance (AF), market facilitation (MF) and infrastructure development (ID). It was hypothesized that the policies under these six policy dimensions are equally responsible for the development of SMEs in Asian countries.

Data Collection

Secondary data were collected from the World Bank's Enterprise Survey (enterprise.org) for the base year 2011, which provides homogeneous data on 145 SME development indicators for all the selected 32 Asian countries. The Enterprise survey uses a common definition for Small and Medium scale enterprises based on the number of employees; 5 – 19 employees as "Small scale" and 20 – 99 employees as "Medium scale" enterprises. As all the data were collected from the Enterprise survey, these same definitions were used for defining small and medium scale enterprises in this research.

Indicator Selection

From a comprehensive survey of literature the study was able to identify 29 development indicators under six major policy intervention areas (Table 1).

Table 1: Selected Indicators under the Major SME Policy Intervention Areas

| Policy Area | Indicators |
|-------------|---|
| EE | Cost of business start-up procedures |
| | Time required to start a business |
| | Senior management time spent in dealing with requirements of government regulations |
| | Percent of firms identifying tax rates as a major constraint |
| | Days to obtain operating license |
| | Days to obtain construction-related permit |
| MAT | Days to obtain an import license |
| | Percentage of firms using technology licensed from foreign companies |
| | Percentage of firms having its own website |
| | Percentage of firms using E-mail to communicate with clients/ suppliers |
| CSD | Percentage of firms with annual financial statement reviewed by external auditor |
| | Percentage of firms offering formal training |
| | Percentage of skilled workers |
| | Years of the top manager's experience working in the firm's sector |
| AF | Percentage of firms with female participation in ownership |
| | Percentage of firms with a female top manager |
| | Percentage of firms with a bank loan/line of credit |
| | Percentage of firms with a checking or savings account |
| MF | Percentage of loans not requiring collaterals |
| | Percentage of firms not needing a loan |
| | Percent of firms with internationally-recognized quality certification |
| ID | Percentage of total sales that are exported directly |
| | Percentage of firms using material inputs and/or supplies of foreign origin |
| | Losses due to electrical outages |
| | Days to obtain an electrical connection |
| | Percentage of firms identifying electricity as a major constraint |
| | Number of water insufficiencies in a typical month |
| ID | Proportion of products lost due to breakage or spoilage during shipping to domestic markets |
| | Percentage of firms identifying transportation as a major constraint |

Note: EE – Enabling Environment, MAT – Modern Appropriate Technology, CSD – Culture and Skills Development, AF – Access to Finance, MF - Market Facilitation, ID – Infrastructure Development

When values of selected indicators under MAT, CSD, AF, and MF increases they cause positive impacts on SME development while values of indicators selected under EE and ID increase they cause negative impacts on SME development. Most of the selected indicators were expressed as an average percentage and average wait, in days. To calculate the cost of business start-up procedures, cost to register a business was normalized by presenting it as a percentage of gross national income (GNI) per capita. Number of calendar days needed to complete the procedures to legally operate a business was taken as the time required to start a business. Average percentage of senior management's time that is spent in a typical week dealing with requirements imposed by government regulations (eg. taxes, customs, labor regulations, licensing and registration), including dealings with officials, completing forms, etc. was taken as the

senior management time spent in dealing with requirements of government regulations.

The indicator percentage of firms not needing a loan, can be defined as the percentage of firms in a country that did not apply for a loan in the last fiscal year because they did not need a loan as the establishment had sufficient capital. The denominator is the number of firms who did and did not apply for a loan. The numerator is the number of firms who did not apply for a loan and also stated that they did not need a loan. Losses due to electrical outages were also expressed as a percentage of total annual sales. Days to obtain an electrical connection was counted as average wait, in days, experienced to obtain electrical connection from the day this establishment applied for it to the day it received the service. Proportion of products lost due to breakage or spoilage during shipping to domestic markets was calculated as an average percentage of products shipped to supply domestic markets lost due to breakage or spoilage.

Data Analysis

Collected data were subjected to a Principal Component Analysis (PCA) using the statistical software Minitab 17 and the resultant principal components were used to construct six different indices which can be used to explore the levels of SME development under the six major policy dimensions.

Principal Component Analysis

Principal Component Analysis is the general name for a technique which uses sophisticated underlying mathematical principles to transform a number of possibly correlated variables into a smaller number of variables called principal components (Richardson, 2009). In PCA, each component is a linear weighted combination of the initial variables. For example, from a set of variables X_1 through to X_n ,

$$\begin{aligned}
 PC_1 &= a_{11}X_1 + a_{12}X_2 + \dots + a_{1n}X_n \\
 PC_2 &= a_{21}X_1 + a_{22}X_2 + \dots + a_{2n}X_n \\
 &\dots \\
 PC_m &= a_{m1}X_1 + a_{m2}X_2 + \dots + a_{mn}X_n
 \end{aligned}
 \tag{1}$$

Where, a_{mn} represents the weight for the m^{th} principal component and the n^{th} variable. Weights for each principal component (PC) are given by the eigenvectors of the correlation matrix and the variance (λ) for each principal component is given by the eigenvalue of the corresponding eigenvector (Vyas and Kumaranayake, 2006). The first principal component accounts for the maximum possible proportion of the variance of the set of X_s , the second principal component accounts for the maximum of the remaining variance and so on until the last of the principal component absorbs all the remaining variance not accounted for by the preceding components. Principal component analysis works best when variables are highly correlated but also when the distribution of variables varies across countries.

Index Construction

The six indices namely; Enabling Environment Index (EEI), Modern Appropriate Technology Index (MATI), Culture and Skills Development Index (CSDI), Access to Finance Index (AFI), Market Facilitation Index (MFI) and Infrastructure Development Index (IDI) were constructed using the equation [2], with the use of principal components having λ greater than one.

$$I_i = \frac{PC_1\lambda_1 + PC_2\lambda_2 + \dots + PC_n\lambda_n}{\lambda_1 + \lambda_2 + \dots + \lambda_n} \tag{2}$$

Where,

- I_i – Index score for i^{th} Asian country
- PC_1, PC_2, PC_n – Principal Component values
- $\lambda_1, \lambda_2, \lambda_n$ – Eigen values
- n – No. of principal components with Eigen values greater than one

Normalization

It was important to express all the six indices in a homogeneous and comparable way. Therefore each and every index score was expressed as a value between 0 and 100 by applying the following general formula:

$$Index\ Value = \frac{I_i - Min}{Max - Min} \times 100 \tag{3}$$

Where,

- I_i – Index score for i^{th} Asian country
- Min – Minimum index score
- Max – Maximum index score

According to this formula, the country with the lowest performance will get an index value of zero, the country with the best performance will get value of 100 while all other countries will have values reflecting their relative distance from the best and worst performer. As the increase in selected variables under EE and ID cause negative impacts on SME development, when lower the index value for EEI and IDI, the SME sector was more developed. In this case, the index value was reversed to make the interpretation of the value the same as that of others using the formula:

$$Index\ Value = 1 - \frac{I_i - Min}{Max - Min} \times 100 \tag{4}$$

With this approach all indices bear the same meaning: the higher the index value, the SME sector was more developed. Values for six indices were calculated separately for 32 Asian countries and the results were taken for further analysis.

Ranking Countries by SME Development

As all the six policy dimensions are equally responsible for the development of SMEs, the SME Development Index (SMEDI) was constructed by aggregating values of all the six indices using the equation [5].

$$SMEPI = \frac{\sum_{i=2}^n \chi_i}{n} \quad [5]$$

Where,

X_i = Value of i^{th} index

$i = 1, 2, \dots, n$

n = No. of indices

Results and Discussion

Values for EEI, MATI, CSDI, AFI, MFI, IDI and SMEDI were obtained for all the 32 Asian countries to explore the levels of SME development comparatively (Table 2).

Table 2: Values of Indices for Small and Medium Enterprises in Asian Countries

| Economy | EEI (%) | MATI (%) | CSDI (%) | AFI (%) | MFI (%) | IDI (%) | SMEDI |
|----------------------|------------|-------------|-------------|------------|------------|------------|-------|
| Afghanistan | 77.85 | 30.76 | 31.96 | 24.56 | 24.32 | 17.99 | 34.57 |
| Armenia | 86.52 | 67.07 | 17.49 | 70.81 | 17.36 | 91.50 | 58.46 |
| Azerbaijan | 84.29 | 51.79 | 37.47 | 37.92 | 23.74 | 100.00 | 55.87 |
| Bangladesh | 57.04 | 11.84 | 3.17 | 60.36 | 12.52 | 53.97 | 33.15 |
| Bhutan | 92.47 | 50.69 | 37.36 | 74.81 | 0.00 | 77.94 | 55.55 |
| Cambodia | 95.30 | 34.09 | 78.06 | 21.05 | 18.65 | 73.79 | 53.49 |
| China | 83.03 | 85.28 | 89.09 | 69.09 | 100.00 | 99.76 | 87.71 |
| Georgia | 85.11 | 54.54 | 25.20 | 62.24 | 3.83 | 74.55 | 50.91 |
| India | 88.19 | 70.78 | 30.99 | 52.63 | 48.32 | 80.77 | 61.95 |
| Indonesia | 90.61 | 0.00 | 19.47 | 39.32 | 15.39 | 87.49 | 42.05 |
| Iraq | 84.16 | 20.06 | 12.03 | 38.69 | 7.22 | 34.47 | 32.77 |
| Israel | 16.69 | 100.00 | 0.00 | 95.26 | 47.56 | 89.81 | 58.22 |
| Kazakhstan | 71.55 | 48.81 | 25.82 | 54.27 | 11.21 | 86.69 | 49.72 |
| Korea, Rep. | 58.76 | 66.38 | 11.38 | 86.41 | 30.10 | 92.16 | 57.53 |
| Kyrgyz Republic | 77.11 | 60.47 | 59.37 | 64.12 | 31.59 | 62.52 | 59.20 |
| Lao PDR | 87.61 | 29.22 | 38.78 | 57.77 | 28.44 | 81.56 | 53.90 |
| Lebanon | 53.88 | 89.04 | 34.85 | 93.93 | 21.14 | 47.63 | 56.74 |
| Malaysia | 80.14 | 46.91 | 56.42 | 100.00 | 79.17 | 85.23 | 74.64 |
| Mongolia | 65.04 | 70.21 | 62.60 | 78.12 | 24.61 | 78.39 | 63.16 |
| Myanmar | 88.03 | 14.31 | 24.31 | 0.00 | 8.58 | 72.34 | 34.60 |
| Nepal | 93.28 | 57.79 | 26.01 | 63.11 | 14.37 | 23.81 | 46.39 |
| Pakistan | 86.49 | 41.85 | 15.91 | 32.27 | 53.03 | 0.00 | 38.26 |
| Philippines | 91.89 | 80.80 | 32.49 | 77.68 | 24.93 | 80.13 | 64.65 |
| Sri Lanka | 78.18 | 39.39 | 8.09 | 77.86 | 22.50 | 75.06 | 50.18 |
| Syrian Arab Republic | 0.00 | 72.83 | 44.47 | 62.05 | 28.92 | 33.81 | 40.35 |
| Tajikistan | 86.29 | 49.17 | 30.82 | 36.34 | 19.91 | 68.65 | 48.53 |
| Thailand | 90.13 | 77.97 | 100.00 | 91.20 | 20.98 | 69.94 | 75.04 |
| Timor-Leste | 83.79 | 20.75 | 60.85 | 41.39 | 0.62 | 79.78 | 47.86 |
| Turkey | 82.78 | 76.37 | 18.85 | 87.11 | 65.36 | 88.70 | 69.86 |
| Uzbekistan | 85.48 | 34.35 | 18.30 | 54.60 | 7.28 | 89.72 | 48.29 |
| Vietnam | 82.36 | 48.76 | 45.33 | 78.89 | 17.79 | 90.70 | 60.64 |
| Yemen, Rep. | 100.00 | 22.22 | 20.48 | 23.53 | 11.73 | 0.13 | 29.68 |

Note: EEI – Enabling Environment Index, MATI – Modern Appropriate Technology Index, CSDI – Culture and Skills Development Index, AFI – Access to Finance Index, MFI – Market Facilitation Index, IDI – Infrastructure Development Index, SMEDI – SME Development Index

Enabling Environment Index (EEI)

Yemen showed the highest value for EEI while Syrian Arab Republic showed the lowest value (Figure 1). Although both of them were developing nations in the Middle East Asia, they had contrasting levels of SME development. All the Asian countries showed higher values for EEI except Syrian Arab Republic and Israel. It reveals that the countries with higher EEI values have a business enabling environment which supports the development of SMEs.

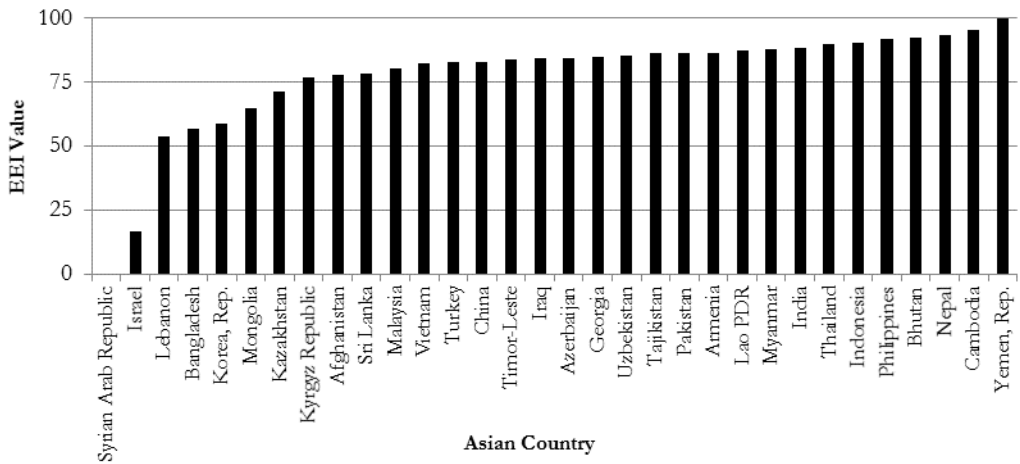


Figure 1: Index Values for Business Enabling Environment

Modern Appropriate Technology Index (MATI)

Israel which is a developed nation in Asia scored the highest value for MATI while Indonesia showed the lowest value (Figure 2).

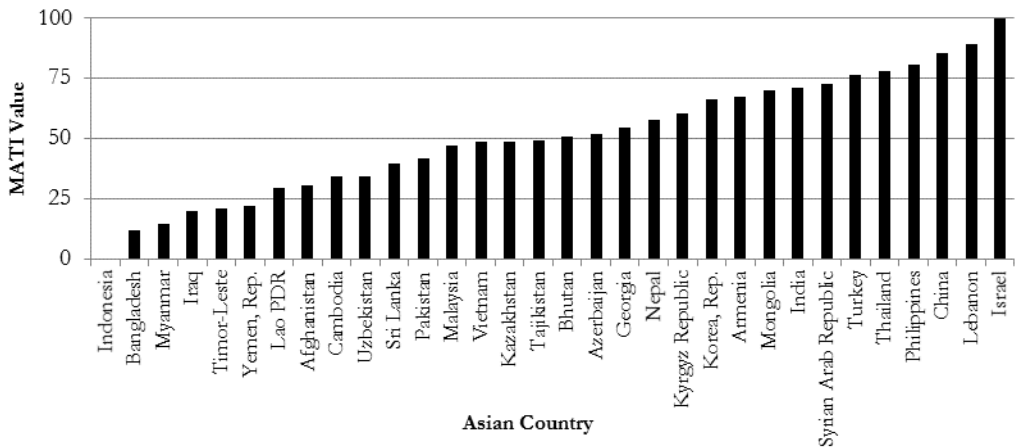


Figure 2: Index Values for Modern Appropriate Technology

Culture and Skills Development Index

Thailand, one of the developing nations in Asia acquired the highest value in CSDI and its lowest value was shown by Israel (Figure 3). Most of the Asian countries scored lower levels of CSDI revealing that their SME culture was not so developed and skills of employees in SME sector were not outstanding due to lack of formal training.

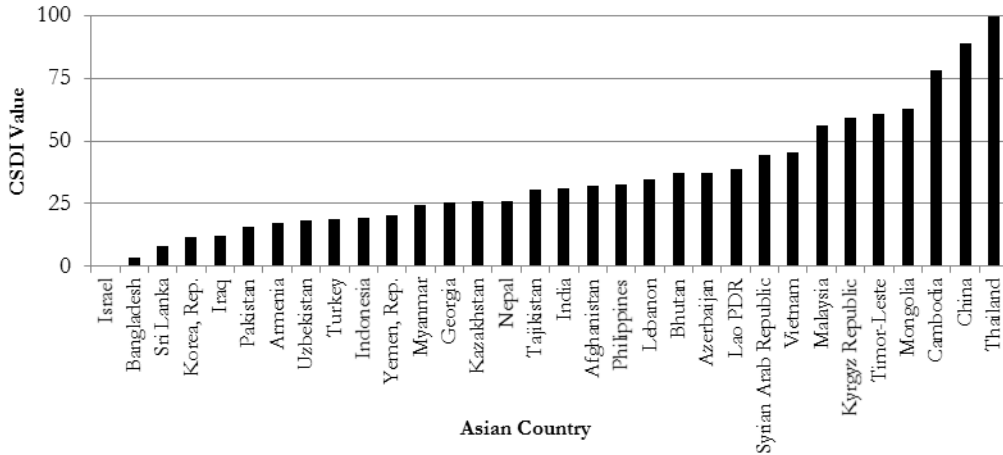


Figure 3: Index Values for Culture and Skills Development

Access to Finance Index (AFI)

Malaysia scored the highest value while Myanmar scored the lowest value in AFI (Figure 4).

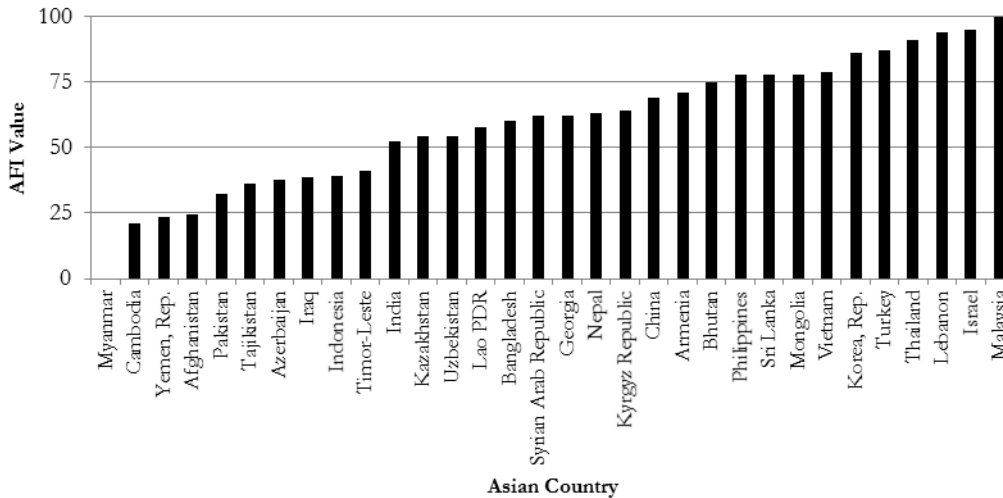


Figure 4: Index Values for Access to Finance

Both of them were developing nations in East Asia but they have contrasting levels of access to finance. Most of the countries showed higher levels of access to finance when running their SMEs while Pakistan, Tajikistan, Azerbaijan, Iraq, Indonesia and Timor-

Leste showed lower levels and Myanmar, Cambodia, Yemen and Afghanistan showed critical levels of access to finance.

Market Facilitation Index (MFI)

China which is a developed nation in East Asia scored the highest value for MFI while Bhutan, a South Asian country resulted the lowest value (Figure 5). All the Asian countries showed critical or lower levels of MFI except China, Malaysia, Turkey and Pakistan. It reveals that proper marketing facilities were not so developed for SMEs in most of the Asian Countries.

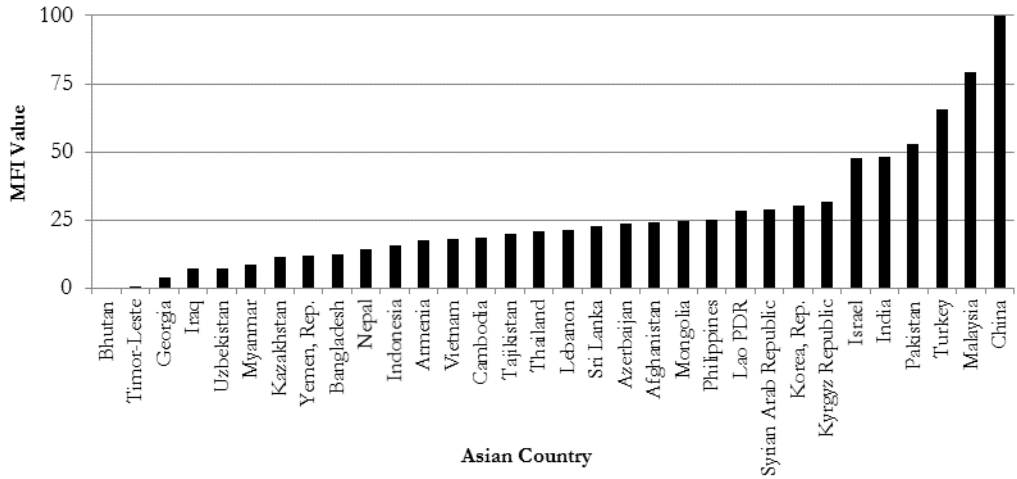


Figure 5: Index Value for Market Facilitation

Infrastructure Development Index (IDI)

Azerbaijan, a developing nation in Central Asia scored the highest value for IDI and its lowest value was acquired by Pakistan which belongs to South Asia (Figure 6).

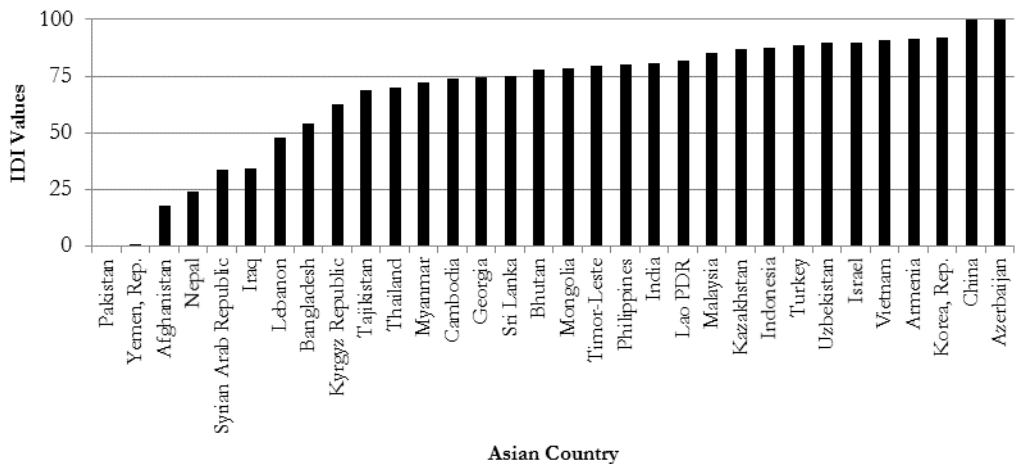


Figure 6: Index Values for Infrastructure Development

Most of the Asian countries showed higher levels of infrastructure development while Syrian Arab Republic, Iraq and Lebanon showed lower levels and Pakistan, Yemen, Afghanistan and Nepal showed critical levels of infrastructure development.

SME Development Index (SMEDI)

SMEDI scores give an overall idea on development of SMEs in each country. Scores for SMEDI were graphically represented in Figure 7.

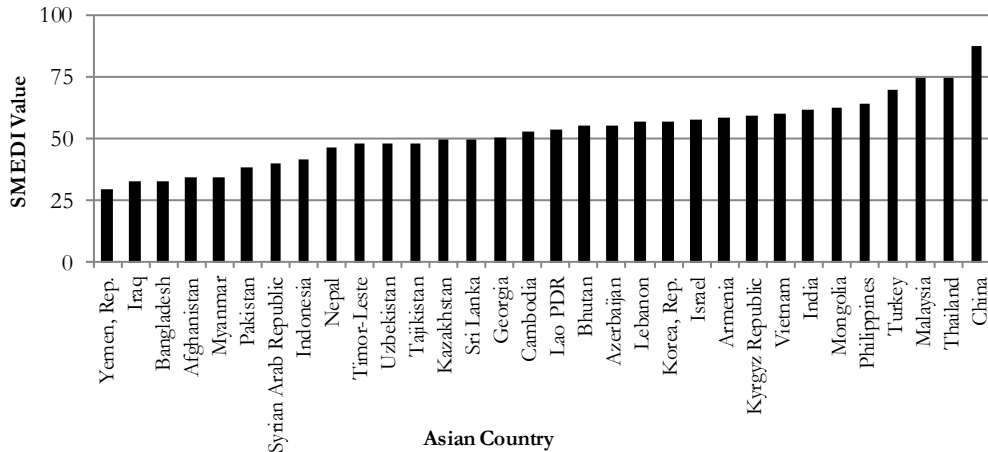


Figure 7: SME Development Index Scores

China was the leading country with the highest SMEDI score (87.71). It was closely followed by Thailand and Malaysia. Development of SMEs in China was outstanding as it has scored higher values for all the six indices and it depicts that China’s SMEs have a supportive business environment, good knowledge on modern technology, skilled employees, gender equity, good access to finance, better marketing facilities and well developed infrastructure facilities.

Yemen showed the lowest SMEDI score (29.68). Yemen has scored the highest value for EEI but it has scored lower values for all the other five indices MATI, CSDI, AFI, MFI and IDI. It reveals that although Yemen has a business enabling environment its SMEs have no any interest in gaining knowledge on modern technology, training employees in SME sector, accessing finance for SME development, creating good markets for SMEs and in developing infrastructure which facilitate SMEs.

Conclusions

This study developed six indices to measure the development of SMEs in Asian countries. Those indices could be used as diagnostic tools to see whether the environment within which the SMEs are supportive for the development of SMEs in the Asian region. Weak linkages with external market, weak technological innovation,

and limited skills of employees in SME sector have limited SMEs' growth and development. The governments of developing nations in the Asian region should conceive better policies for SMEs to uplift marketing facilities, to strengthen the skills of employees working in SMEs and also to provide better knowledge on modern technology.

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