

GRADUATION THESIS

**ASSESSING ASIAN COUNTRIES' COMPETITIVENESS: TWO-STAGE DEA
ANALYSIS OF GLOBAL INNOVATION INDEX AND LOGISTICS
PERFORMANCE INDEX INTEGRATION**

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Overview

01 Introduction (Viet Phuong)

02 Literature Review (Dang Duong)

03 Methodology (Dieu Vi)

04 Findings and Analysis (Ha Anh)

05 Conclusion (Viet Phuong)

1. INTRODUCTION

1.1 Topic Background

1.2 Research Questions
and Objectives

1.3 Methodology and
Data Overview

1.1

Topic Background

* Competitiveness of Countries

Highly significant role in affirming the position of a country



Competitiveness



Defined as the capacity of an economy to deliver valuable goods and services that improve the standard of living and employment opportunities for its population (European Commission, 2004)



Measured based on various indicators (LPI, GII,...)

Topic Background

✧ Importance of the Global Innovation Index (GII)

- Innovation is crucial for driving economic progress and fostering competitiveness, which is pivotal in developed and developing economies
- The GI is a remarkable tool for measuring innovation while providing a rigorous statistical benchmark
- The WIPO publishes GI.

Topic Background

* Importance of Logistic Performance Index (LPI)

- Logistics is a fundamental pillar for a country's trade relations across borders
- The LPI is a comprehensive benchmarking tool designed to assist nations in identifying the challenges and opportunities regarding trade logistics and determining strategies for enhancing their performance (Worldbank, 2023)
- The Worldbanks publishes LPI

1.1

Topic Background

✱ The interrelationship between the GII and the LPI with Countries' Competitiveness

Innovation and logistics are pivotal in shaping a country's competitiveness

Evaluates countries' innovation performance

GII

LPI

Measures the efficiency and effectiveness of a country's logistics

Topic Background

✧ Practical Problems

- The suitability of the GII and the LPI
- The effectiveness of Asian countries in utilizing resources to improve competitiveness
- Exploring the changes in resources optimization among Asian countries

1.2

Research Questions and Objectives

Are the GII and the LPI appropriate sets of indexes to assess the competitiveness of Asian countries?

01

To assess the competitiveness of Asian countries by combining the GII and the LPI

Are Asian countries effective in using resources to improve competitiveness?

02

To analyze and evaluate Asian countries' effectiveness in using resources to improve competitiveness

How has there been a change in optimizing the resources of Asian countries?

03

To see the change in optimizing the resources of Asian countries over the years (2012-2018)

1.3

Methodology and Data Overview

Method: Integrated

- DEA-Super SBM
- DEA-Malmquist

7 outputs

7 inputs

Scope: 30 Asian
countries

Data source:
World Bank



2. LITERATURE REVIEW

01 Literature Review on Theoretical Foundation

02 Competitiveness from innovation and logistics perspectives

03 Literature Review on DEA Methods

04 Research Gaps

05 Conclusion

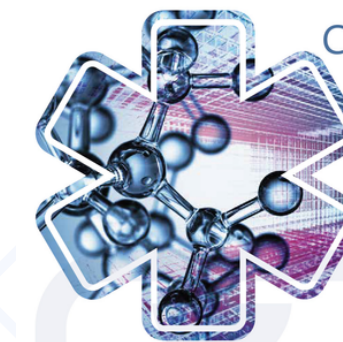
2.1

Literature Review on Theoretical Foundations

The Innivation-Driven Theory (IDT)

- The innovation diffusion theory IDT proposed by Rogers (1995)
- The IDT postulates that countries exhibiting a high level of innovation are more likely to possess a competitive edge.

The **GII** is crucial in measuring and benchmarking countries' innovation capabilities.



CHỈ SỐ ĐỔI MỚI SÁNG TẠO TOÀN CẦU (GII) 2019

**Việt Nam đạt thứ hạng
cao nhất từ trước tới nay**

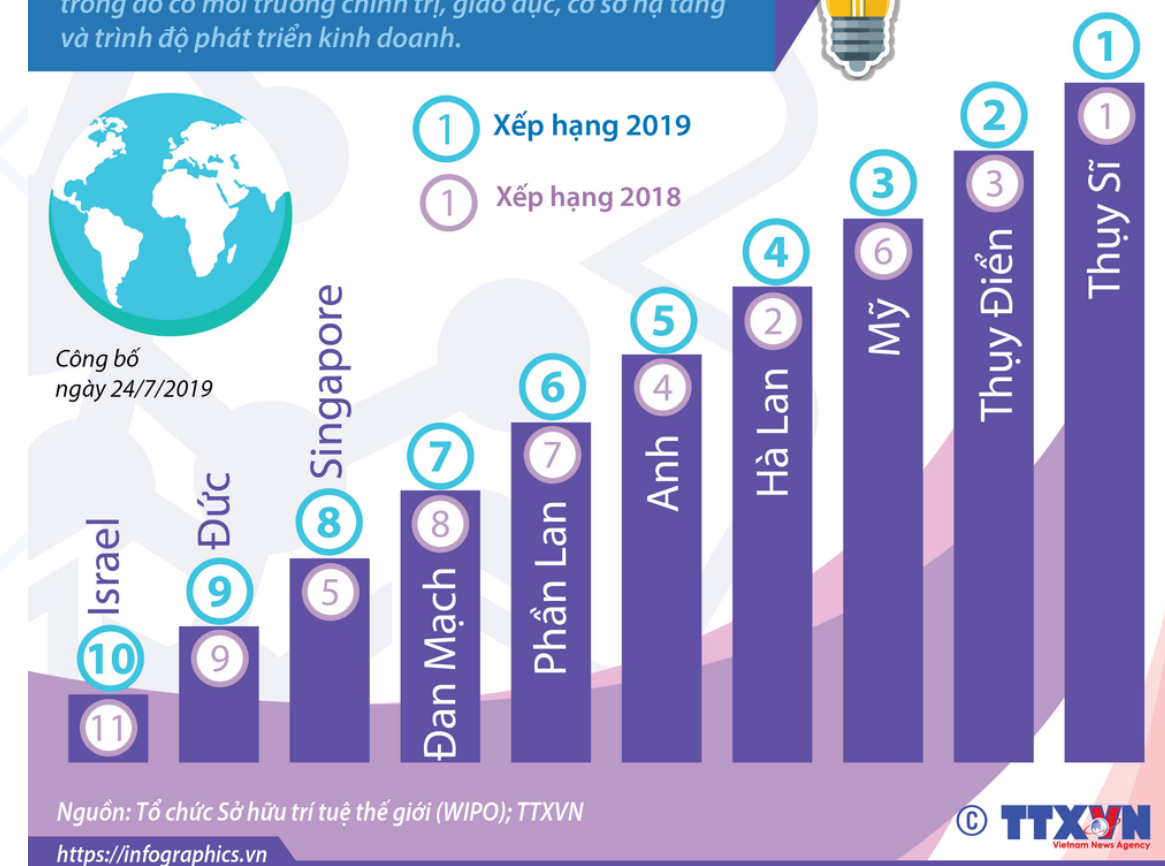
Xếp hạng **42/129**
nền kinh tế trên thế giới,
tăng **3** bậc so với năm 2018



80 tiêu chí số của GIÍ cung cấp một tầm nhìn sâu rộng về hoạt động đổi mới sáng tạo, trong đó có môi trường chính trị, giáo dục, cơ sở hạ tầng và trình độ phát triển kinh doanh.



Công bố
ngày 24/7/2019



Nguồn: Tổ chức Sở hữu trí tuệ thế giới (WIPO); TTXVN

<https://infographics.vn>

TTXVN
Vietnam News Agency

2.1

Literature Review on Theoretical Foundations

Trade Facilitaion Theory (TFT)

- The TFT emphasizes logistics systems' efficient and effective functioning in enhancing a country's competitiveness.
- Efficient transportation networks enable the timely delivery of goods, reduce lead times, and increase competitiveness.

The **LPI** indicators provides a comprehensive overview of a nation's logistics capabilities



2.2

Competitiveness from Innovation Perspectives

- The GII assists in assessing a country's innovation performance and enhancing its global competitiveness.
- The GII serves as a valuable tool for policymakers to identify strengths, weaknesses, and areas for improvement in their country's innovation ecosystem.
- Countries can enhance their competitiveness, drive economic growth, and foster sustainable development by promoting innovation.



2.2

The GII Indicators

No.	Indicators	Definition	References				
1	Institutions	Political environment/Regulatory environment/Business environment	(Global Innovation Index (GII), 2022)	5	Business sophistication	Knowledge workers/Innovation linkages/Knowledge absorption	(Global Innovation Index (GII), 2022)
2	Human capital and research	Education / Tertiary education / Research and development (R&D)	(Global Innovation Index (GII), 2022)	6	Knowledge and technology outputs	Knowledge creation/Knowledge impact/Knowledge diffusion	(Global Innovation Index (GII), 2022)
3	Infrastructure	Information and communication technologies (ICTs)/Ecological sustainability/General infrastructure.	(Global Innovation Index (GII), 2022)	7	Creative outputs	Intangible assets/Creative goods and services/Online Creativity	(Global Innovation Index (GII), 2022)
4	Market sophistication	Credit/Investment/Trade, diversification, and market scale	(Global Innovation Index (GII), 2022)				

2.2

Competitiveness from Logistic Performance Perspectives

- Logistics plays a vital role in facilitating the movement of goods and services to support international trade
- The relationship between logistics and economic performance is significant, but its impact is dependent on various economic and geographical factors.



2.2

The LPI Indicators

No.	Indicators	Definition	References
1	Customs	The effectiveness and smoothness of customs and border management clearance	(Worldbank, 2018)
2	Infrastructure	The quality of trade and transport infrastructure	(Worldbank, 2018)
3	Ease of arranging shipments	The ease of arranging competitively priced shipments	(Worldbank, 2018)
4	Quality of logistics services	The competence and quality of logistics services trucking, forwarding, and customs brokerage	(Worldbank, 2018)
5	Tracking and tracing	The ability to track and trace consignments	(Worldbank, 2018)
6	Timeliness	The rate at which shipments are delivered to recipients within the designated or anticipated timeframe	(Worldbank, 2018)

2.3

Literature Review on Methods: DEA Super SBM

- Introduced by Tone (2002)
- Utilizes Slack's objective function for input-output surplus/deficiency assessment
- Ranks DMUs with an efficiency value of 1.

2.3

Literature Review on Methods: DEA Malmquist

- **The Malmquist Productivity Index (MPI)** plays a crucial role in evaluating the competitiveness and efficiency of various entities change over time, often used in the context of analyzing regions, industries, and countries.
- Derived from the DEA Malmquist model, the MPI integrates two fundamental components:
 1. **The catch-up index** (efficiency change)
 2. **The frontier-shift index** (technical change)

2.3

List of related Studies

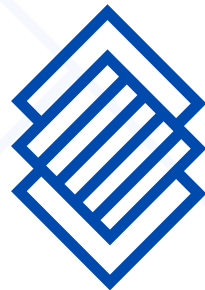
No.	Studies	Inputs	Outputs	Methods	Sample and Region
1	Charles and Zegarra (2014)	Regional competitiveness index	Rank the competitiveness	DEA-BCC model	Peru
2	Guan et al. (2006)	Technological innovation capability dimensions	Competitiveness factors	DEA-CCR model and DEA-BCC model	China
3	Halkos and Tzeremes (2007)	The number of employees, The R&D expenditure, The market capitalization	Revenues; The net income	DEA	Top 50 ICT company
4	Wei-Wen (2011)	Travel & Tourism Competitiveness Index	Travel & Tourism competitiveness ranking	Super-efficiency DEA; grey system theory (GST); artificial neural network (ANN)	
5	Stanikova and Skokan (2012)	Four of EU Policy indicators; EU Structural (Lisbon) indicators and indicators of Strategy Europe 2020	Two of EU Policy indicators; EU Structural (Lisbon) indicators and indicators of Strategy Europe 2020	DEA-CCR model and DEA-BCC model	27 EU countries
6	Melecky (2013)	Institution; Macroeconomic Stability; Infrastructure, Health; Primary, secondary and Tertiary Education; Training and Lifelong Learning; Indicators for technological readiness	Labour market efficiency; Market size; Business sophistication; Innovation	DEA-Malmquist	15 EU nations
7	Kuo et al. (2020)	Terminal area; Terminal length; Equipment	Throughput; Ship calls	DEA-CCR model	53 Vietnamese ports
8	Liu et al. (2018)	Outlets; Warehouses; Suppliers	Inhabitants; Market concentration; Consumer spending; Market share; Total sales; ROI	DEA	124 organizations in the global retailing industry.
9	Nguyen et.al (2023)	Entry costs; Land access and security; Transparency; Informal charges; Time Costs and Regulatory; Compliance; Policy bias; The proactivity of provincial leadership; Business support service:	FDI capital; FDI by cases	Super-SBM model; The DEA–Malmquist	63 provinces in Vietnam
10	Tachegea et al. (2021)	Energy; Economic	Desirable output (GDP); undesirable output (CO2)	DEA-Malmquist	Africa countries
11	Giacalone et al. (2020)	Judges employed; Number of administrative; Pending cases; New cases filed.	Cases finished	DEA- Malmquist	Italian judicial system
12	Zheng Z (2021)	Capital stock; Working population; total energy consumption	Expected output (GDP); non-expected output (sulfur dioxide, wastewater discharge, PM2.5)	DEA Malmquist DEA SBM	23 China cities

2.4

Research Gaps

- Existing studies tend to focus on individual aspects of innovation or examine the GII separately rather than integrating it with other dimensions of competitiveness
 - There is a lack of research that combines the LPI with other dimensions of competitiveness, particularly the innovation aspect, in Asian countries
 - There is a lack of research that has integrated the innovative Super-SBM and DEA Malmquist methods to evaluate Asian countries' competitiveness
- > Hence, this study seems as the first research integrating the GII and the LPI in two-stage DEA to evaluate a more comprehensive and accurate assessment of competitiveness in 30 Asian countries

Conclusion



This research utilizes a functional framework to evaluate Asian Countries' Competitiveness by employing an integrated approach that combines the DEA-Super SBM, and DEA-Malmquist



The objective is to assess Asian Countries' Competitiveness from 2012 to 2018



The Super-SBM model is applied to measure the competitiveness of all 30 nations in Asia



The DEA-Malmquist model is utilized to analyze the overall changes in productivity within the competitiveness performance of these 30 nations

3. METHODOLOGY

3.1. Research process

3.2. DEA models

3.2.1. DEA

3.2.2. Super-SBM Model

3.3.3. DEA Malmquist

3.1

Research Process

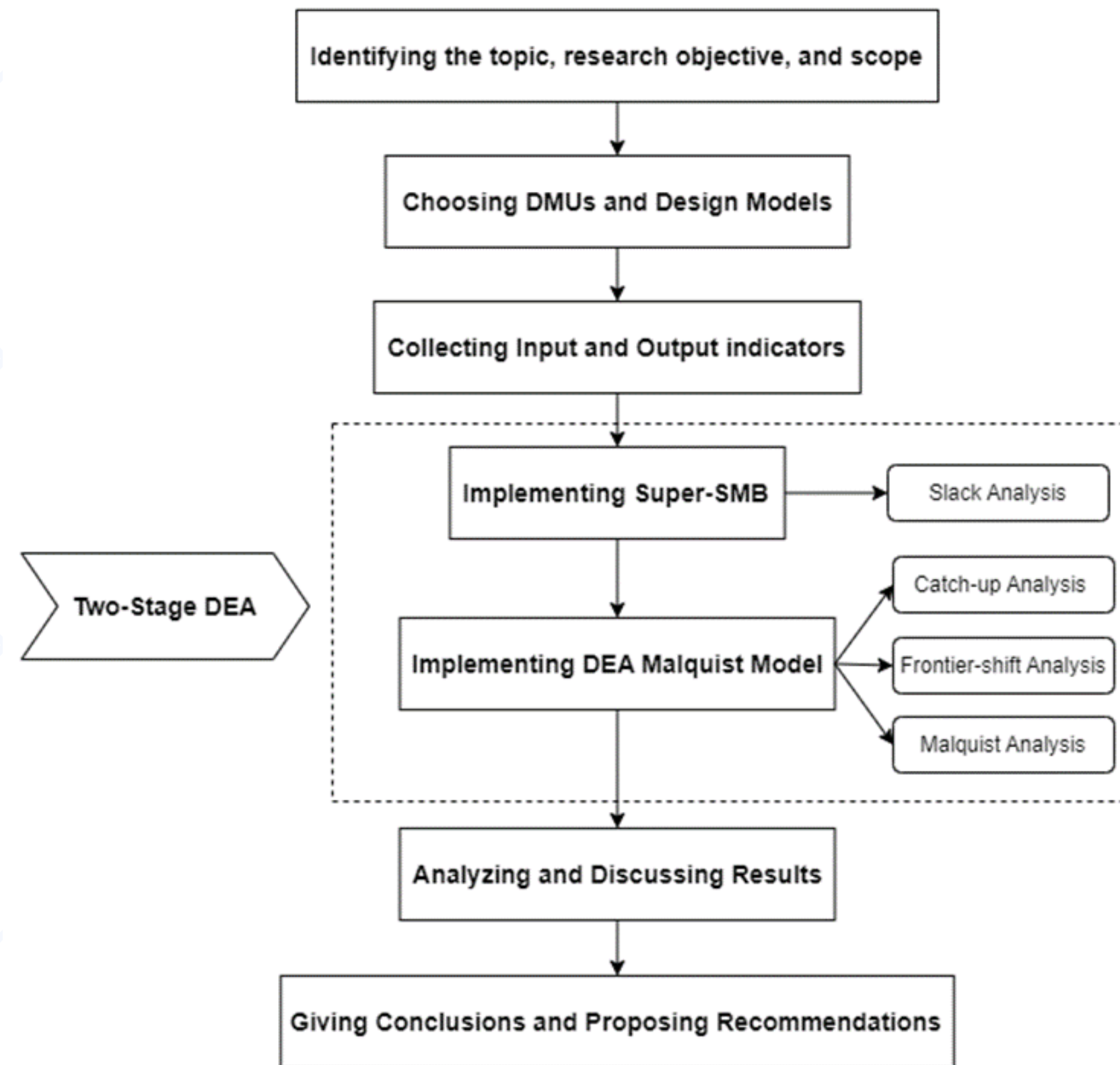
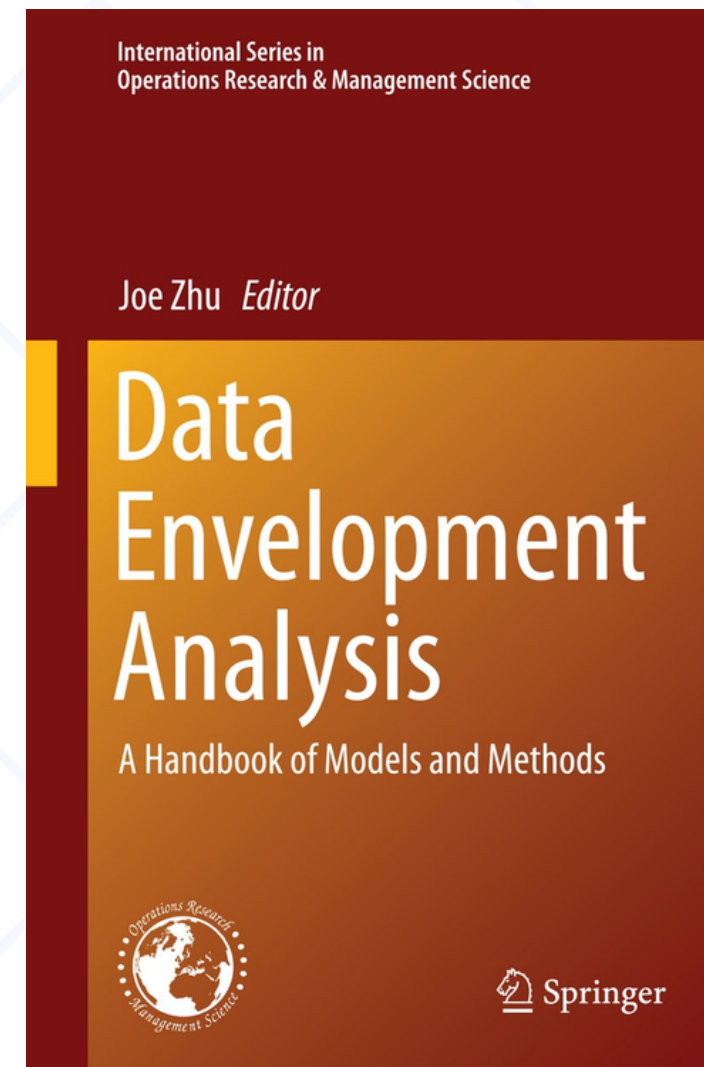
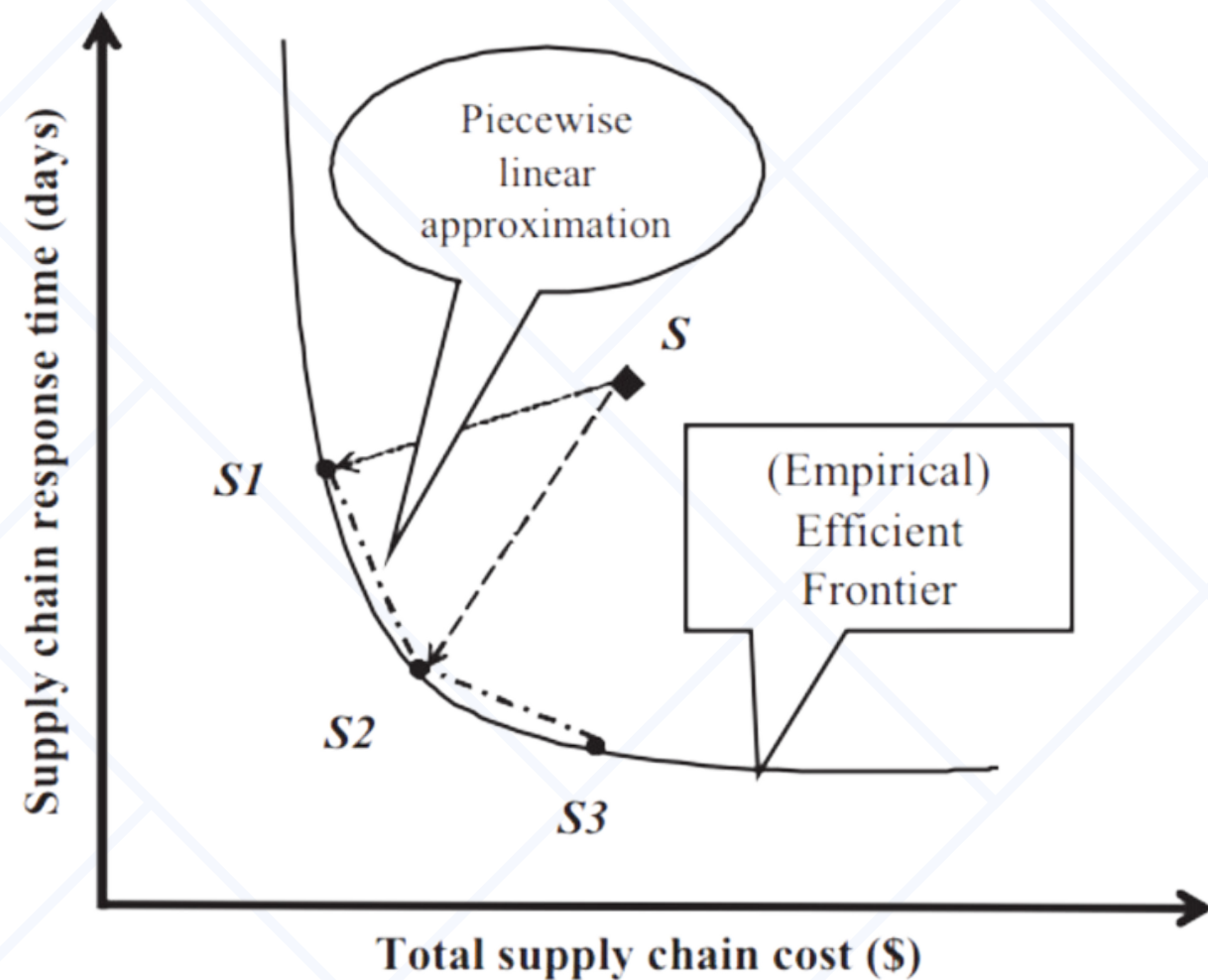


Figure 3.1: The Research Process

3.2

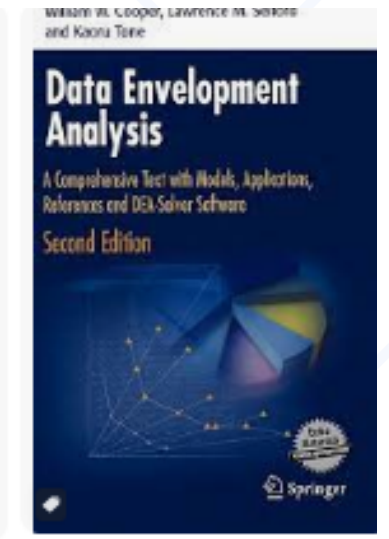
Data Envelopment Analysis Model (DEA Model)



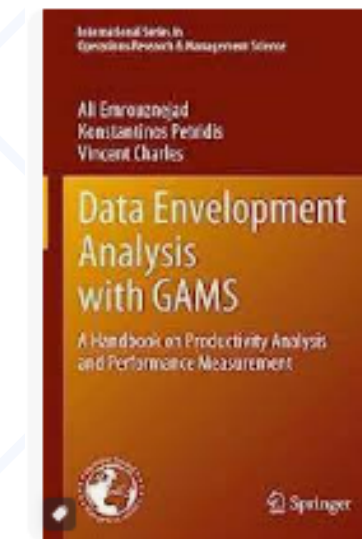
Amazon - In stock
Handbook on Data Envelopment...



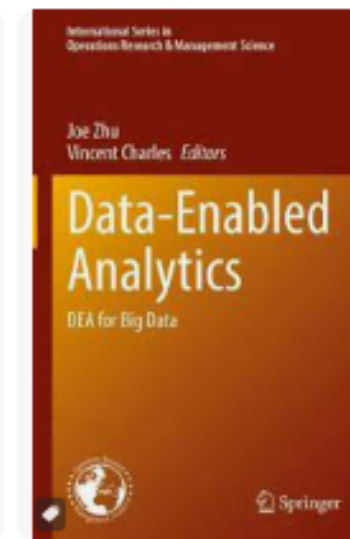
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Buy Data Envelopment Analysis: ...



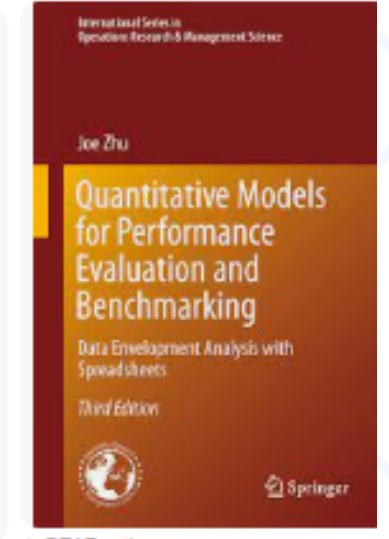
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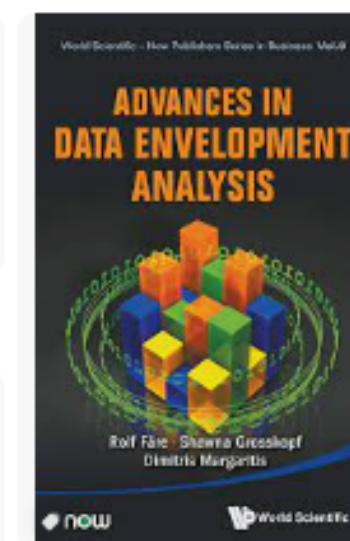
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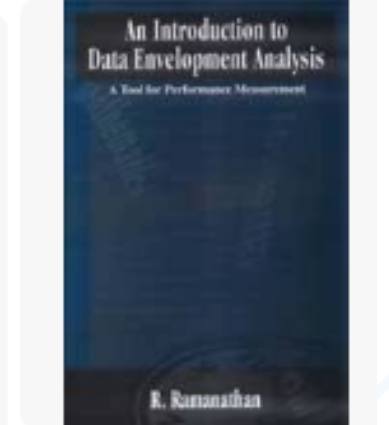
DEAFrontier
DEA Book: Benchmarking



Springer Link
Data Envelopment Analysis with ...



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Sage Publications
An Introduction to Data Envelopm...



3.2.1. DEA: Evaluating performance and trade-offs

01

- Performance evaluation is important for businesses to remain competitive. Though it, we can:
 - Reveal strengths and weaknesses
 - Enhance customer alignment
 - Identify improvement opportunities



02

- Single-measure gap analysis: Key in performance evaluation and benchmarking.

03

- Single measures ignore performance interactions, substitutions, or tradeoffs.
- Operations have specific unique measures or metrics with tradeoffs.



3.2.1. DEA: Data Envelopment Analysis

According to Charnes et al. (1978) and Cooper et al. (2011),

- DEA is a data analysis tool for identifying best practices as shown in Figure 3.2 when such a best-practice frontier is characterized by multiple performance metrics.
- Decision-making units (DMUs) represent business operations or processes. Each DMU is evaluated based on a set of multiple performance measures that are classified as “inputs” and “outputs”.
- DEA minimizes “inputs” and maximizes “outputs”.

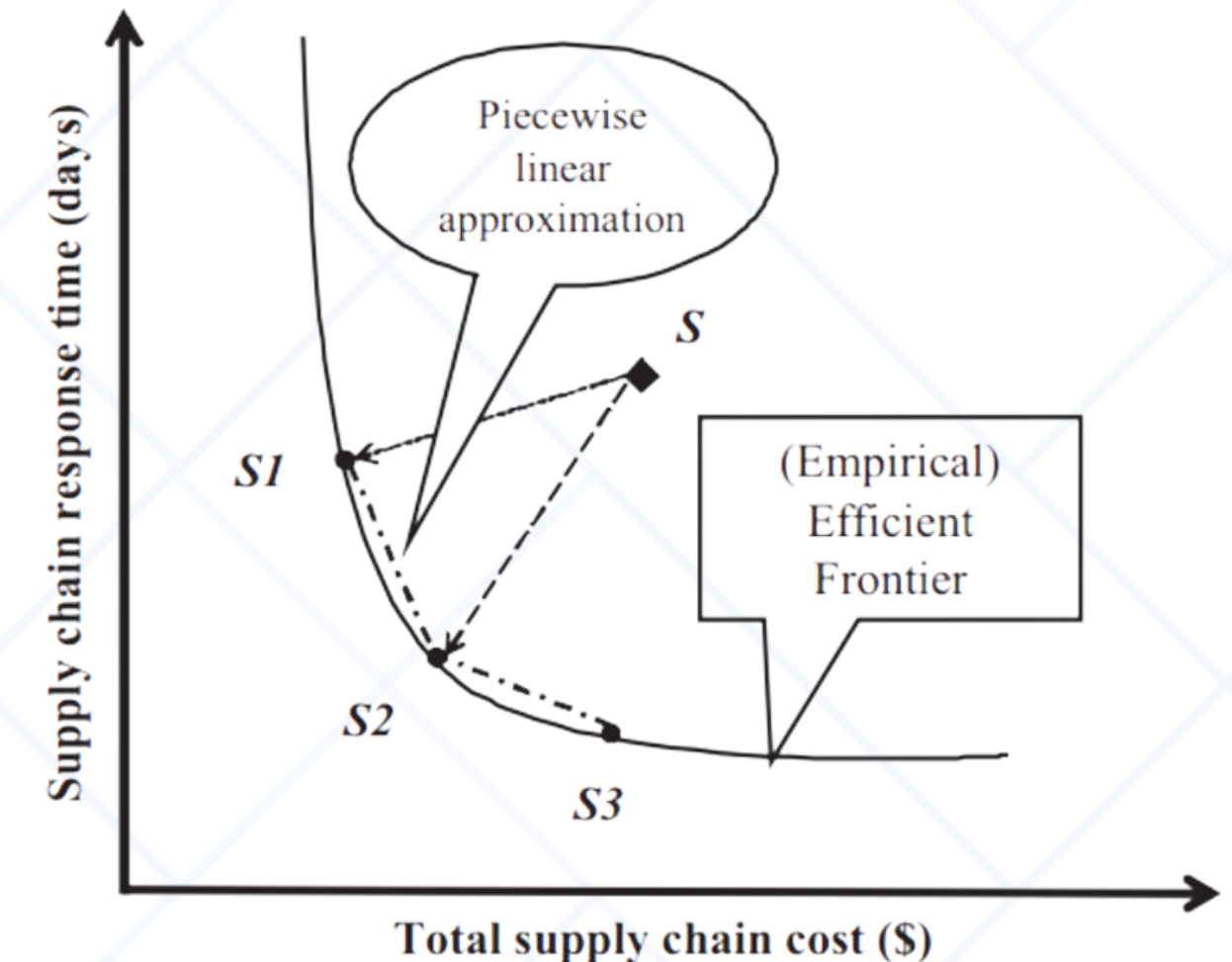
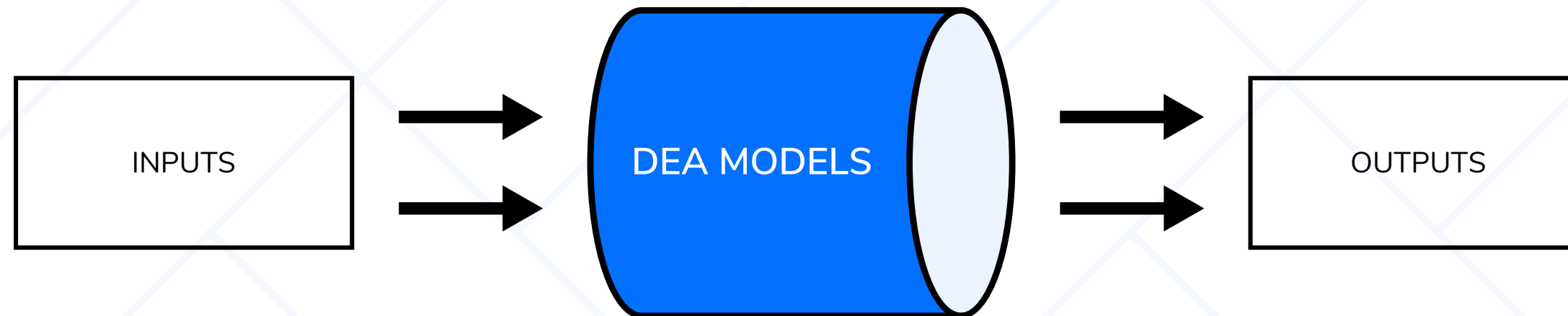


Figure 3.2: Best practice (efficient) frontier of supply chain operations

3.2.2. Super-SBM Model

According to Tone (2002),

- Super-SBM model checks DMU efficiency by comparing it to the nearest frontier point, except itself.
- The efficiency results in SBM are independent of the unit of input-output variables.
- The SBM model is expressed as follows by **Equation (1)**.

	Score	DMU
$\min p$	≥ 1	efficiency
$\min p$	< 1	inefficiency

$$\min \rho = \frac{\frac{1}{m} \sum_{i=1}^m \frac{\bar{x}_i}{x_{ik}}}{\frac{1}{s} \sum_{r=1}^s \frac{\bar{y}_r}{y_{rk}}}$$

s.t.

$$\sum_{j=1, j \neq k}^n x_{ij} \gamma_j \leq \bar{x}_i, \forall i$$

(1)

$$\sum_{j=1, j \neq k}^n y_{rj} \gamma_j \geq \bar{y}_r, \forall r$$

$$\bar{x}_i \geq x_{ik}, \forall i$$

$$\bar{y}_r \leq y_{rk}, \forall r$$

$$\gamma_j \geq 0, \forall j (j \neq k)$$

3.2.3. DEA Malmquist

According to Caves et al. (1982),

- **The Malmquist index (MI)** evaluates the efficiency change of a DMU between two time periods.
- It reflects *progress or regress*, along with progress or regress in frontier technology between two periods of time.
- It is defined as the product of “Catch-up” (or efficiency change) and “Frontier-shift” (or technical change) terms.
 - **The catch-up term (or efficiency change):** the degree to which a DMU improves or worsens its efficiency during the period.
 - **The frontier-shift term (or technical change):** the change in the efficient frontiers between the two time periods.

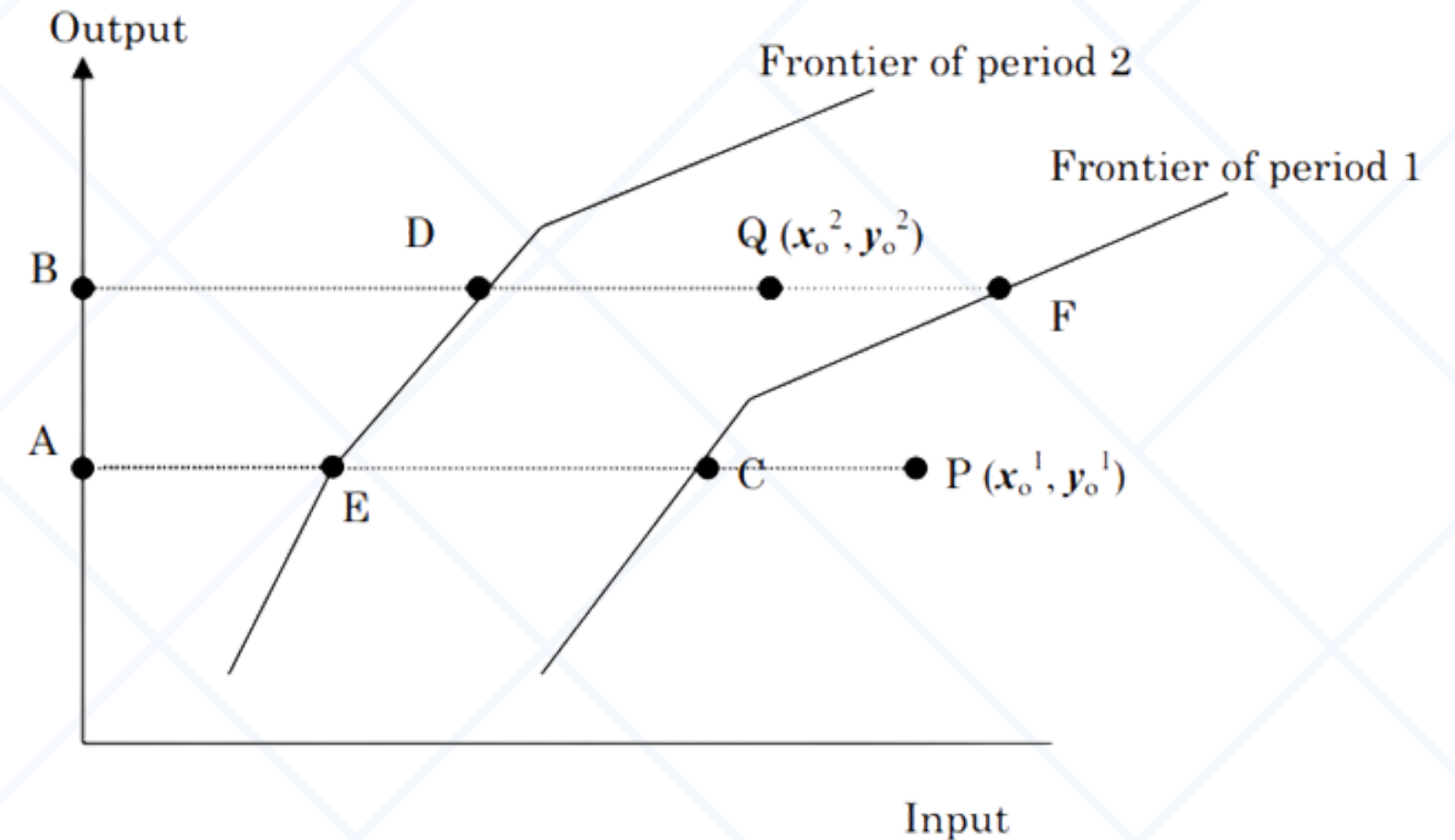


Figure 3.3: Single input and output case

3.2.3. DEA Malmquist: Catch-up

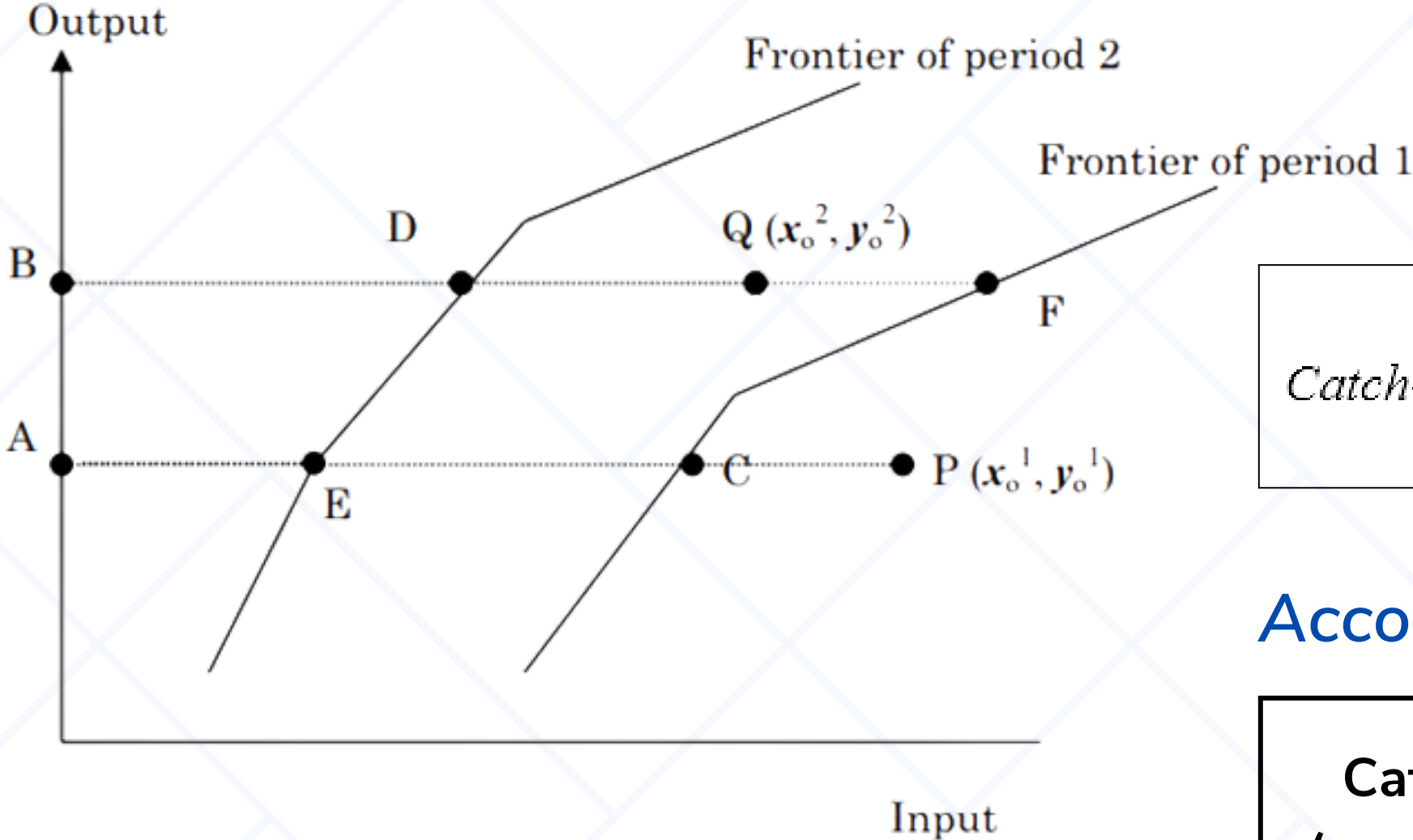


Figure 3.3: Single input and output case

- We denote DMUo at the time period 1 and 2, by (x_o^1, y_o^1) and (x_o^2, y_o^2) , respectively. Then, the catch-up effect is measured by the following **Equation (2)**.

$$Catch-up = \frac{\frac{BD}{BQ}}{\frac{AC}{AP}} = \frac{Efficiency\ of\ (x_o^2, y_o^2)\ with\ respect\ to\ the\ period\ 2\ frontier}{Efficiency\ of\ (x_o^1, y_o^1)\ with\ respect\ to\ the\ period\ 2\ frontier}$$

(2)

According to Cooper et al. (2004),

Catch-up (or recovery)	Result
> 1	Progress in relative efficiency from period 1 to 2
$=< 1$	No change and regress in the efficiency

3.2.3. DEA Malmquist: Frontier-shift

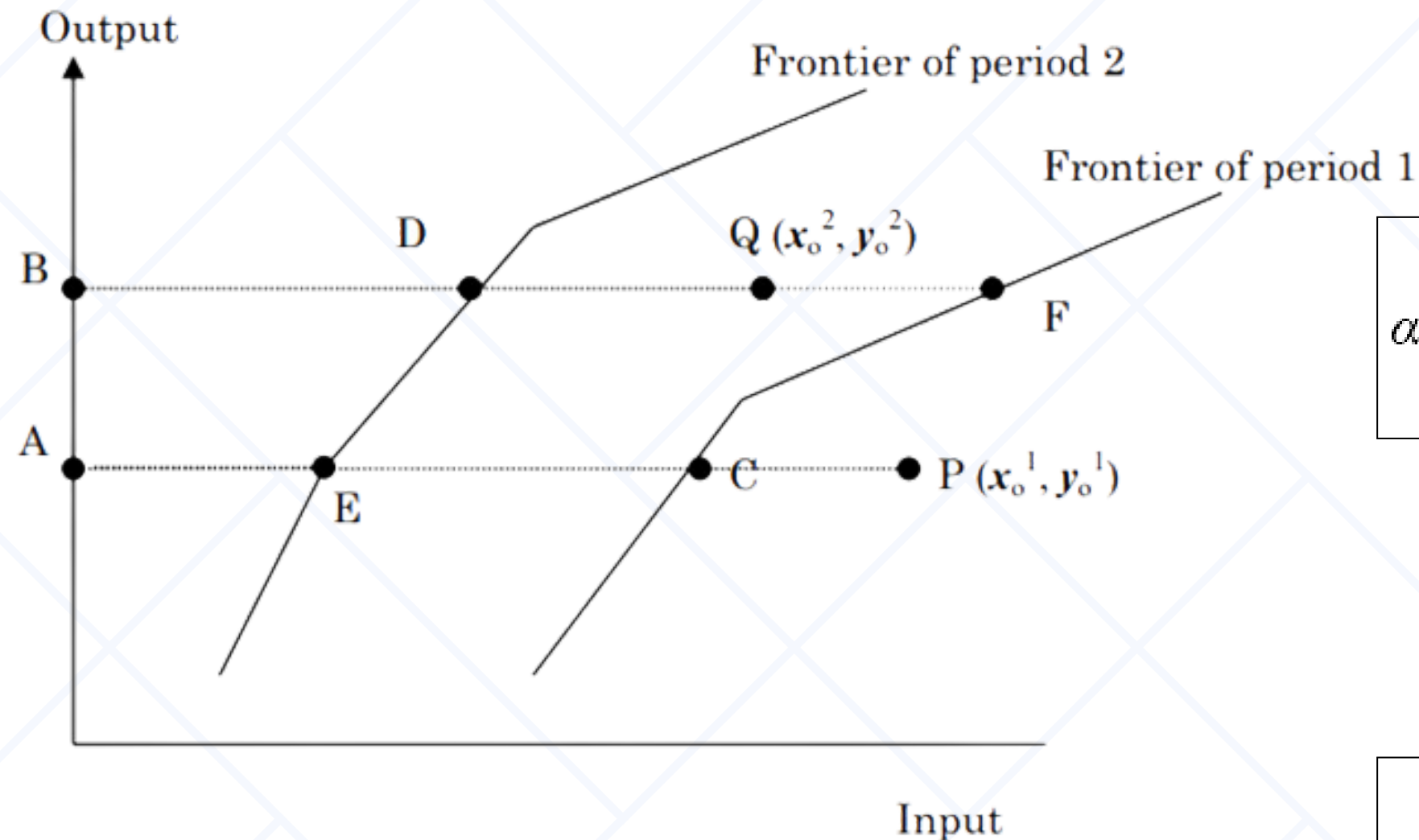


Figure 3.3: Single input and output case

- The frontier-shift effect at (x_o^1, y_o^1) is evaluated by **Equation (3)**:

$$\alpha_1 = \frac{AC}{AE} = \frac{\frac{AC}{AP}}{\frac{AE}{AP}} = \frac{\text{Efficient of } (x_o^1, y_o^1) \text{ with respect to the period 1 frontier}}{\text{Efficient of } (x_o^1, y_o^1) \text{ with respect to the period 2 frontier}} \quad (3)$$

- The frontier-shift effect at (x_o^2, y_o^2) is expressed by **Equation (4)**:

$$\alpha_2 = \frac{BF}{BD} = \frac{\frac{BF}{BQ}}{\frac{BD}{BQ}} = \frac{\text{Efficient of } (x_o^2, y_o^2) \text{ with respect to the period 1 frontier}}{\text{Efficient of } (x_o^2, y_o^2) \text{ with respect to the period 2 frontier}} \quad (4)$$

3.2.3. DEA Malmquist: Frontier-shift

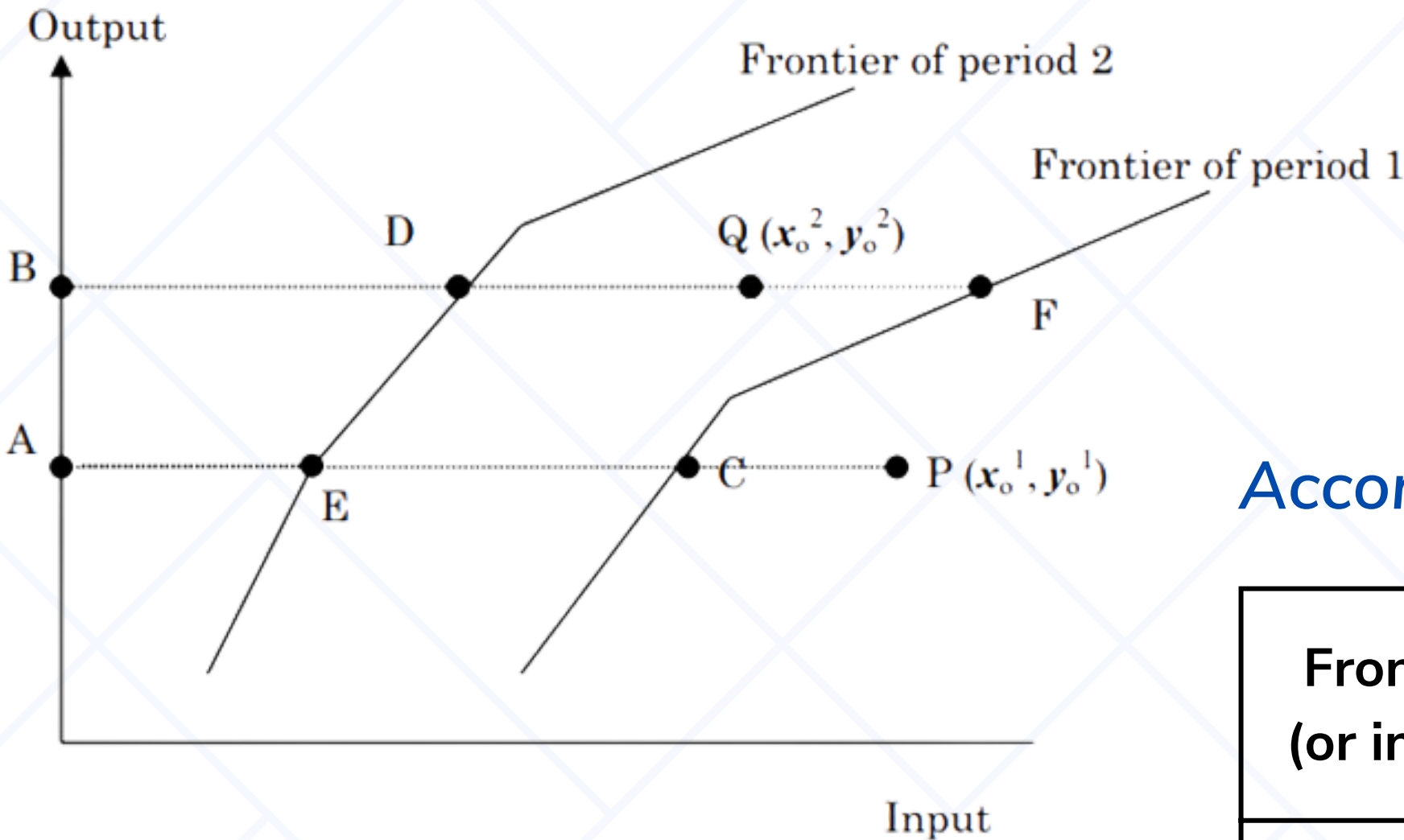


Figure 3.3: Single input and output case

- By utilizing α_1 and α_2 , we define the "Frontier-shift" in **Equation (5)**:

$$Frontier-shift = \alpha = \sqrt{\alpha_1 \alpha_2}$$

(5)

According to Fare et al. (1984),

Frontier-shift (or innovation)	Result
> 1	Progress in the frontier technology around DMU from period 1 to 2
$= < 1$	The status quo and regress in the frontier technology

3.2.3. DEA Malmquist: Malmquist index

- The Malmquist index (MI) is obtained as the product of (Catch-up) and (Frontier-shift) as **Equation (6)**:

$$MI = (\text{Catch-up}) \times (\text{Frontier-shift}) = \sqrt{\frac{\beta^1((x_o, y_o)^2)}{\beta^1((x_o, y_o)^1)} \times \frac{\beta^2((x_o, y_o)^2)}{\beta^2((x_o, y_o)^1)}} \quad (6)$$

According to Fare et al. (1984),

MI	Result
> 1	Progress in the total factor productivity of the DMUo from period 1 to 2
$=< 1$	The status quo and decay in the total factor productivity

4. FINDINGS AND ANALYSIS

4.1 Data Collection

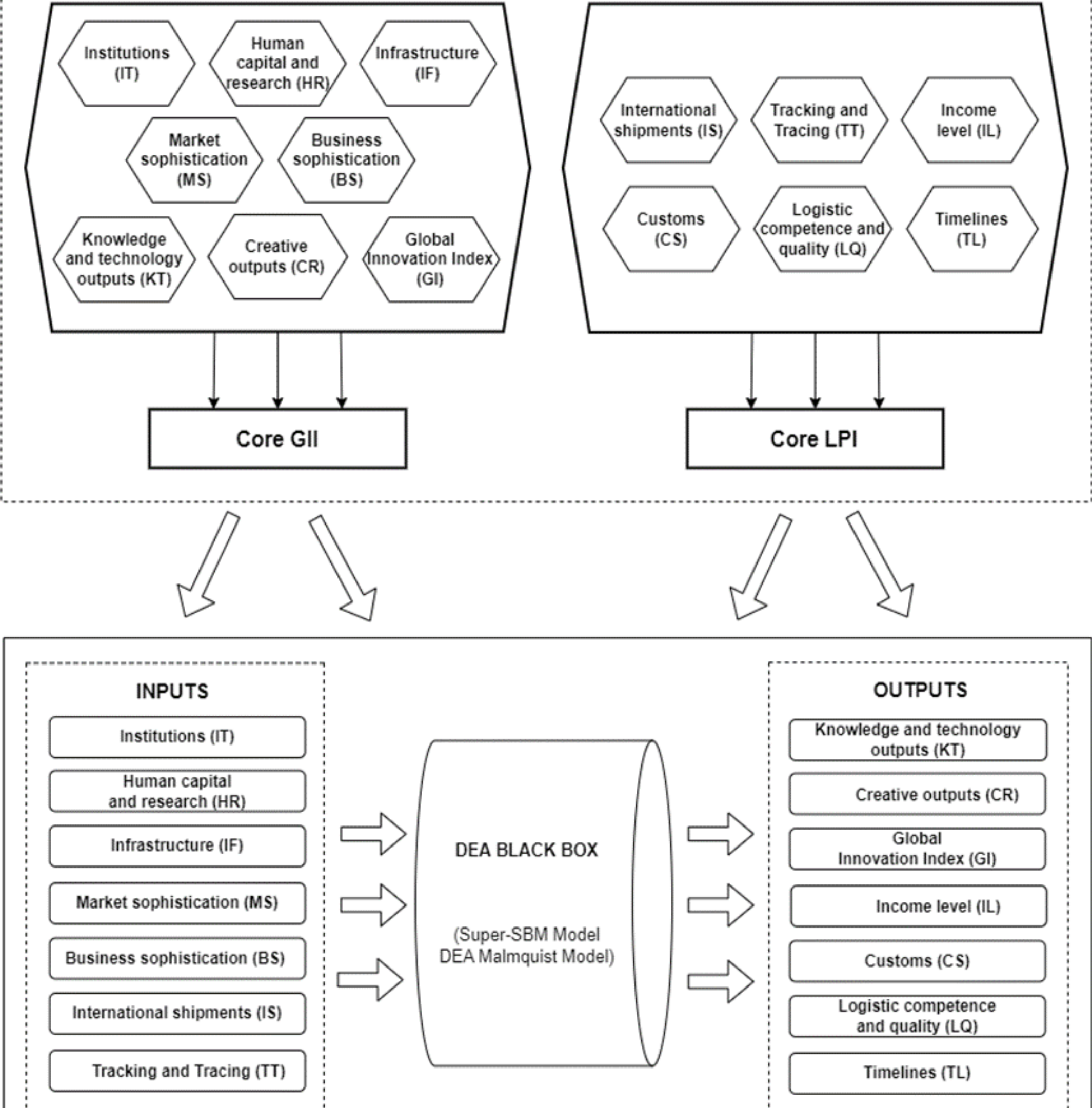
4.2 Super-SBM Results

4.3 Malmquist Results

4.4 Discussion

Data Collection

The study establishes 14 specific input and output factors outlined to enhance the analysis further.

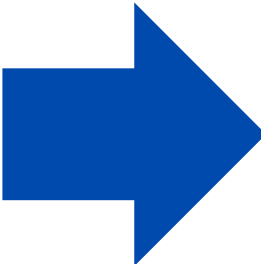


4.2

Pearson Correlation Coefficient

Table A1: Correlation (Time period = 2012)

	Institution	Human ca	Infrastruc	Market sc	Business	Internatio	Tracking	Knowledg	Creative c	Global In	Income le	Customs	Logistics	Timelines
Institution	1,000	0,843	0,744	0,706	0,697	0,501	0,506	0,438	0,576	0,839	0,746	0,623	0,497	0,484
Human ca	0,843	1,000	0,835	0,571	0,759	0,500	0,582	0,495	0,597	0,858	0,834	0,569	0,525	0,567
Infrastruc	0,744	0,835	1,000	0,719	0,875	0,792	0,858	0,639	0,630	0,926	0,780	0,806	0,832	0,844
Market sc	0,706	0,571	0,719	1,000	0,698	0,620	0,611	0,599	0,423	0,805	0,465	0,667	0,594	0,586
Business	0,697	0,759	0,875	0,698	1,000	0,746	0,790	0,608	0,667	0,902	0,687	0,736	0,742	0,815
Internatio	0,501	0,500	0,792	0,620	0,746	1,000	0,909	0,597	0,613	0,763	0,500	0,870	0,920	0,906
Tracking	0,506	0,582	0,858	0,611	0,790	0,909	1,000	0,555	0,611	0,773	0,593	0,845	0,949	0,951
Knowledg	0,438	0,495	0,639	0,599	0,608	0,597	0,555	1,000	0,179	0,751	0,462	0,560	0,585	0,514
Creative c	0,576	0,597	0,630	0,423	0,667	0,613	0,611	0,179	1,000	0,681	0,567	0,545	0,533	0,681
Global In	0,839	0,858	0,926	0,805	0,902	0,763	0,773	0,751	0,681	1,000	0,769	0,775	0,745	0,767
Income le	0,746	0,834	0,780	0,465	0,687	0,500	0,593	0,462	0,567	0,769	1,000	0,602	0,585	0,555
Customs	0,623	0,569	0,806	0,667	0,736	0,870	0,845	0,560	0,545	0,775	0,602	1,000	0,925	0,836
Logistics	0,497	0,525	0,832	0,594	0,742	0,920	0,949	0,585	0,533	0,745	0,585	0,925	1,000	0,913
Timelines	0,484	0,567	0,844	0,586	0,815	0,906	0,951	0,514	0,681	0,767	0,555	0,836	0,913	1,000



Pearson correlation coefficient values for all DMUs during the four-year timeframe are not only statistically significant but also consistently positive

4.3 Super-SBM Results

Table 4.1: Competitiveness efficiency

Table 4.1: Competitiveness efficiency scores and ranking of Asian countries (2012–2018)

Country	2012	2014	2016	2018	Average Scores	2012	2014	2016	2018	Average Ranking
	Efficiency Scores					Ranking				
Pakistan	1.280	1.188	1.082	1.061	1.153	1	1	5	7	4
Kuwait	1.054	1.067	1.167	1.143	1.108	9	4	2	1	4
Armenia	1.008	1.073	1.134	1.117	1.083	20	3	4	2	7
Thailand	0.889	1.004	1.404	1.010	1.077	26	26	1	21	19
Tajikistan	1.054	1.122	1.070	1.059	1.076	8	2	6	8	6
China	1.112	1.050	1.026	1.095	1.071	2	8	15	3	7
Cyprus	1.008	1.047	1.139	1.049	1.061	21	11	3	10	11
Jordan	1.070	1.047	1.045	1.065	1.057	6	10	8	6	8
Mongolia	1.036	1.033	1.034	1.076	1.045	11	16	11	4	11
Turkey	1.030	1.065	1.045	1.040	1.045	12	5	9	12	10
Qatar	1.067	1.038	1.036	1.021	1.041	7	14	10	16	12
Indonesia	1.079	1.055	1.009	1.017	1.040	3	6	22	17	12
Oman	1.075	1.022	1.032	1.029	1.040	5	20	12	14	13
Cambodia	0.680	1.039	1.051	1.068	0.960	30	13	7	5	14
Hong Kong	1.004	1.012	0.811	1.000	0.957	23	22	30	27	26
Kyrgyzstan	1.028	0.732	1.001	1.031	0.948	14	30	27	13	21

Super-SBM Results

Country	2012	2014	2016	2018	Average Scores	2012	2014	2016	2018	Average Ranking	
	Efficiency Scores					Ranking					
Pakistan	1.280	1.188	1.082	1.061	1.153	1	1	5	7	4	Five countries with the highest efficiency score
Kuwait	1.054	1.067	1.167	1.143	1.108	9	4	2	1	4	
Tajikistan	1.054	1.122	1.070	1.059	1.076	8	2	6	8	6	
Armenia	1.008	1.073	1.134	1.117	1.083	20	3	4	2	7	
China	1.112	1.050	1.026	1.095	1.071	2	8	15	3	7	
Thailand	0.889	1.004	1.404	1.010	1.077	26	26	1	21	19	Three countries with the most fluctuations
Armenia	1.008	1.073	1.134	1.117	1.083	20	3	4	2	7	
Cyprus	1.008	1.047	1.139	1.049	1.061	21	11	3	10	11	
Singapore	1.024	1.012	1.002	1.009	1.012	15	23	26	22	22	Five countries with the least efficiency score
Philippines	1.013	0.902	1.022	1.004	0.985	17	28	18	25	22	
Lebanon	1.007	1.005	1.020	0.841	0.968	22	25	20	30	24	
Hong Kong	1.004	1.012	0.811	1.000	0.957	23	22	30	27	26	
Malaysia	0.842	0.821	0.848	0.888	0.850	28	29	29	29	29	

The average efficiency scores of 30 Asia countries in 2012-2018 was high. Most of the scores were more than 1. The average efficiency score obtained throughout the years is merely 1.009 to 1.027

Country	Average Score	Average Rank	(I) IT	(I) HR	(I) IF	(I) MS	(I) BS	(I) IS	(I) TT	(O) KT	(O) CR	(O) GI	(O) IL	(O) CS	(O) LQ	(O) TL
Russia	1.031	16	0.000	0.000	0.000	0.109	0.071	0.039	0.217	1.849	2.034	0.084	0.276	0.248	0.030	0.052
China	1.071	7	6.101	0.000	0.671	0.973	0.000	0.000	0.000	1.475	2.026	0.089	0.197	0.059	0.118	0.195
India	1.021	21	0.462	0.000	0.000	0.000	0.000	0.052	0.000	1.519	2.093	0.596	0.220	0.107	0.048	0.079
Saudi Arab	1.013	21	0.631	0.000	0.000	0.000	0.078	0.004	3.430	7.014	2.427	1.009	0.168	0.121	0.107	0.032
Mongolia	1.045	11	0.000	0.000	0.000	0.000	0.042	0.087	2.800	0.948	0.000	0.152	0.448	0.226	0.250	0.045
Indonesia	1.040	12	3.487	0.000	0.000	0.000	0.058	0.013	1.121	3.544	0.264	0.973	0.151	0.081	0.000	0.000
Pakistan	1.153	4	1.775	1.876	1.667	3.052	0.000	0.000	0.404	1.384	1.411	0.504	0.001	0.000	0.000	0.064
Turkey	1.045	10	1.018	1.110	0.748	0.800	1.225	0.000	0.000	1.881	0.000	0.000	0.049	0.095	0.171	0.018
Thailand	1.077	19	0.535	1.744	1.172	2.710	1.562	0.000	1.082	4.719	1.932	0.000	0.000	0.069	0.061	0.078
Japan	1.010	21	0.000	0.000	0.000	0.000	0.024	0.095	0.000	1.965	2.960	0.000	0.023	0.000	0.046	0.150
Vietnam	0.986	17	0.611	3.447	2.855	1.069	1.050	0.000	0.010	0.674	1.471	0.302	0.416	0.123	0.132	0.000
Malaysia	0.850	29	9.724	8.277	0.000	5.693	2.149	0.125	2.129	4.823	0.806	0.433	0.242	0.075	0.140	0.175
Oman	1.040	13	0.000	0.000	0.346	1.206	0.087	0.052	4.138	3.171	1.361	0.709	0.015	0.007	0.043	0.070
Philippines	0.985	22	0.270	0.788	0.840	0.594	0.000	0.008	0.000	1.875	2.592	0.176	0.172	0.105	0.024	0.058
Kyrgyzstan	0.948	21	2.652	0.982	3.294	0.000	0.041	0.110	1.289	8.280	4.141	0.648	0.364	0.090	0.077	0.000
Cambodia	0.960	14	1.731	3.345	1.013	1.854	0.629	0.000	0.279	4.124	1.474	0.846	0.269	0.077	0.106	0.057
Tajikistan	1.076	6	0.000	1.929	1.594	1.247	1.281	0.043	0.023	3.977	1.254	0.096	0.102	0.065	0.161	0.063
South Korea	1.024	17	0.000	0.000	0.538	0.263	0.692	0.099	0.027	0.633	0.885	0.000	0.000	0.037	0.160	0.188
Jordan	1.057	8	0.000	0.124	2.269	1.338	0.873	0.101	0.000	2.152	0.000	0.033	0.076	0.034	0.105	0.182
UAE	0.980	21	1.441	0.000	1.854	3.320	0.058	0.034	3.843	5.059	1.784	0.533	0.000	0.034	0.041	0.200
Georgia	1.026	16	0.000	0.000	0.241	0.160	0.029	0.045	0.074	2.268	2.351	0.000	0.025	0.076	0.038	0.103
Egypt	1.024	18	0.000	0.000	1.294	0.234	0.010	0.000	0.001	1.416	2.881	0.408	0.220	0.073	0.026	0.000
Armenia	1.083	7	1.668	1.392	0.310	0.000	0.006	0.083	0.000	0.832	1.787	0.151	0.095	0.018	0.116	0.025
Kuwait	1.108	4	1.539	0.000	0.474	1.770	3.272	0.084	0.057	0.660	0.438	0.000	0.031	0.118	0.040	0.098
Qatar	1.041	12	0.000	0.000	2.138	2.301	0.029	0.168	3.827	0.000	1.209	0.210	0.029	0.125	0.082	0.047
Lebanon	0.968	24	0.000	0.071	0.704	0.000	2.304	0.053	2.536	3.126	1.602	0.345	0.083	0.203	0.253	0.000
Cyprus	1.061	11	0.000	0.733	0.755	0.000	0.042	0.097	0.035	0.033	0.491	0.000	0.024	0.123	0.115	0.032
Bahrain	0.983	20	2.737	2.519	1.515	1.274	0.046	0.000	0.786	6.719	2.329	0.645	0.019	0.074	0.252	0.070
Singapore	1.012	22	0.000	0.000	0.000	0.000	0.022	0.085	1.359	3.588	2.597	0.273	0.154	0.000	0.137	0.137
Hong Kong	0.957	26	3.591	1.117	1.407	0.000	0.056	0.068	5.656	5.984	1.094	0.389	0.000	0.035	0.241	0.589

Table 4.2: Average Slack of Asian Countries (2012 – 2018)

4.4

Malmquist Results

Table 4.3: Catch-up of Asian countries (2012 - 2018)

Country	2012=>2016	2014=>2018	Average
Thailand	1.651	0.995	1.323
Cambodia	1.246	1.071	1.159
Armenia	1.149	1.087	1.118
Kuwait	1.122	1.055	1.088
Vietnam	1.143	1.025	1.084
Kyrgyzstan	0.853	1.301	1.077
Cyprus	1.141	0.983	1.062
Bahrain	1.145	0.978	1.062
Mongolia	1.026	1.083	1.055
Egypt	1.047	1.062	1.054
Turkey	1.084	0.995	1.039
Malaysia	1.026	1.027	1.026
Philippines	1.000	1.040	1.020
Average	1.018	1.002	1.010
South Korea	1.014	1.002	1.008
Japan	0.995	1.015	1.005
Oman	0.976	1.028	1.003

Country	2012=>2016	2014=>2018	Average
Qatar	0.984	0.988	0.986
Singapore	0.974	0.995	0.985
Georgia	0.989	0.969	0.979
Lebanon	1.027	0.926	0.977
Tajikistan	1.010	0.941	0.976
Saudi Arabia	1.013	0.935	0.974
Hong Kong	0.910	0.986	0.948
Jordan	0.861	1.014	0.937
United Arab Emirates	0.921	0.952	0.937
Russia	0.919	0.932	0.926
India	0.830	0.991	0.910
Indonesia	0.930	0.885	0.907
Pakistan	0.781	0.941	0.861
China	0.775	0.867	0.821

4.4

Malmquist Results

Table 4.4: Frontier-shift of Asian countries (2012 - 2018)

Country	2012=>2016	2014=>2018	Average
Hong Kong	1.102	0.97	1.038
Oman	1.031	1.017	1.024
Kyrgyzstan	1.076	0.966	1.021
Georgia	1.040	0.992	1.016
Mongolia	1.024	0.995	1.010
Singapore	1.000	1.001	1.001
Kuwait	1.022	0.979	1.001
South Korea	0.994	0.999	0.997
Japan	0.995	0.996	0.996
Jordan	1.002	0.984	0.993
Lebanon	0.960	1.019	0.989
Saudi Arabia	0.971	1.004	0.987
Qatar	0.961	1.008	0.985
China	0.962	1.002	0.982
Cyprus	0.981	0.980	0.981

Country	2012=>2016	2014=>2018	Average
Russia	0.967	0.992	0.980
Bahrain	0.947	1.010	0.979
Armenia	0.988	0.966	0.977
Tajikistan	0.988	0.962	0.975
Egypt	1.004	0.941	0.972
Indonesia	0.968	0.950	0.960
United Arab Emirates	0.938	0.960	0.950
Turkey	0.949	0.928	0.939
India	0.970	0.901	0.935
Malaysia	0.938	0.928	0.933
Thailand	0.932	0.927	0.929
Pakistan	0.978	0.878	0.928
Vietnam	0.912	0.901	0.907
Cambodia	0.883	0.920	0.901
Philippines	0.950	0.828	0.889

4.4 Malmquist Results

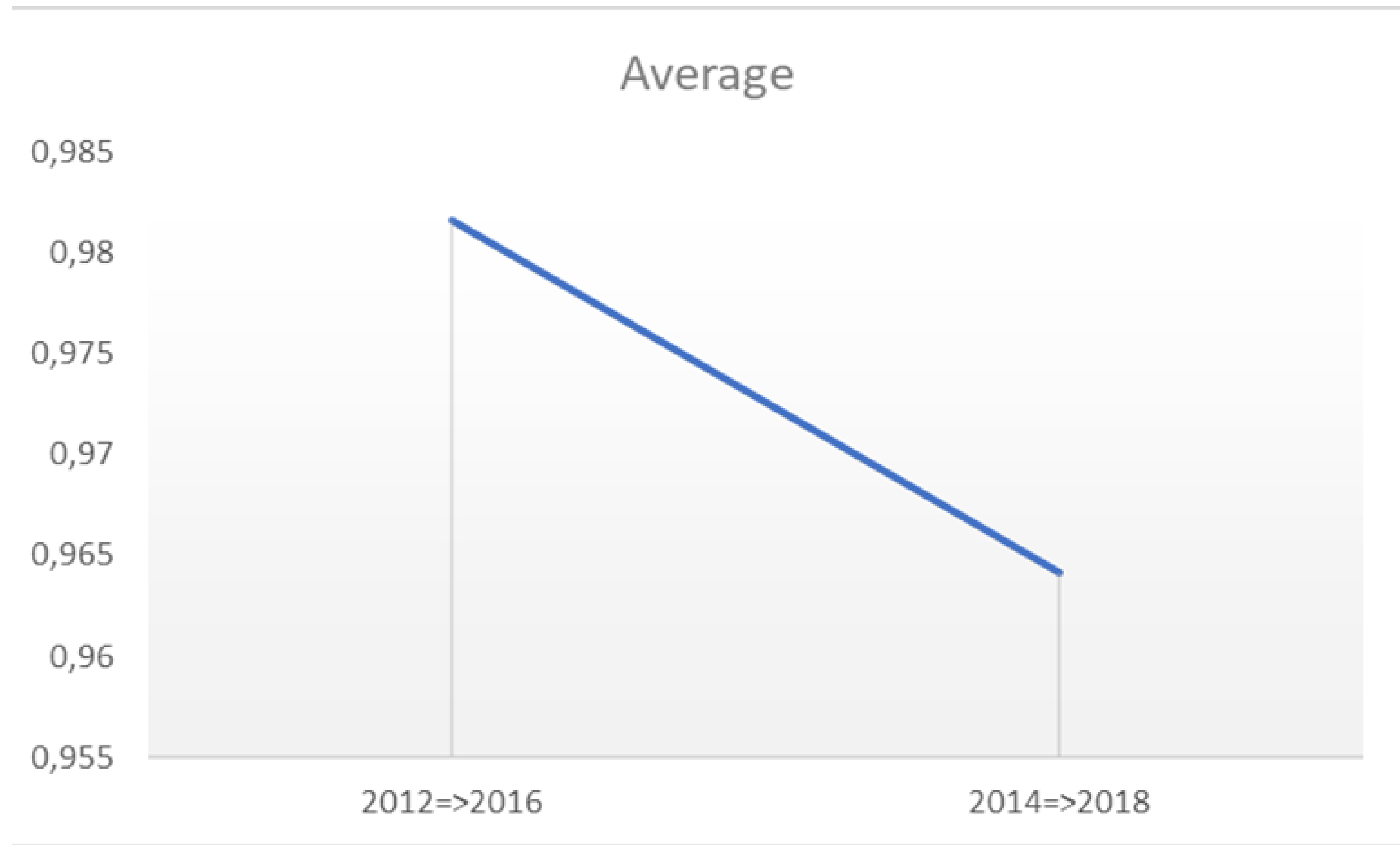


Chart 4.2: The Average Frontier Shift score in 2 period

4.4

Malmquist Results

Table 4.5: Malmquist Productivity Index (2012–2018)

Country	2012-2016	2014-2018	Average
Japan	0.992	1.012	1.002
South Korea	1.009	1.002	1.006
Egypt	1.052	0.999	1.026
Oman	1.007	1.047	1.027
Bahrain	1.086	0.989	1.038
Cyprus	1.120	0.965	1.043
Cambodia	1.101	0.987	1.044
Mongolia	1.051	1.079	1.065
Kyrgyzstan	0.920	1.258	1.089
Kuwait	1.148	1.034	1.091
Armenia	1.137	1.051	1.094
Thailand	1.540	0.923	1.232
Pakistan	0.765	0.827	0.796
China	0.746	0.870	0.808
India	0.805	0.893	0.849

Country	2012-2016	2014-2018	Average
Indonesia	0.902	0.841	0.872
United Arab Emirates	0.865	0.916	0.891
Philippines	0.951	0.862	0.907
Russia	0.890	0.926	0.908
Jordan	0.864	0.999	0.932
Tajikistan	0.999	0.907	0.953
Malaysia	0.964	0.953	0.959
Saudi Arabia	0.984	0.939	0.962
Lebanon	0.987	0.945	0.966
Qatar	0.947	0.996	0.972
Turkey	1.030	0.924	0.977
Hong Kong	1.004	0.962	0.983
Vietnam	1.044	0.925	0.985
Singapore	0.976	0.997	0.987
Georgia	1.030	0.962	0.996

4.4 Malmquist Results

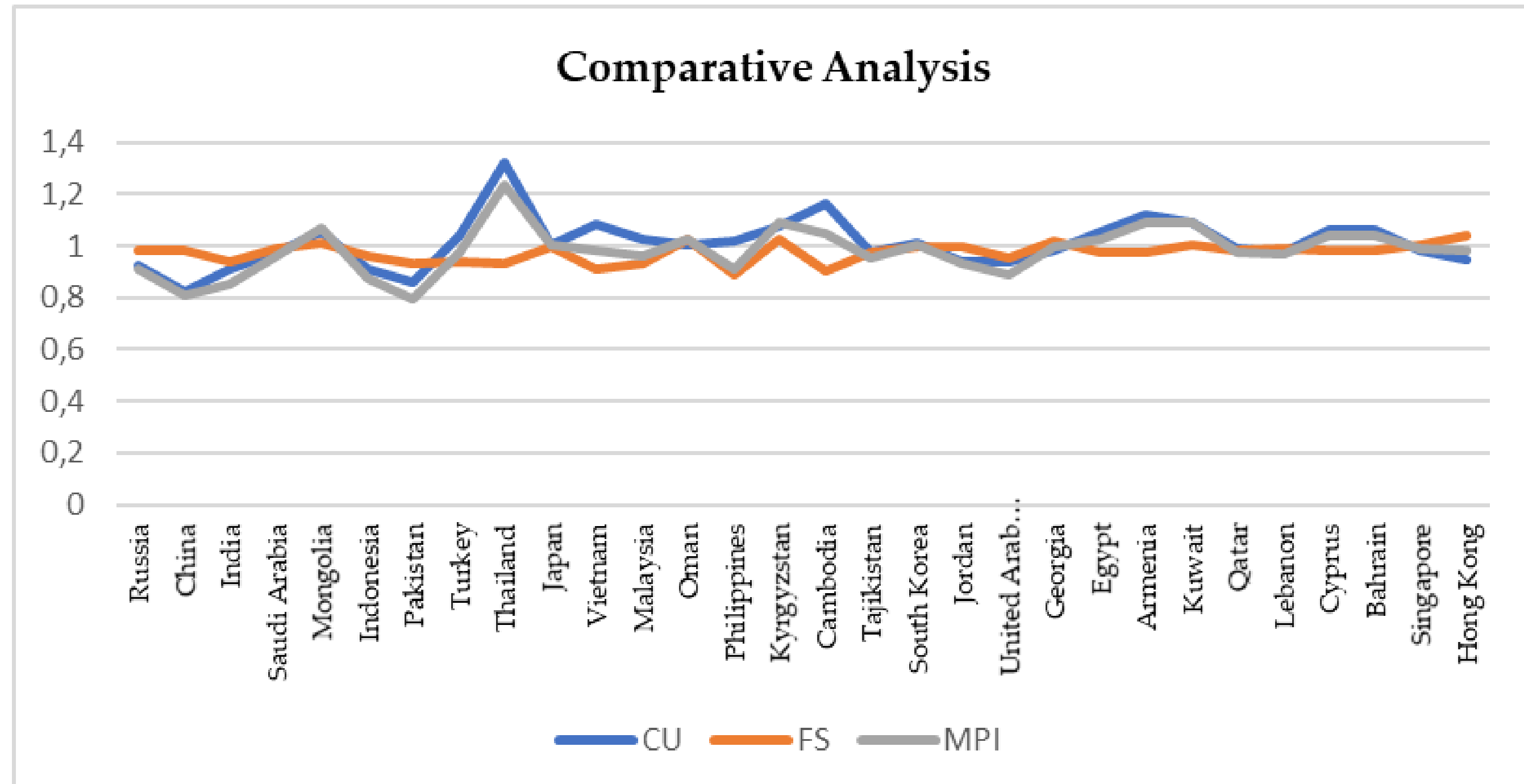
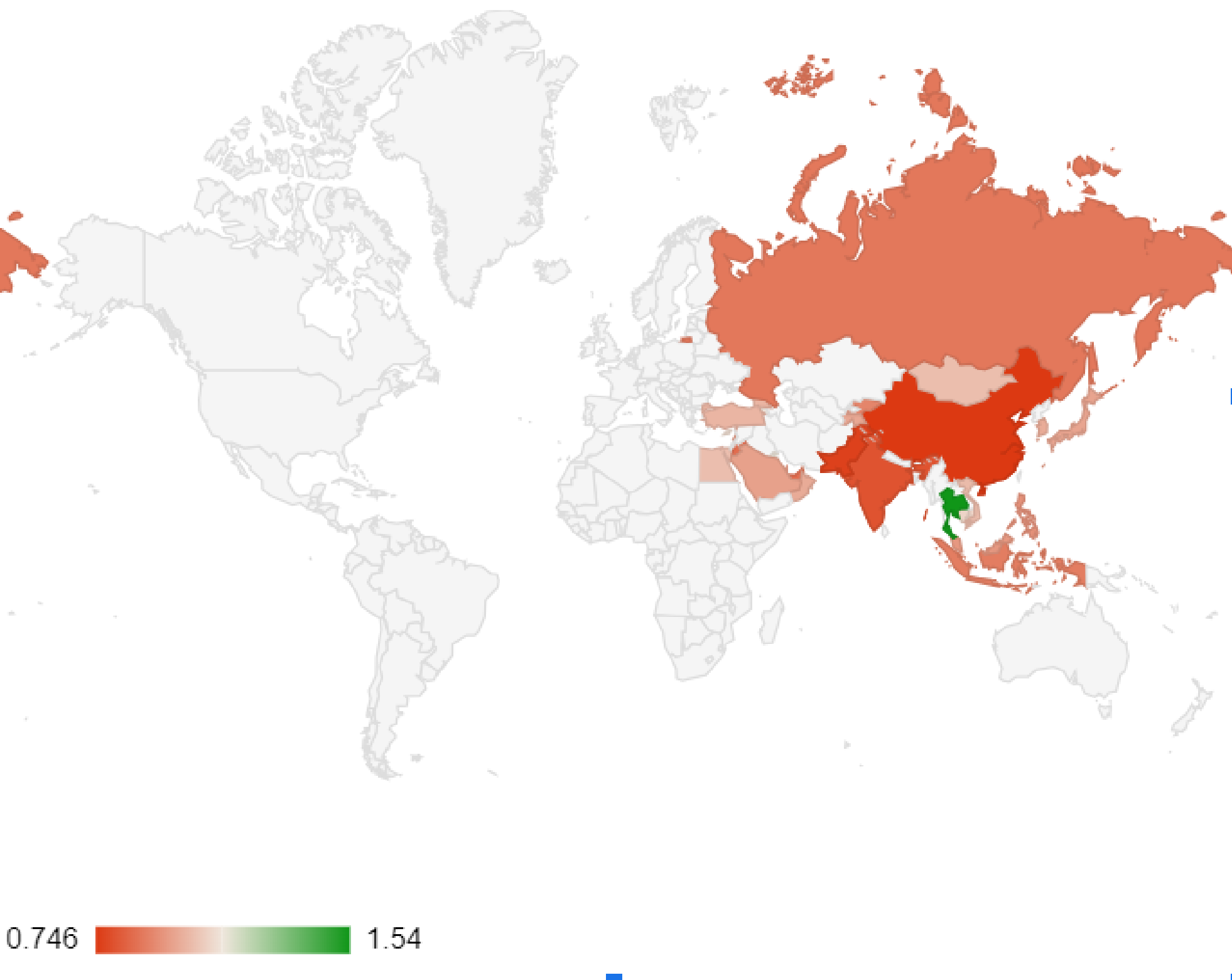


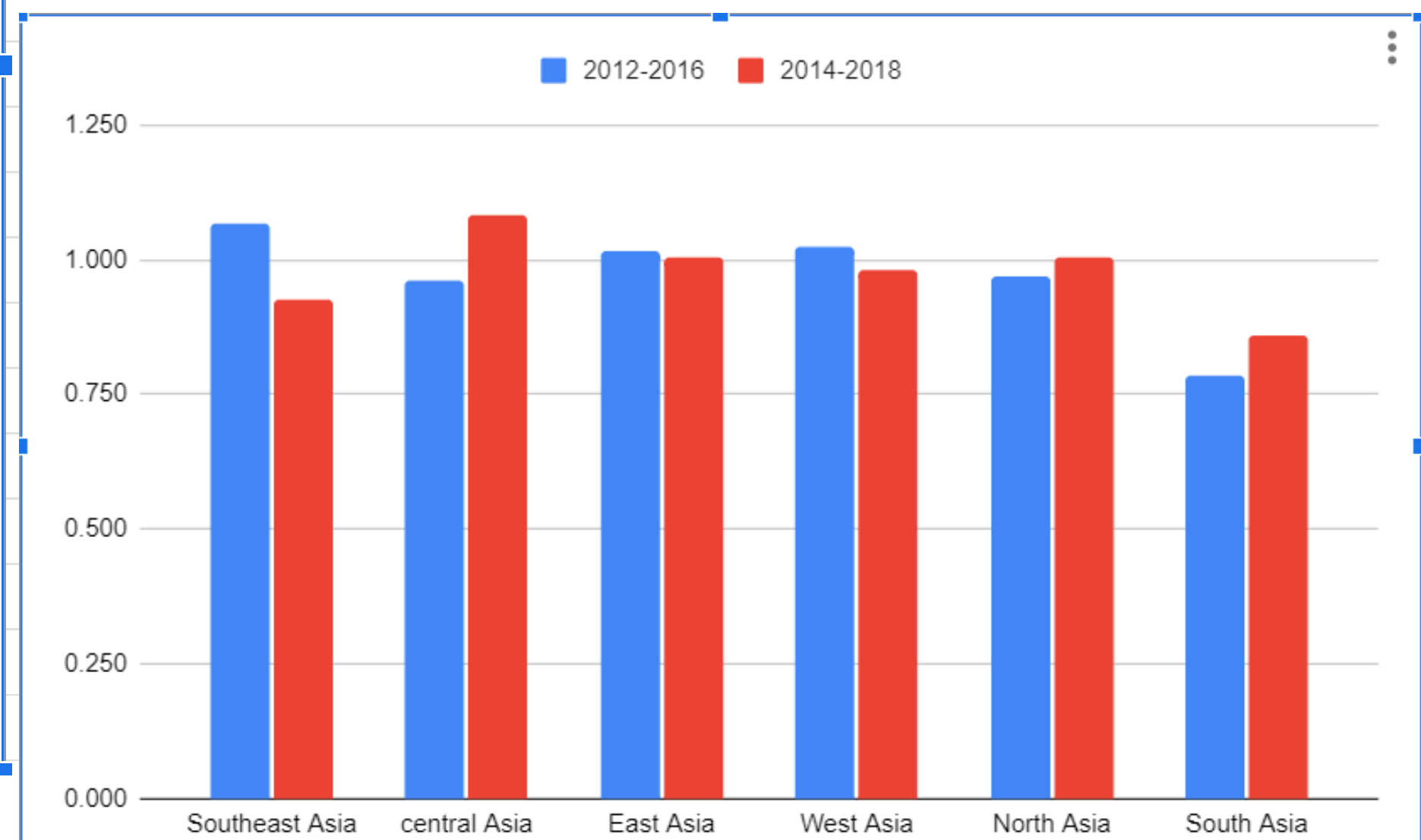
Chart 4.4: Comparison of CU, FS, and MPI

The analysis findings revealed an intriguing pattern, highlighting the significance of efficiency change compared to technical change in driving productivity improvements

4.5 Discussion



Region	2012-2016	2014-2018
Southeast Asia	1.068	0.927
Central Asia	0.960	1.083
East Asia	1.014	1.005
West Asia	1.022	0.981
North Asia	0.971	1.003
South Asia	0.785	0.860



5. CONCLUSION

5.1 Conclusion

5.2 Implications

5.3 Limitations and
Future Works

5.1

Conclusion

01 Competitiveness is pivotal in ensuring a nation's economic health and vitality

02 This study employed the Super-SBM and DEA Malmquist models to assess the competitiveness of 30 Asian nations relative to GII and LPI between 2012 and 2018

03 This study provides valuable insights into the competitiveness of Asian countries, offering guidance for policymakers in formulating effective strategies to enhance competitiveness and stimulate economic development

5.1

Implications

✧ Theoretical Implications

01

The study introduces a pioneering approach to evaluating the competitive strength of Asian countries by integrating the GII and the LPI

02

The research findings have broad applicability beyond Asia, providing a basis for assessing competitiveness globally

03

This study's focus on Asian countries contributes a valuable perspective to the existing literature on competitiveness

Implications

* Managerial Implications

Provides policymakers with a roadmap to prioritize areas for improvement



Enables policymakers to assess their countries' performance relative to regional counterparts



Presents a longitudinal view of competitiveness trends



5.3

Limitations and Future Works

Limitations

The GII and the LPI have inherent limitations

The assumption of a linear relationship between innovation and logistics performance

The subjective selection of variables and assignment of weights

The datasets may not be up-to-date

Future Works

Explore alternative frameworks,
A broader range of variables,
Employ advanced statistical techniques

Conduct case studies focusing on specific Asian countries and include external factors

Acknowledging and overcoming these limitations through further research

This research paper has been accepted for presentation at the 15th Global Conference on Business and Social Sciences.

It currently under review at the Journal of the Knowledge Economy.



LETTER OF ACCEPTANCE

15th Global Conference on Business & Social Sciences

"Contemporary Issues in Management and Social Sciences Research"

Dates: 14-15 SEPTEMBER 2023 **(IN-PERSON & ONLINE)**

NOVOTEL BANGKOK PLATINUM PRATUNAM, BANGKOK, THAILAND

Date: 9th June 2023

Authors: Phi-Hung Nguyen, Dieu-Vi Thi Dao, Ha-Anh Vu, Duong-Dang Pham, Viet-Phuong Vu Nguyen,

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Paper Title: Assessing Asian Countries' Competitiveness: Two-Stage DEA Analysis Of Global Innovation Index And Logistics Performance Index Integration.

Dear Phi-Hung Nguyen,

Congratulations! We are pleased to confirm that the GCBSS committee has accepted your submitted paper abstract based on a double-blind peer review for an oral presentation at the 15th Global Conference on Business and Social Sciences in Novotel Bangkok Platinum Pratunam, Bangkok, Thailand.

Please note the following important guidelines:

1. Your paper abstract number is **CIMSSR-00370**, and please quote this number for all future correspondence. Please double-check the accuracy of the abstract title, address, and spelling of the author's name and name of the university and send us the corrected abstract, if necessary, by **10th June 2023**.
2. Your paper abstract will be published in the Refereed Conference Proceedings, which will be published online and in a CD form with ISBN 978-967-13147-0-8. All submitted conference full papers will go through a double-blind peer-review process by two to three competent reviewers. **All accepted** full articles would be published in any **WOS/Scopus/A-Category-indexed** journals with revisions. (Journals list available at [Publication Opportunity](#)).
3. You must send us the enclosed completed registration form and a payment slip **on or before 19th June 2023 to avail normal fee discount. Afterward, a late fee will be applied**. For more details, [click here](#)
4. The 15th GCBSS conference program will be sent to registered participants after **6th September 2023**. Two parallel presentations: Abstract-based presentation duration is 12-15 Minutes, including Discussions, and the full paper-based presentation duration is 15-20 minutes, including discussions. Please bring your flash drive, pen drive, or USB containing PowerPoint slides. We will provide an LCD projector and a computer at the venue for in-person guests. All online presentations will be conducted through Zoom.
5. Please visit the [15th GCBSS](#) web and read all information related to [Venue](#), [Accommodation](#), [Academic Discussion Session](#), Publishing in [ABS & ABDC Workshop](#), and all other details. We look forward to meeting you at the conference.

Yours sincerely

Prof Abd Rahim

GCBSS Conference Team



Collaborators:

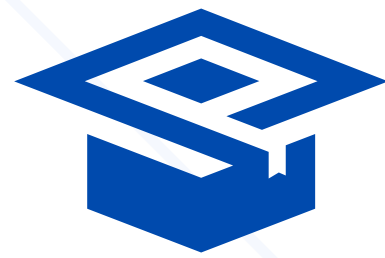


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Thank You