Ibrahim, Musa Jega (Ed.)

Book

Emerging issues in economics and development

Chapter 1

Introductory Chapter: Economics, Natural Resources and Sustainable Development

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Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.70399

1. Introduction

Economics, which has evolved into set of principles that define rational behavior of various stakeholders, is the fountain for achieving sustainable development-appreciable level of social and economic well-being of the people that is inter-generationally balanced. Effective governance, resource endowments, and demography are complementary factors that need to be properly coordinated based on sound economic principles to underpin the process of sustainable development. The division of economics into microeconomics and macroeconomics has gained prominence in economic theory, but the distinction is mainly about whether analysis and economic decision-making focus on individual economic agents such as households and firms (microeconomics) or activities of the overall economy relating to such indicators as national income, employment, and government policies (macroeconomics). In practice, the microeconomics and macroeconomics intertwine such that the conditions of the overall economy influence the decisions of individual economic agents and in turn, the performance of the economy depends on the activities of individual economic agents. Essentially, all economic agents, at both micro and macro level of economic analysis, act in accordance with rational economic principles to optimize outcomes that collectively provide the basis for attaining economic growth and sustainable development.

As a demonstration of the essence of economics, in terms of both micro and macro, empirical analysis of various economic activities relating to emerging sustainable development issues, undertaken by different authors, is compiled and presented in the chapters of this book. This

introductory chapter, however, provide overview of the essence of economics in the context of theory, philosophy, and principles that guide decision-making of economic agents with the coordination function of government to foster sustainable development. The remainder of this introductory chapter is classified into three sections. The section that follows focus on the nexus of economics and sustainable development, followed by the analysis of natural resource use for economic growth and implications for sustainable development. The concluding section articulates the imperativeness of effective governance in achieving sustainable development despite the existence of sound economic principles to guide economic agents.

2. The nexus of economics and sustainable development

The essence of economics is the well-being of the people, which is formulated as the maximization of social welfare function (SWF). Economic activities lead to transformation of natural resources into consumable/usable goods and services, in other words, production of goods and services, create income earning job opportunities for achieving best outcomes of SWF. However, as more intense economic activities push up the SWF, it generates environmental drawbacks such as pollution that tends to affect social welfare negatively. Besides, the exhaustibility of natural resources imposes limits on the extent to which economic activities could be intensively undertaken.

Thus, economics recognizes that apart from direct welfare benefits (income, consumption, etc.), there are positive and negative externalities-unintended consequences arising from economic activities. For instance, economic activities could give rise to positive externalities such as backward and forward linkages, learning-by-doing, and technological progress. It could also give rise to environmental challenges such as pollution and associated adverse health and social adversities in form of negative externalities. Rational economic principles require that policy formulation and implementation leads to chain of economic activities to generate growth while minimizing adverse effects arising from natural resource utilization. Hence, the most critical factor in achieving sustainable development lies in the proper management of the complex interactions among various forces within the economic, political, and social environment.

3. Natural resources, economic growth, and sustainable development

Natural resource utilization, pollution, and other environmental considerations have become critical to the possibilities of long-run economic growth and by extension sustainable development. The effect of natural resources on society is as old as human activities as the environment inserts itself between nature and society. Economic activities (production, exchange, and consumption) generate environmental problems while the depletion of scarce renewable and nonrenewable natural resources raise concerns about the sustainability of economic rents from the exploitation of natural resources. Sustainable development, a steady state long-term economic and social well-being, hinges on economic growth "a long term rise in capacity to supply increasingly diverse economic goods to its population; this growing capacity is based on advancing technology and the institutional and ideological adjustments that it demands" [1].

http://dx.doi.org/10.5772/intechopen.70399

Natural resources have a double-edge effect on economic growth, in that the intensity of its use raises output, but increases its depletion rate. Natural resource is a key input in the production process that stimulates economic growth. However, the depleting character of natural resources coupled with diminishing returns of factor input implies that dependence on natural resource utilization is not an optimal strategy for sustainable growth. By extension, intensive utilization of natural resources undermines sustainable development. Natural resources have limited direct economic use in satisfying human needs but transforming them into goods and services enhances their economic value to the society. Through the mix of productive activities by different sectors of the economy, transformation of natural resources into usable goods and services occurs to propel the overall economy to achieve sustainable growth that forms the basis for sustainable development.

The productivity of factors of production has positive relationship with absorptive capacity. Technological inter-connections among various sectors of the economy could evolve from structural and spatial interdependence of the production processes of the sectors. The rational response to incentives leads to increase in the level of activities of sectors of the economy in a self-reinforcing manner. The expansion of activities in the various sectors of the economy is mutually self-stimulating to provide opportunities for economies of scale that translate into lower per unit cost of production.

The temptation for rent-seeking behavior could undermine the efficient use of the natural resources to stifle economic growth and weaken the possibility of positive externalities. The use of rents derived from natural resource extraction to facilitate complacent consumption[1] at the detriment of real production leads to the expansion of nontradable sector activities while tradable sector activities such as manufacturing shrink. This give rise to the "Dutch Disease"[2], which is a chronic source of slow growth due to the absence of "backward and forward" linkages among sectors of the economy [2]. The manufacturing sector, with a sound service sector for support, is a vital source for economic growth through learning-by-doing, as such should have a pivotal link with natural resource sector to stimulate real productive activities that propels the economy toward sustainable growth and development. Ideas that emanate from production processes is the driving force for generating high levels of growth [3] to form the bedrock for sustainable development.

As the essence of sustainability is to maintain a given level of social welfare at a constant level [4], six key conditions are prerequisites. These are nondeclining consumption (utility), maintaining (constant) production opportunities over time, nondeclining natural capital stock, maintaining a steady yield of resource services, stability and resilience of the ecosystem through time, and the development of capacity for consensus building. These sustainability conditions require efficient management of resources as well as ethical and moral standards, which makes the crucial role of government in coordinating economic, social, and political activities imperative for achieving sustainable development.

[1]This refers to a consumption pattern that is disconnected from economic activities of a given economy as such does not stimulate further economic activities of the economy.

[2]The "Dutch disease" is an economic phenomenon in which a sharp increase in the output and revenue of one product in an economy has adverse repercussions in other sectors of the economy. There are variant models of the "Dutch disease" syndrome, all of which demonstrates that the existence of large natural resource sectors, or booms in these natural resource sectors, will affect the distribution of employment throughout the economy as wealth effects pull resources in and out of other sectors of the economy. The disease is most pernicious when the revenue of the product that started the problem reverses itself, and the economy is left high and dry with an inappropriate composition of output.

4. Conclusion: governance and sustainable development

Economic activities thrive with the existence of basic infrastructures and the rule of law that guarantees property rights (patents and copyright laws). In addition, human capital formation, which is the bedrock upon which all aspects of economic growth processes are hinged, requires to be nurtured by services that are provided by nonprofit making principles. Furthermore, natural resource sectors, around which many economic activities revolve, require legal and institutional framework based on robust institutional principles [5].

These essential services (provision of infrastructure, the rule of law, and human capital formation) are nonexcludable public goods; and therefore, not the function of economic agents that aim to maximize profit. It is imperative for government to undertake the crucial function of providing essential services as well as coordinating the activities of economic agents to ensure alignment with strategies for achieving sustainable development. A responsible government will ensure the formulation and implementation of policies for equity inter-generational balance in economic and social welfare for the benefit of both current and future generations, a sine qua non, for sustainable development. In conclusion therefore, even though economics is the fountain of human activities, effective governance, through the proper functioning of institutions and the implementation of robust policies, is crucial for achieving sustainable development.

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References

[1] Kuznets S. Modern Economic Growth: Findings and Reflections. Nobel Prize Lecture; December 11, 1971

[2] Sachs JD, Warner AM. Natural Resource Abundance and Economic Growth. Working Paper 5398, National Bureau of Economic Research (NBER), 1995

[3] Perman R, et al. Natural Resource and Environmental Economics. 2nd ed. England: Person Education Ltd.; 1999

[4] Romer MP. Two strategies for economic development: Using ideas and producing ideas. World Bank Economic Review, Volume 6, pages 63-91, December 1992

[5] Ibrahim MJ. Technological change and economic transformation. Chapter 1. In: Teixteira AC, editor. Technological Change. Intech Publishers; April 2012. ISBN: 978-953-51-0509-1. Available from: http://www.intechopen.com/books/technological-change

Chapter 2

Self-Organizing Maps to Analyze Value Creation in Mergers and Acquisitions in the Telecommunications Sector

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Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.68757

Abstract

A great effort has been made in recent years to refine the study methods that emerged in the 1990s to assess long-term abnormal returns in the stock markets as a way to evaluate the value creation or destruction of merger and acquisition (M&A) in the sector of telecommunications. It is regularly addressed in generic merger and acquisition studies, with a short-term time horizon or just with a qualitative focus. In this work, we use a visual data-mining tool, Self-Organizing-Maps (SOM), to analyze mergers and acquisitions in telecommunications sector. The relationship among variables influencing the M&A was only observed due to the capabilities of the visual neural map method that allow to relate variables, which is not possible with other classical methods. In this work, the relationship obtained with the SOM linking M&A language, M&A cross-border, and size of the acquiring company is an important result.

Keywords: Self-Organizing Maps, data, merger & acquisition, abnormal returns, telecommunications

1. Introduction

The long-term analysis of merger and acquisition (M&A) is a new avenue of research that started in the last decade of twentieth century. Currently, we can often find more researches devoted to this issue in order to understand the long-term corporate performance of these operations, but

it is still quite infrequent in the telecommunication sector. It is regularly addressed in generic merger and acquisition studies, with a short-term time horizon or just with a qualitative focus. Specifically, the analyses of M&A in this sector normally focus on the following:

- Short-term studies using an event-oriented methodology, where the stock market performance of a group of telecommunications firms involved in M&A processes is analyzed [1–3]. Specific studies by countries such as Taiwan [4], Korea [5], Turkey [6], or Brazil [7].
- Concrete examples of M&A operation involve different actors, such as the study of the unsuccessful M&A of Telia and Telenor [8], the Cingular—AT&T Wireless merger [9], the acquisition of Voice Stream by Deutsche Telecom [10], the SBC-Pacific Telesis merger, and the Bell Atlantic-Nynex merger analyzed by Sung and Gort [11].

In telecom, there is an observable shortage of statistical and econometric analyses of a sectorial nature in M&A. Moreover, except for Ref. [12] who studied the sector before liberalization, all of them are short-term studies.

As for results, the evidence is mixed: the assessments that indicate negative abnormal returns stand out [3, 13]. For instance, [5], supported by empirical evidence, suggest that M&A generally do not reward the participants on stock markets primarily because of the dynamic nature of the telecommunications sector, which is characterized by frequent changes of a technical and regulatory nature, market globalization, new product definition, and entry of new competition. However, another group of researchers reveal the positive market reaction to announcements of M&A in telecommunications [2, 14, 15]. There is a certain tendency to recognize, as is customary in the general literature on mergers and acquisitions, that the acquirers are negatively impacted by the M&A. Additionally, the factors involved in the M&A remain unclear. Our work thus aims to throw more light on this issue, especially since long-term research is, as we have seen, practically inexistent for this industry, and the methodological controversy between long-term and short-term analysis remains open.

In order to answer the question: do the M&A in telecommunications create or destroy value in the long term? Nowadays, there are three fundamental methodologies for analyzing the specific returns of the M&A:

- BHAR, *Buy-and-Hold Abnormal Returns*.
- CAR, *Cumulative Abnormal Returns*.
- CTAR, *Calendar-Time Portfolio Approach*.

The calendar-time portfolio approach when constructing the comparison portfolios allows the variance in each of the periods to automatically incorporate the cross-sectional correlation of the individual returns of the sample firms. This is a relevant advantage against the other analyzed methodologies. According to Mitchell and Stafford [16], the use of large samples and the careful construction of benchmark portfolios can partially mitigate the negative effects of the BHAR methodology, but it cannot solve the serious problem of cross-sectional dependence [17].

The calendar-time portfolio methodology results very solid and statistically robust for the analysis of value creation in M&A by evaluating the stock abnormal returns, but the relationship

among possible variables to explain it remains unclear. With classical statistical analysis, further studies of dependences and causes for the values creation or destruction are not conclusive. Other methodologies are required.

In this work, we propose a new approach: Self-Organizing Maps (SOM), a visual data-mining tool to analyze (M&A) in telecommunications sector. We will obtain visual information about the time evolution (short to long term) of the stock cumulative abnormal returns of the M&A acquirer company as a way to evaluate the operation´s value creation or destruction and the behavior of different related parameters. This analysis will make possible to draw qualitative conclusions in such operations.

Self-Organizing Maps are a very useful and effective visualization tool nowadays [18]. It is based on neural networks and its goal is to search and show patterns in high-dimensional data sets. In classical approximations, data are represented in two or three dimensions. However, when the dimension number is higher, the representation of all obtained data is difficult. The dimension restriction in the visualization space makes necessary restrictions in the variables to show, as, for example, to fix some of them and to represent the rest. This limitation gives rise to a partial representation of the representation and important information could be hided or ignored. Nevertheless, SOM enables to visualize all the dimensions (variables) from the data with no restrictions and to find relations in data sets with high dimensionality, allowing to maintain topographical relations between the input and output spaces. Patterns near the original space will be near to the output space [19, 24].

The chapter is structured as follows: Section 2 describes the SOM algorithm. Section 3 describes the data set used to extract the conclusions. Section 4 presents the results obtained with the SOMs used over the data set described. And finally, the conclusions of the work are summarized in Section 5.

2. Self-Organizing Maps

In Ref. [19], Teuvo Kohonen proposed a special neural network: The Self-Organizing Map. After that, SOM has been widely used and analyzed. Most recent reviews can be found in Refs. [20, 21]. This technique and its variants are used often in a broad variety of domains: financial [22], medical [23], and engineering applications [24, 25]. Also in animal sciences SOMs have been applied [26–28]. As a neural network, SOM is formed by neurons, in this case organized in two layers (**Figure 1**): N neurons disposed in the input layer (each input variable has assigned a neuron) and a second layer used to process the information, named output layer. The output layer is disposed in a regular low-dimensional structure, normally, a two-dimensional grid.

Each neuron is represented by an N-dimensional weight vector $\mathbf{m} = [m1,\ldots, mN]$, where N is equal to the dimension of the input vector.

The most important principle in the SOM is to maintain a neighborhood relation between the N-dimensional data space original and the regular low-dimensional grid. In fact, for this

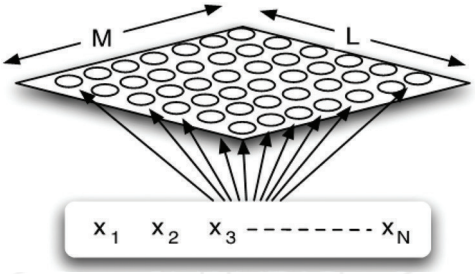

Figure 1. Self-Organizing Map scheme.

paper and this particular case, similar M&A behavior (characterized by the observed variables) will be placed near areas in the low-dimensional output space.

A learning algorithm is used now to calculate the corresponding coefficients for each neuron, called synaptic weights. First, the algorithm makes a weight initialization. With this initial values of synaptic weight selected, the following is to get them closer to the optimum. An iterative procedure is used to obtain these new values. For each training step, the distances between all the weight vectors of the SOM and a random sample vector **x** from the input data set are calculated using some distance measure. The neuron with the weight vector nearest to the input vector **x** is called the *Best-Matching Unit (BMU)*, denoted here by *c*:

$$\| \mathbf{x} - \mathbf{m}c \| = \min_i \{ \| \mathbf{x} - \mathbf{m}i \| \} \quad (1)$$

where || || is the distance measured, typically Euclidean distance.

Once BMU is found, SOM's vectors weight are updated in order that the BMU is moved closer to the input vector in the input space. All topological neighbors of the BMU are treated in the same way.

Once the map training is completed, the visualization of the two-dimensional map named "components plane" provides qualitative information about how the input variables are related to each other for the data set used to train the map. In this figure, the weight vector of neurons that form the map is represented separately using a color code. In this way, establishing relationships among variables is immediate.

3. Data set

The telecommunications M&A occurred between 1995 and 2010 have been counted as samples, to conduct the analysis. These samples have been obtained from the Thomson Routers One-Banker database, including 10,459 announcements. Only operators of the telecommunications sector (SIC codes 4812, 4813, and 4899) with effective date of M&A have been included. In this way, we obtained the specific data for each M&A. Of these data, 4337 are M&A made

"between operators." Financial information has been obtained from the S&P's COMPUSTAT database, obtaining the most significant book values (3878 annual records of fiscal data), and from the University of Chicago CRSP database on monthly stock evolution (18,425 records of monthly listings). All the information was consolidated in a single database. We proceeded to a manual consolidation as the databases are indexed in different ways, and to elaborate the book-to-market ratio.

After the processing, we have obtained 402 samples with all the required data: deal information, the acquirer's stock market data, and its financial book data. A sample of this size is equivalent or larger than those generally analyzed in the studies of M&A in this market. For instance, [1] with 275 operations and [3] with 144 short-term studies and also in the levels of key studies based on long-term generic post-M&A analyses: 399 in [29] and 230 in [30].

To evaluate value creation or destruction, we analyze the short- and long-term abnormal returns provided by the financial markets. We calculate the calendar-time cumulative abnormal returns (*CTARt*), which are defined as the mean abnormal return calculated each month for each firm (*Rpt*), subtracting from the monthly portfolio returns of each firm the reference expected portfolio return ($E[RPt]$) and we cumulate them with different time horizons (3, 6, 12 months, and so on). The final variables used to be analyzed are shown in **Table 1**.

Before proceeding to use the SOM to analyze the data set, possible dependencies between variables were searched. For this purpose, an independent analysis was carried out for discrete variables (χ^2-test) and correlations for the continuous variables. Regarding continuous variables, correlations higher than ($p < 0.05$), in absolute value, were not found, so none of them were removed. Regarding the discrete variables, the next dependencies were found:

- *Dependence Size-Language*. The observed dependence of size and language indicates the influence of proceeding with M&A of same language to guarantee their corporate success [31].

Name of variables	Meaning
Size	Acquirer market: 1 (64%) 0 (36%) 1 big company; 0 small company
Domestic	In-country (25%) Cross-border (75%)
Experience	Number of previous acquisitions (same acquirer, 3-year period)
Language	M&A language: same language (46.5%), different language (53.5%)
Target company's market situation (GDP, penetration of Internet, Mobile before Telephone)	Interannual growth of GDP, internet, mobile and fix penetration (2 years the M&A)
Intangible	Acquirer's intangible assets/total assets ratio
European	European M&A or not: 1 (61.5%) 0 (38.5%)

Table 1. Variables analyzed in this study. The frequency of occurrence of the discrete variables listed.

- *Dependence Size-Spanish*. With the same idea of merging or acquiring companies with same language, the main acquirers in Spanish are Telefonica and America Mo´vil, both are large in size and with preference to proceed with M&A in Spanish.
- *Dependence Domestic-Spanish*. Typically, the M&As in a country use the country language to complete the operation.
- *Dependence European-Spanish*. This dependence was expected because it relates a geographical area (Europe) with one of the languages spoken in this area.

After this analysis, the variables Size and Domestic and European were disregarded.

To analyze the temporal dynamics of the acquisitions, it was considered to modify the CTAR index defining a new input variable to the SOM. Eq. (2) determines the difference in values of the CTAR variable in different temporal instants (6, 12, 24, and 36 months) versus the value initially taken (3 months). In this way, the temporal variation of this index can be integrated into the SOM. As we prefer performing a qualitative analysis, it is important to normalize the initial value from the beginning. It was noted that other approaches used, and not presented in this paper for lack of space, did not present good performance. These approaches were, on one hand, to use CTAR values as variables and, on the other hand, to use the increments without normalize

$$\mathrm{CTAR}_i = \frac{\mathrm{CTAR}_i - \mathrm{CTAR}_3}{\left|\mathrm{CTAR}_3\right|} \tag{2}$$

After that, the SOM was trained with the selected variables, which is discussed in Section 4.

4. Results

This section presents the results obtained with the data set put forward in Section 3. The SOM was trained varying the following training parameters [20]:

- *Initialization*. Two different types of parameter initialization of the model (synaptic weights) were conducted. On one hand, random initialization and on the other, principal component analysis of the inputs was used.
- *Neighborhood function*. The *Gaussian, bubble, and cut-gauss* functions were used as neighborhood functions to update the neuron coefficients close to the winner.
- *Learning algorithm*. Two types of algorithms were used for training the SOM:

- *Sequential*. In this way, the synaptic weights are updated with each pattern of the database.
- *Batch*. Here, the weights are updated when all the patterns of the database are passed. This algorithm is faster than the previous one because it requires fewer updates. However, this algorithm usually provides worse results.

After varying these parameters, 4000 different SOMs were obtained; the selection of the best SOM was based on two different error measures: the topographic and quantization errors

[20]. The topographic error evaluates the neighborhood relationships; that is, it quantifies if patterns close in the original space remain close in the output space (defined by the SOM).

The quantization error measures the quality of the mapping established by the SOM and calculates the norm among the input patterns and the corresponding winner's neurons. As both are important measures, that which presented the best balance between the two measures was chosen. Therefore, the geometric mean between the quantization and topographical errors was chosen as a measure of the quality of SOM. The only problem with this measure is if one of them is zero (this case did not happen). The SOM finally chosen presented a random initialization, sequential learning mode, and Gaussian neighborhood function (**Figure 2**).

The following conclusions can be drawn from **Figure 2**:

- The normalized increase in CTAR index at 6 months is different to that presented at 12–24 months. This indicates that an M&A has a transitional period exceeding the value of 6 months. It shows that any attempt to draw conclusions in that period of time can lead to errors as seen in the subsequent evolutions. Also, there are delimited areas with best performance (top-center part of the map) and with the lowest one (bottom-left part of the map).
- The largest variations of normalized CTAR occur in the same position (top-center part). It is worth mentioning that both Spanish language and language of M&A are found in this area.
- After 36 months, the situation is very similar to the initial one except for the extreme behaviors, or M&A has gone very well or very badly. This fact is proved by the last component which presents values near to zero in almost the entire map.

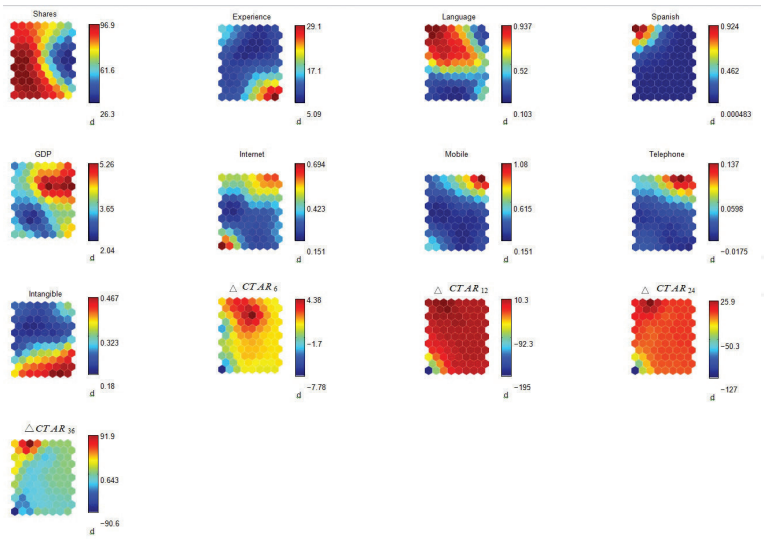

Figure 2. Components plane obtained after the SOM training.

- These regions (bad/good evolution) have different values in the variables *Language, Spanish, and Intangible*.

The results have relevant methodological implications in the discussion of the analysis of value creation timing (short-term vs. long-term analysis). In this sense, several studies are supported against short-term methodologies stressing that the short-term event studies results only reflect the market reaction in a very limited period of time, by evaluating fluctuations around the date of the event. It therefore does not appear that value creation is properly addressed from the structural and sectorial perspective. We can identify several reasons why the evolution of stock market prices in short term does not reflect properly a solid long-run value creation for the acquirer and the market could include the following:

1. It is generally accepted that short-term researches are devoted to M&A announcements around the date of the announcement more that real situations of M&A with an effective date [32].
2. Short-term value changes may reflect speculative or ephemeral changes. The M&A may affect not only the acquirer but also the competitive position, the situation of the rest of the industry and its rivals and even the likelihood of other competitors being acquired [33–35].
3. A short-term analysis window may not capture all the effects on stock markets [35, 36].
4. Supporting the M&A performance conclusions in the analysis of short-term returns means considering that the investors fully understand the determining factors of a successful acquisition and have enough information to accurately predict how the process of integration is going to affect the future results of the acquirer. This assumption is not always possible [37].

Therefore, the validity of our long-term approach in the study of mergers and acquisitions is also supported by these results.

Due to the temporal evolution of the index CTAR, it was decided to carry out a cluster analysis of neurons in the SOM to further clarify the above conclusions. The obtained clusters (10) are shown in **Figure 3**.

Moreover, to study the problem in more depth, the cluster centroids are represented by parallel coordinates (standardized centroids are calculated to jointly represent all variables). This visualization method is useful for data analysis when you need to discover or validate a group structure. **Figure 4** shows such representation. This figure shows the evolution of the variables related to CTAR. Three different behaviors can be observed: one upward, another downwards and other one with constant evolution (where clusters from 8 to 10 are included).

To determine the differences of a good and bad M&A, a new parallel coordinate figure was used (**Figure 5**). For this purpose, the centroids of clusters for good and bad M&A are used. The biggest differences between a successful and a bad M&A are clearly represented in **Figure 5**. The main differences are corresponding to variables 3 and 4 (Language and Spanish), having lower incidence at the ninth, eighth, and second variables (Intangible, Telephone, and Experience) in that order.

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Figure 3. SOM clusters obtained.

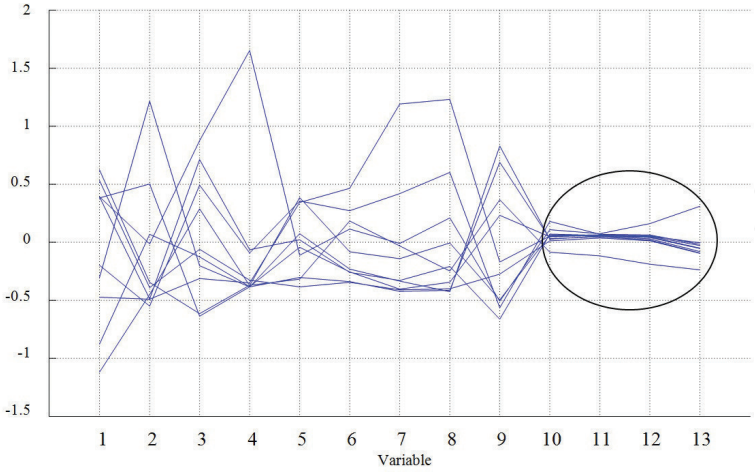

Figure 4. Parallel coordinates of the clusters obtained within the SOM.

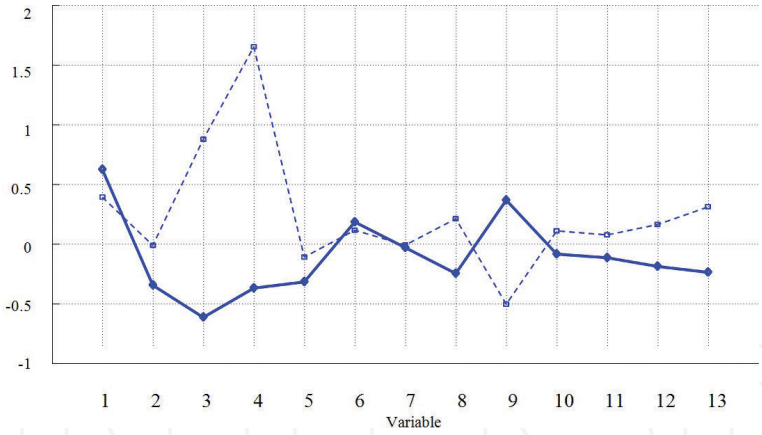

Figure 5. Parallel coordinates of clusters corresponding to a good M&A and bad M&A.

5. Conclusions

This paper proposes the use of a Self-Organizing Map to extract qualitative information about the different variables in M&A operations in the field of telecommunications. The relationship between the variables is complex and highly nonlinear. The Self-Organizing Map together with the parallel coordinate method shows the most important factors in this problem. The current study is relevant for deepening in the study of the variables that influence telecommunications mergers and acquisitions, which, as we saw, is a relatively young field of research. Highlight the importance of language in such transactions, especially when the language, as explanatory value of M&A, is not a factor lavish too much [38, 39]. The chapter discussed the role of the acquirer´s size, which is not a factor extensively studied in the acquirer´s value creation [30] and internationalization [40]. Also, this paper especially relates these factors all together, thanks to the visual analysis and SOM. Additionally, new areas of future research were identified, thanks to the centroids analysis, as the role of post-acquisition degree of control and also the acquirer´s intangible value that usually present the opposite behavior, as the literature points out.

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References

[1] Akdogu E. Gaining a competitive edge through acquisitions: Evidence from the telecommunications industry. Journal of Corporate Finance. 2009;**15**:99-112

[2] Rieck O, Doan CT. Shareholder wealth effects of mergers and acquisitions in the telecommunications industry. Telecommunication Markets: Contributions to Economics. 2009;**5**:363-394

[3] Jope F, Schiereck D, Zeidler F. Value generation of mergers and acquisitions in the technology, media and telecommunications industry. Journal of Telecommunications Management 2. 2010;**4**:369-386

[4] Hsiang-His L, Tser-Yieth C, Lin-Yen P. The influence of merger and acquisition activities on corporate performance in the Taiwanese telecommunications industry. Service Industries Journal. 2007;**27**(8):1041-1051

[5] Nam C, Yang D, Park M, Oh G, Park J. Stock market reaction to mergers and acquisitions in anticipation of a subsequent related significant event: Evidence from the Korean telecommunications industry. Review of Pacific Basin Financial Markets and Policies. 2005;**8**:185-200

[6] Akdogu E. Mergers, acquisitions and merger waves in Turkey during the years of 1988-2008. Journal of Accounting and Finance. 2011;**52**:137-152

[7] Van Aduard de Macedo-Soares TDL, Gouveˆa de Mendoc¸a AP. Strategic implications of alliances and other linkages if leading telecom operators in Brazil. Latin American Business Review. 2010;**11**:45-73

[8] Fang T, Fridh C, Schultzberg S. Why did the Telia-Telenor merger fail? International Business Review. 2004;**13**:573-594

[9] Zimmerman PR. Strategic incentives under vertical integration: The case of wireline-affiliated wireless carriers and intermodal competition in the US. Journal of Regulatory Economics. 2008;**34**:282-298

[10] Sidak JG. Capital subsidies, profit maximization and acquisitions by partially privatized telecommunications carriers. Telecommunications Policy. 2002;**26**:287-294

[11] Sung N, Gort M. Mergers, capital gains and productivity: Evidence from U.S. telecommunication mergers. Economic Policy. 2006;**24**(3):382-394

[12] Ferris SP, Park K. How different is the long-run performance of mergers in the telecommunications industry? Innovation in Investment and Corporate Finance. 2002;**7**:127-144

[13] Amesse F, Latour R, Rebolledo C, Se´nguin-Dulude L. The telecommunications equipment industry in the 1990s: From alliances to mergers and acquisitions. Technovation. 2004;**24**:885-897

[14] Wilcox HD, Chang K, Grover V. Valuation of mergers and acquisitions in the telecommunications industry: A study on diversification and firm size. Information and Management. 2001;**38**:459-471

[15] Rhe´aume L, Bhabra HS. Value creation in information-based industries through convergence: A study of U.S. mergers and acquisitions between 1993 and 2005. Information and Management. 2008;**45**:304-311

[16] Mitchell ML, Stafford E. Managerial decisions and long-term stock price performance. Journal of Business. 2000;**73**(3):287-329

[17] Ecker F. Information Risk and Long-Run Performance of Initial Public Offerings. Wiesbaden: Gabler; 2008

[18] Kohonen T. Self-Organization and Associative Memory. 3rd ed. New York, NY: Springer-Verlag New York, Inc.; 1989

[19] Kohonen T. Self-organized formation of topologically correct feature maps. Biological Cybernetics. 1982;**43**:59-69

[20] Kohonen T. Self-Organizing Maps. 3rd ed. Springer Berlin Heidelberg; 2000

[21] Haykin S. Neural Networks and Learning Machines. 3rd edition, New Jersey, Prentice Hall, 2009

[22] Deboeck GJ, Kohonen TK, editors. Visual Explorations in Finance. 1st ed. Secaucus, NJ, USA: Springer-Verlag New York, Inc.; 1998

[23] Alakhdar Y, Mart´ınez-Mart´ınez JM, Guimera`-Toma´s J, Escandell-Montero P, Ben´ıtez J, Soria-Olivas E. Visual data mining in physiotherapy using self-organizing maps: A new approximation to the data analysis. In: Magdalena R, Soria E, Guerrero J, Go´mez J, Serrano AJ, editors. Medical Application of Intelligent Data Analysis: Research Advancements. Chapter 12. IGI Global, Pennsylvania; 2012 pp. 186-193

[24] Kohonen T, Oja E, Simula O, Visa A, Kangas J. Engineering applications of the self-organizing map. Proceedings of the IEEE. 1996;**84**(10):1358-1384

[25] Díaz I, Cuadrado AA, Diez AB, Domínguez M, Fuertes JJ, Prada MA. Supervision of industrial processes using self organizing maps. In: Magdalena-Benedito R, Mart´ınez-Sober M, Martínez-Martíinez JM, Escandell-Montero P, Vila-France´s J, editors. Intelligent Data Analysis for Real-Life Applications: Theory and Practice. Chapter 11. IGI Global, Pennsylvania; 2012 pp. 206-227

[26] Soria E, Mart´ın JD, Ferna´ndez C, Magdalena R, Serrano AJ, Moreno A´. Qualitative modelling of time series using self-organizing maps: Application to animal science. In: Proceedings of the 6th WSEAS International Conference on Applied Computer Science, ACS'06; Stevens Point, Wisconsin, USA: World Scientific and Engineering Academy and Society (WSEAS); 2006. pp. 183-187

[27] Ferna´ndez C, Soria E, Mart´ın-Guerrero JD, Serrano AJ. Neural networks for animal science applications: Two case studies. Expert Systems with Applications. 2006;**31**(2):444-450

[28] Magdalena R, Ferna´ndez C, Mart´ın JD, Soria E, Mart´ınez M, Navarro MJ, Mata C. Qualitative analysis of goat and sheep production data using self-organizing maps. Expert Systems. 2009;**26**(2):191-201

[29] Franks J, Harris R, Titman S. The postmerger share-price performance of acquiring firms. Journal of Financial Economics. 1991;**29**(1):81-96

[30] Laabs J, Schiereck D. The long-term success of M&A in the automotive supply industry: Determinants of capital market performance. Journal of Economics and Finance. 2010;**34**:61-88

[31] Georgopoulos A, Argyros G, Boura G. Which targets stimulate cross-border acquisitions? An empirical investigation of industrial organization and trade factors within a competition framework of international and domestic acquisition targets. Journal of Industry, Competition and Trade. 2008;**8**:55-72

[32] Farino´s JE, Garc´ıa C, Iba´n˜ez A. Cuestiones metodolo´gicas de los estudios de eventos a largo plazo. Serie Teknos. 2009;**1**:61-117

[33] Akhigbe A, Madura J. The industry effects regarding the probability of takeovers. The Financial Review. 1999;**34**:1-18

[34] Kohers N, Kohers T. Information sensitivity of high tech industries: Evidence from merger announcements. Applied Financial Economics. 2004;**14**:525-536

[35] Walker M, Hsu C. Strategic objectives, industry structure, and the long-term stock price performance of acquiring and rival firms. Applied Financial Economics. 2007;**17** (15):1233-1244

[36] Agrawal A, Jaffe J, Mandelker G. The post-merger performance of acquiring firms: A re-examination of an anomaly. Journal of Finance. 1992;**47**(4):1605-1621

[37] Sorescu A, Chandy R, Prabhu J. Why some acquisitions do better than others: Product capital as a driver of long-term stock returns. Journal of Marketing Research. 2007;**44**(1):57-72

[38] Zademach H, Rodriguez-Pose A. Cross-border M&A and the changing economic geography of Europe. European Planning Studies. 2009;**17**:765-789

[39] Vaara E, Tienari J, Piekkari R, Santti R. Language and the circuits of power in a merging multinational corporation. Journal of Management Studies. 2005;**43**(3):595-623

[40] Boateng A, Qian W, Tianle Y. An analysis of strategic motivation and performance of cross-border mergers and acquisitions in China. Thunderbird International Business Review. 2008;**50**(4):259-270

INTECH

Chapter 3

Do Foreign Investors Crowd Out or Crowd In Domestic Investment? A Panel Analysis for OECD Countries

Burçak Polat

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.68856

Abstract

The studies of the relationship between foreign direct investment and domestic investments indicate that the findings are mixed and controversial. This study argues that some of the conflicting evidence may be related to the ignorance of financing structure of foreign direct investments in the host market. Foreign investment can be financed as a mixture of three components (equity capitals, reinvested earnings, and intra-company loans). Thus, crowding out or crowding in effect of foreign investments on local investments may be determined by the choice of investors to finance the foreign capital in the host country. The main objective of this study is to find out the impact of foreign investment inflows on domestic investments for 30 Organization for Economic Co-operation and Development (OECD) countries from 2006 to 2013 by employing one-step Generalized Method of Moments system. We have empirically confirmed that while total foreign direct investment inflows do not have a significant effect on overall domestic investments, intra-company loans as sub-component of total foreign direct investments, do indeed, have a positive effect on domestic capital formations.

Keywords: foreign direct investment, gross domestic capital formation, domestic investment, dynamic panel data, intra-company loans

1. Introduction

Regarding of foreign direct investment (FDI) as a source of capital accumulation for both developed and developing countries leads policymakers to find new ways to attract new investments into the country. However, the role of FDI as an engine behind the economic

growth in local market may vary based on its substitution or/and complementary interactions with domestic investment.

FDI may affect the structure of capital stock in the local market through two ways. First, the majority of foreign investments are likely to be financed by borrowing from host market rather than the home market. Thus, the domestic capital stock may be structured by foreign investments at the expense of domestic investments in the local market. In other words, as demand for loanable funds increases, higher cost of borrowing may crowd out domestic investments. In that case, there might be a substitution effect between domestic investments and foreign investments. On the other hand, foreign investments may be followed by domestic supplies. It is the mere fact that most of the investments in abroad take place to utilize from lower resource cost in the host market. In such case, foreign investments may have a complementary effect on the domestic investments. Therefore, complementary or substitution interactions between foreign and domestic investments, if any, may be ones' policy interest to formulate and adjust right FDI strategies to enhance the capital accumulation in the local market.

Even though there is an abundant literature dealing with crowd in or crowd out effect of FDI on domestic investments, almost none of these studies concern for the characteristics of financial components of FDI. FDI can be financed as a mixture of three components (equity capitals, reinvested earnings, and intra-company loans). Due to the fact that crowding out effect of FDI on domestic investments arises from the financing choice of foreign capital in the local market, one should also consider the main characteristics of financial components. Equity capitals are regarded as initial investments in the local market. Therefore, they are more likely to be financed by borrowing from the host market. However, subsequent components of FDI emerge over long run and differ from the initial investments. While reinvestments represent the undistributed earnings from the foreign investments, intra-company loans represent the financing of foreign investments by borrowing from parent company rather than local institutions. Thus, these two components of FDI may reduce the need for funds to expand foreign operations within the local market.

The main objective of this study is, therefore, to find out the impact of FDI inflows on domestic investments for 30 Organization for Economic Co-operation and Development (OECD) countries from 2006 to 2013 by employing one-step generalized method of moments (GMM) system. The contribution of study to the existing literature can be explained as follows: First, this study employs three financial components of FDI to find out any substitution or complementary relations between foreign investments and domestic investments. Second, this study also employs total FDI to capture the complementary interaction between domestic supplies and foreign investments. Third, by employing the one-step GMM method, this study is aimed to capture any endogeneity, if any, among the explanatory variables within the specification.

The rest of the chapter is organized as follows: Second section explains literature review and overviews the theoretical background. This is followed by a description of data and methodological part. In the fourth section, empirical results and their implications are discussed. The last section summarizes the findings by suggesting important implications to shed light for the future policy formations.

2. Literature review

A recent debate regarding the role of FDI in domestic investment is still a controversial and forgoing issue in the FDI literature. Some of the literature argue a positive relation, while some others argue a negative relation and still others claim a neutral effect of FDI on domestic investment. As the FDI stock reached a considerable share in the domestic market of many developing countries, domestic investors increased their complication about uncontrolled foreign investments entry into the domestic market. They argued that FDI policies formulated to please investors yielded an important portion of domestic share to the foreigners. The studies of Refs. [1, 2] have claimed that part of the fear regarding the FDI comes from its crowding out effect on domestic investment. If the foreign investment is not a complement for domestic investment, local firms may suffer from a lost in their profits and close down completely [3]. Also contributed the literature by arguing that FDI may crowd out domestic investment by creating a national sovereignty in the host market. The studies of Refs. [4–10] have all agreed that foreign investments may cause crowding out effects on domestic investments through competition in the product market, financial market, or using a superior technology.

On the other side, if foreign investments are supplied by domestic firms, they may have complementary effect on domestic investments. The studies of Refs. [10–14] have analyzed the impact of FDI on local investments and concluded that foreign investments may boost the domestic investment through complementarity in production and efficiency from new advanced technology. A recent study by Farla et al. [15] reanalyzed the study of Ref. [10] by employing total gross capital formation without subtracting foreign investment. Notation assigned to the domestic investment and a foreign investment varies so that differentiating accumulated domestic investment from foreign investment may give biased estimation results. Finally, they concluded that some statistical measurement mistakes and estimation methods may yield different conclusions. Contrary to the study of Ref. [10], they claimed that foreign investments may affect the host country's domestic investment positively.

Furthermore, several scholars found neutral effects of FDI on domestic investment if it leads one-to-one increase in total investment in the host market. The studies of Refs. [6, 13, 16] have supported the view that foreign investments will increase the capital formation one to one in the host country. Scholars finding mixed evidence explain that the diversity of findings may depend on selected country group, regions, or sectors, alongside the chosen variables and methodologies in the analysis. For example, Ahmed et al. [17] have investigated the effect of FDI on the domestic investment at the sectoral level by using data from 1992 to 2012 for Uganda. They have proved that while foreign investments have a neutral effect on the overall domestic investments, this effect may change with respect to the sectors that the foreign investment flowed in. They have found a crowding out effect in four sectors; a crowding in effect in two sectors; and a neutral effect in three sectors. They have attributed the varying impacts of FDI on different sectors to the ability of foreign investors to out-compete domestic investors due to having superior technology.

3. Data and methodology

3.1. Data

Gross domestic capital formations in 30 OECD countries are determined as our dependent variable. This variable is taken from the OECD statistics [18]. The main interest of independent variables is selected as total FDI inflows and its three financial components (equity capital inflows, reinvested earnings, and intra-company debt flows). Data on FDI and its components have taken from International Monetary Fund (IMF) retrieval tool [19]. The rest of the control variables are determined as Gross Domestic Product (GDP), growth rates (Growth) in GDP, corporate tax rates (Tax) on Profits, inflation, openness, exchange rates (REX), and composite CR (country risks) indices. Statistical data on GDP, growth, corporate tax, inflation, openness, and exchange rates were received from the World Bank Data dissemination tool [20]. Data points on CR indices are taken from Political Risk Service (PRS) group website [21]. CR indices represent composite indices of economic, financial, and political risk ratings of 30 OECD countries. The risk ratings range from low to high so that as the ratings get higher, risk gets lower. Furthermore, all data are measured in US dollars.

Expected effects of the variables on dependent variable and descriptive statistics are summarized in **Tables 1** and **2**, respectively,

As seen from **Table 2**, there are no missing observations except REX, and all of the variables are in expected range. From the mean of the variables, it is clear that equity capital constitutes the largest portion of total FDI, whereas subsequent components constitute the almost half

Variable	Expected sign
FDI	+/−
Equity	+/−
Reinvestments	+
Loans	+
GDP	+
Growth	+
Tax	+/−
Inflation	−
Openness	+
REX	+/−
Composite	+

Note: Main variables of interest are represented by italic letters. Expected signs of all coefficients are expressed based on the economic theory.

Table 1. Expected sign of the coefficients.

Variable	Obs.	Mean	Std. Dev.	Min	Max
FDI	228	45.36	83.77	−22.72	525.44
Equity	228	27.81	63.28	−40.26	363.27
Reinvestments	228	8.18	14.70	−33.16	87.48
Loans	228	9.36	25.29	−81.90	187.98
GDP	228	146.75	287.45	1.69	1676
Growth	228	1.37	3.46	−14.73	10.68
Tax	228	43.98	11.71	19.8	75.4
Inflation	228	1.97	2.15	−5.20	11.34
Openness	228	101.13	61.26	24.76	371.43
REX	224	99.66	5.72	80.15	125.72
Composite	228	77.73	6.80	56.62	92

Table 2. Descriptive statistics and summary.

of total FDI. Again, from the standard deviations, one may easily assume that least volatile variable is reinvested earnings while equity components are most volatile component of total FDI. Stability of reinvested earnings and intra-company loans as an important part of total FDI may mean that FDI may cause a crowd in rather than a crowd out effect on domestic investments.

3.2. Methodology

Most of the econometric applications need to be taken within a dynamic equation. With panel data, the dynamic structure can be formulated by taking the first lagged of the dependent variable into the panel specification. However, the inclusion of lagged of dependent variable into the model leads collinearity problem between the previous variable of dependent variable and error term. And, this problem cannot be solved by employing fixed effects and random effects approach of panel data models. At this point, Arellano and Bond [22] proposed generalized method of moment (GMM) procedure, which generates both unbiased and efficient estimators. This method mainly utilizes from the orthogonality conditions that exist between lagged values of y_{it} and the disturbance v_{it}. The method takes several steps.

The econometric model should be first transformed into the first differences. The resulting equation can be written as follows:

$$\Delta y_{i,t} = \Delta \alpha_{0t} + \Delta\alpha\, y_{i,t-1} + \Delta\sum_{k=1}^{n}\delta_k X_{kit} + \eta_i + \varepsilon_{it} \quad (1)$$

Where $\Delta y_{it} = y_{it} - y_{i,t-1}$ and so on, and $u_{i,t} = v_{i,t} - v_{i,t-1}$. This transformation eliminates the country effect while leaving the time effect intact. By applying [22] estimation, the lagged of dependent variables can be used as instruments. The procedure of inclusion previous values of a dependent

variable as regressor is known as a difference GMM estimation. However, if explanatory variables in the form of lagged of dependent variable are persistent over time, they may act as weak instruments which produce biased estimators. Therefore, [23, 24] propose using additional moment conditions by taking the first difference of moment conditions. This procedure is called as system GMM, which generates estimators that are more efficient and unbiased.

Since previous foreign investments are likely to crowd out or crowd in current domestic investments, the econometric model also needs to be adjusted to capture a dynamic structure of first lagged of foreign investment. Therefore, we have employed one-step system GMM to deal with the endogeneity issue within the explanatory variables. Our one-step stem GMM equation is formulated as below:

$$\Delta y_{i,t} = \Delta \alpha_{0t} + \Delta\alpha\, y_{i,t-1} + \Delta \sum_{k=1}^{n} \delta_k X_{kit} + \eta_i + \varepsilon_{it} \quad (2)$$

Where $y_{i,t}$ and $y_{i,t-1}$ represent the dependent variable and lagged of dependent variable. Moreover, while $X_{ki,t}$ represent the explanatory variables within the specification, η_i and $\varepsilon_{i,t}$ denote fixed effects and the error disturbance, respectively.

4. Empirical results

The study employs yearly data from 2006 to 2013 to find out the effect of FDI inflows on domestic investments within a one-step system GMM specification. Empirical findings of the estimations are presented in **Table 3**. To ensure the robustness of the model, we have determined two different GMM specifications to be able to employ both total FDI and its financial components. Two specifications are represented by GMM 1 and GMM 2 located in the first and second columns of **Table 3**, respectively. Furthermore, post-test statistics are presented at the bottom of the table. Based on the Hansen and Arellano-Bond AR (2) test statistics, the study ensures that our results are robust and the findings are well fit with the dynamic structure of the data.

It is clearly seen from **Table 3** that we could not find any effect of total FDI on domestic investments. Yet, we have found empirical evidence that intra-company debt flows have a positive significant effect on domestic investment. In other words, FDI inflows seem not to have any substitution or complementary interaction between domestic investments. Yet, employing each financial FDI component separately shows that intra-company debt flows may have a complementary effect with domestic investments. Possible explanation for this result may be that: Foreign investors do not only borrow from parent company to finance their investment but they may also transfer funds from parent company to its subsidy to receive a high rate of return (high-interest income) on their deposits. As the financial market improves in the local (host) market, this may induce foreign investors to invest in more of transferred funds into the deposit accounts hold by local financial institutions. In conclusion, loanable funds from financial institutions to the domestic investors enhance the ability of domestic investors to increase the volume of domestic capital accumulations.

Variable	Sys-GMM1	Sys-GMM2
$Investment_{t-1}$	0.4919 (0.000)**	0.4914 (0.005)**
FDI	−0.0006 (0.707)	_
Equity investments	_	−0.0050 (0.077)
Reinvested earnings	_	0.0249 (0.126)
Intra-company loans	_	0.0047 (0.035)*
GDP	−0.0012 (0.111)	−0.0019 (0.057)
Growth	0.3125 (0.000)**	0.2932 (0.000)**
Tax	0.0510 (0.020)**	0.0512 (0.018)**
Inflation	0.0405 (0.437)	0.0389 (0.416)
Openness	−0.0017 0.645	−0.0004 (0.896)
REX	0.0195 0.230	−0.0182 (0.295)
Composite	0.1149 (0.001)**	0.0929 (0.013)**
Wald Test	2447.28 (0.000)**	5318 (0.000)**
Hansen Test	0.544	0.628
Arellano Bond AR (2) Test	0.298	0.394
Observations	178	178
Instruments	25	28

* represents % 5 significance level but ** represents % 1 significance level.

Table 3. Estimation results.

With respect to the effects of control variables on domestic investments, we have found similar results. Growth rates, corporate tax rates on profits, and composite risk ratings have a meaningful positive effect on domestic capital accumulations. We can interpret these results as follows: The increase in GDP growth rates may make domestic investors feel more optimistic for the future market potentials in which then lead them to invest in more of physical capitals. Furthermore, the positive relation between corporate taxes and domestic capital formations may be the natural result of government investments into the physical capitals. It is well-known fact that government investments constitute the important portion of domestic investments. Higher corporate tax rates raise the government revenues so that government expenditures may be reallocated more to the physical capital investments. Moreover, as expected, composite risk ratings reveal that as the OECD Country group's political, financial, and economic risks decrease, all households, firms, and government feel more confident to increase the level of their physical investments. This result does not come to a surprise since, as the economic, political, or financial conditions get better, higher income levels may be realized by households. Thus, households will be more willing to translate their disposable income into savings.

5. Conclusion

The FDI is widely accepted as the main source to fulfill the inadequate capital formations for not only developing but also developed countries. However, FDI may have varying effects on the structure of capital stock depending on its substitution or complementary interactions with domestic investments. Thus, foreign investments have often received criticism by scholars in such that they may also crowd out local investments. The main objective of this study was, therefore, to find out the impact of total FDI and its financial components on the domestic investments in 30 OECD countries from 2006 to 2013 by employing one-step system GMM specification.

The local investments may be crowded in or crowded out by foreign investments depending on the foreign investors' choice to finance the new investments in the foreign market. This study, therefore, has employed not only total FDI but also its financial components to determine any substitution or complementary interactions between foreign and local investments.

Based on the estimation results, we have empirically confirmed that total FDI inflows do not have a significant effect on domestic investments. Yet, employing each financial component separately reveals that intra-company loans, do indeed, have a positive effect on domestic capital formations. In other words, foreign investors do not crowd out or crowd in the domestic investments by the other two financial components (equity capital investments or reinvested earnings) of total FDI. However, their transfers (intra-company debt inflows) from parent company into the bank deposits in the host market increase loanable funds from domestic banks to all investors. In conclusion, one may simply assume that as the local banks impose higher interest income on the deposits, this may motivate the profit appetitive investors to invest the more of their transfers into the deposit accounts of the local banks. Thus, as the volume of intra-company debt inflows rises, this may create new loanable funds from local banks to all investors and, thus, crowd in domestic investments. Our intuition is that policymakers should improve the deepness of financial environments to attract the FDI in the form of intra-company loans. In the case of developed countries, deepness of financial market may be well-structured. Yet, interest rates on foreign deposits should be adjusted to attract foreign investors to earn more interest income on their deposits in the host country. On the other side, we can argue that most of the developing countries are structured with poor financial institutions that are inadequate to meet the demand for loanable funds from both domestic and foreign investors. Therefore, local banks or financial institutions should be supported by the central banks of these countries to strengthen their financial structure. Investment schemes or new incentives designed by the central banks may encourage local banks to provide higher interest income payments to the foreign deposits.

With respect to the effect of control variables on domestic investments, we have found that higher GDP growth rates, corporate taxes rates on profits and better CR ratings have a positive significant effect in boosting the capital formations. Higher GDP growth rates may be taken as a signal for the high volume of sales and thus higher profitability for both domestic and foreign investors. Thus, as the growth rates increase, we may expect that foreign and domestic investors will be induced to invest more in physical capital to expand their

operations in the host country. Higher CR ratings ensure that the economic, financial, and political environment get better in the host countries. Approaching from the same perspective, better macroeconomic indicators and political rights may make investors feel more comfortable to expand their operations in the local market. Furthermore, as we noted before, strengthened financial markets also help both domestic and foreign investors to reach loanable funds offered by the local banks. Thus, as the CR ratings increase, we expect higher domestic physical capital investments by today. As we know, the most of the physical capital investments come from the investments held by governments rather than private sectors. This is especially true for the developed countries where the government imposes high corporate tax rates on the firms' profits. Since higher corporate tax rates add to the government revenues, these tax revenues can be redistributed into the physical capital investments by the government today.

JEL classifications: C23, F21, F23, F24, F29

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References

[1] Leahy D, Montagna C. Unionization and foreign direct investment: Challenging conventional wisdom? The Economic Journal. 2000;**110**(462):80-92

[2] Lipsey RE. Home-and Host County Effects of Foreign Direct Investment. Challenges to the Globalization: Analyzing the Economics. United States: University of Chicago Press; 2004. pp. 333-382

[3] Buffie EF. Direct foreign investment, crowding out, and underemployment in the dualistic economy. Oxford Economic Papers. 1993;**45** (4):639-667

[4] Borensztein E, De Gregorio J, Lee JW. How does foreign direct investment affect economic growth? Journal of International Economics. 1998;**45**(1):115-135

[5] Misun J, Tomsik V. Does foreign direct investment crowd in or crowd out domestic investment. Eastern European Economic. 2002;**40**(2):38-56

[6] Agosin MR, Machado R. Foreign investment in developing countries: Does it crowd in domestic investment? Oxford Development Studies. 2005;**33**(2):149-162

[7] De Backer K, Sleuwaegen L. Does foreign direct investment crowd out domestic entrepreneurship? Review of Industrial Organization. 2003;**22**(1):67-84

[8] Titarenko D. The Influence of Foreign Direct Investment on Domestic Investment Processes in Latvia. MPRA paper 18192. Germany: University Library of Munich; 2005

[9] Mutenyo J, Asmah E, Kalio A. Does foreign direct investment crowd-out domestic private investment in Sub-Saharan Africa? The African Finance Journal. 2010;**12**(1):27-52

[10] Morrissey O, Udomkerdmongkol M. Governance, private investment and foreign direct investment in developing countries. World Development. 2012;**40**(3);437-445

[11] Bosworth BP, Collins SM. Capital flows to developing economies: Implications for saving and investment. Brooking Papers on Economic Activity. 1999;**30**(1):143-180

[12] Ndikumana L, Verick S. The linkages between FDI and domestic investment: Unravelling the developmental impact of foreign investment in Sub-Saharan Africa. Development Policy Review. 2008;**26**(6): 713-726

[13] Wang M. Foreign direct investment and domestic investment in the host country: Evidence from panel study. Applied Economics. 2010;**42**(29);3711-3721

[14] Ramirez M. Is foreign direct investment productive in the Latin America case? A panel co-integration analysis, 1980-2002. The International Trade Journal. 2011;**25**(1):35-73

[15] Farla K, Ugghe Denis De C, Verspagen B. Institutions, foreign direct investment, and domestic investment: Crowding out or crowding in? World Development. 2016;**88**:1-9

[16] Kim D-KD, Seo, JS. Does FDI inflow crowd out domestic investment in Korea? Journal of Economic Studies. 2003;**30**(6):605-622

[17] Ahmed KT, Ghani GM, Mohamad N, Derus AM. Does inward FDI crowd-out domestic investment? Evidence from Uganda. Social and Behavioral Sciences. 2015;**172**:419-426

[18] Organization for Economic Co-operation and Development [Internet]. 1961. Available from: www.oecd.org [Accessed: October 22, 2016]

[19] International Monetary Fund [Internet]. 1944. Available from: www.imf.org [Accessed: October 29, 2016]

[20] World Bank [Internet]. 1944. Available from: www.worldbank.org [Accessed: October 29, 2016]

[21] Political Risk Service Group [Internet]. 1979. Available from: www.prsgroup.com [Accessed: October 29, 2016]

[22] Arellano M, Bond S. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. The Review of Economic Studies. 1991;**58**(2):277-297

[23] Arellano M, Bover O. Another look at the instrumental variable estimation of error components model. Journal of Econometrics. 1995;**68**(1):29-51

[24] Blundell R, Bond S. Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics. 1998;**87**(1):115-143

Chapter 4

Analysis of 'Dutch Disease Effects' on Asian Economies

Hiroyuki Taguchi

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.68852

Abstract

This chapter addresses the issue of the Dutch Disease in relationship with capital inflows through exporting natural resources, accepting foreign aids and emigrant remittances. The analysis focuses on Asian economies that are expected to sustain their growth and adopts a vector auto-regression model with Granger causality and impulse response tests. The main findings are as follows. Firstly, from the perspective of natural-resource abundance in Asian economies, the Dutch Disease was identified for 1980–1995, but not for 1995–2014, probably because of their institutional improvements. Secondly, in the economies of Cambodia, Lao PDR, Myanmar and Vietnam, their accepted foreign aids have not caused the Dutch Disease and have rather promoted their economic growth, due to their aid contributions to infrastructure development. Thirdly, regarding the Dutch Disease effects of emigrant remittances, the disease was verified in Nepal but not in Bangladesh, due to their different demand structures and policy efforts.

Keywords: Dutch Disease, Asian economies, capital inflows, natural resources, foreign aids, emigrant remittances, vector auto-regression (VAR)

1. Introduction

Asian economies have been accepting intensively capital inflows in terms of foreign direct investment, foreign aids and emigrant remittances since the 1980s. Some economies with rich natural resources have also been able to obtain foreign currencies by exporting their developed resources. It is basically believed that capital inflows towards emerging and developing economies have been useful for raising their economic growth, and thus these economies have adopted policies to attract capital inflows. It is also pointed out, however, that capital inflows have downsides, for instance, of accompanying financial risks such as boom-bust cycles for domestic economies and of causing currency appreciation that deteriorates the competitiveness of tradable sectors. The latter issue is often referred to as the 'Dutch Disease'.

The Dutch Disease is inspired by the crisis of Netherlands in 1960s that was caused by discoveries of huge natural gas deposits in the Northern Sea. It was named by *the Economist* magazine on 26 November 1977. The disease was described as the negative impact on a country's economy due to large inflows of foreign income through the discovery of large oil reserves, natural gas, and so on. The theoretical framework for describing the Dutch Disease effect of 'capital inflows' in small open economies was provided by the Salter-Swan-Corden-Dornbusch model, and this model has been applied to examine the economic impacts of foreign aids and emigrant remittances as well as natural-resource exports, since they constitute the major elements of capital inflows.

This chapter examines the Dutch Disease effects of a variety of capital inflows: natural-resource abundance, foreign aids and emigrant remittances, focusing on Asian economies. The basic reason for targeting Asian economies is that most of Asian economies still stay at the stages of middle income and low income, and thus are expected to sustain their economic growth to realize the 'Asian Century' as ADB [1] proposed. In this context, it would be of great significance to diagnose Asian economies from the perspective that their dependence on capital inflows in various forms might accompany the risk of the Dutch Disease. If some symptoms of the disease were identified, Asian economies should have a strategy to remove the source of disease in advance in order to ensure their sustainable growth.

The rest of this chapter is structured as follows. Section 2 describes the theoretical framework of the Dutch Disease by the Salter-Swan-Corden-Dornbusch model. In brief, Corden and Neary [2] explained this model in the following way: capital inflows trigger higher relative prices of non-tradable goods through raising higher disposal income and aggregate demand (spending effect), which corresponds to a real exchange rate appreciation; this leads further to the movement of resources from tradable sector to non-tradable sector (resource movement effect). From the longer-term perspective, Bourdet and Falck [3] added 'capital accumulation effect', supposing that the capital inflows contribute to domestic capital accumulation, which might offset the economic damage from the Dutch Disease.

Section 3 examines the Dutch Disease effects of 'natural-resource abundance' in Asian economies based on the theoretical framework described in Section 2. The natural-resource abundance in this study is expressed as the 'natural-resource rents', which is defined by the World Development Indicator (WDI) of the World Bank as the sum of oil rents, natural gas rents, coal rents, mineral rents and forest rents. In the worldwide landscape, the Dutch Disease effects in resource-rich economies have been identified by the majority of evidence. Sachs and Warner [4] found that resource-rich economies tended to have higher price levels after controlling for the income effect, and demonstrated further that the subsequent loss of price competitiveness in manufacturing sectors impeded their export-led growth. More recent macroeconomic studies also provided evidence directly to support the Dutch Disease effect. Harding and Venables [5] indicated that the response to a resource windfall is to decrease non-resource exports by 35–70%, and Ismail [6] revealed that a 10% oil windfall is on average associated with a 3.4% fall in value-added across manufacturing sector. When we look at the recent performances of Asian-emerging-market economies, however, they have recorded high economic growth regardless of their abundance of natural resources, and might not fit the Dutch Disease theory. Thus, this study compares the applicability of Dutch Disease

hypothesis on resource abundance in 1995–2014 with that in 1980–1995 with the sample of 37 Asian economies, and also investigates capital accumulation effect as well as resource movement effect in both phases.

Section 4 analyses the Dutch Disease effects of 'foreign aids' with a focus on the economies of Cambodia, Lao PDR, Myanmar and Vietnam (the so-called CLMV). The Dutch Disease theory could, certainly, be applied to examine the economic impacts of foreign aids, since the foreign aids constitute the major elements of capital inflows in the Salter-Swan-Corden-Dornbusch model. There have been, however, very few empirical studies and little consensus on this issue. Rajan and Subramanian [7] analysed the economic impacts of foreign aids on the growth of manufacturing, and showed the evidence for the existence of Dutch Disease effects: foreign aids have negative effects on a country's international competitiveness, as shown in the lower growth rate of exports by manufacturing industries. On the other hand, Adam [8] examined the supply-side effect of aid-financed public expenditure rather than the short-run Dutch Disease impacts, and demonstrated the simulation results that public expenditure creates an intertemporal productivity spillover effect. This study aims to provide evidence on the applicability of the Dutch Disease theory to foreign-aid impact assessment. The CLMV economies are focused as analytical samples, since the CLMVs have rarely been studied in the literature in this field although their economies have still depended highly on foreign aids. According to the Statistics on Resource Flows to Developing Countries in 2014 by OECD, the CLMV economies show a high presence as the recipients of Official Development Assistance (ODA) in Asia: Asia occupies one-third in the values of net ODA receipts, and the CLMV occupies more than 10% in their values within Asia. At the same time, the four economies depend heavily on ODA by 2–5% of their gross national income (GNI).

Section 5 investigates the Dutch Disease effects of 'emigrant remittances' focusing on Nepal and Bangladesh. The Dutch Disease theory could also be applied to examine the economic impacts of emigrant remittances, since they also constitute the major elements of capital inflows. There have been, however, relatively few studies and inconclusive on this issue. Acosta et al. [9] applied the Dutch Disease theory for analysing the effects of emigrant remittances by establishing a dynamic stochastic general equilibrium model in the case of El Salvador. They enriched the original model by adding a transmission mechanism of emigrant remittances directly through labour supply: emigrant remittances raise the reservation wage of recipients and, therefore, bring about a decline in labour supply; a declining labour supply raises wages that, in turn, causes a further contraction of the tradable sector. Through their analysis, they confirmed the existence of the Dutch Disease effects of emigrant remittances. From the viewpoint of different time horizon, however, Bourdet and Falck [3] argued that in the longer term, an increase in remittances might rather enhance capital accumulation. By examining the case of Cape Verde, they argued that the Dutch Disease effects from remittances were not so large, and insisted that growth- and export-oriented policies could mitigate the Dutch Disease effect. This study aims to shed light on what kinds of mechanisms could make the received remittances lead to or not to the Dutch Disease, by sampling the two contrasting economies of Nepal and Bangladesh. The two countries differ in their economic performances though both of them depend highly on remittances. Nepal and Bangladesh represent high presences as the recipients of remittances in the world. According to the dataset of UNCTAD STAT, Bangladesh accounts for 3.6% out of the total value of received remittances

in the world, which ranks sixth in developing countries. In the remittance-gross domestic product (GDP) ratio, Nepal records around 30%, which ranks first in developing economies. Nepal and Bangladesh, however, show a contrast in their economic performances. Since the 2000s, Bangladesh has achieved around 6% economic growth, whereas Nepal has stayed at about 4% growth on the average.

Section 6 finally summarizes the key findings from the empirical analyses in the previous sections and represents some policy implication and recommendation.

2. Theoretical framework of Dutch Disease

This section describes the theoretical framework of analysing the Dutch Disease effect of capital inflows in small open economies by the Salter-Swan-Corden-Dornbusch model. We first introduce the basic framework that is composed of 'spending effect' and 'resource movement effect' based on Corden and Neary [2]. Then, we add 'capital accumulation effect' from the longer-term perspective by following Bourdet and Falck [3].

In **Figure 1**, the horizontal axis exhibits non-tradable while the vertical one shows tradable. The curve P-P represents the initial transformation curve between tradable and non-tradable. Point A is an initial equilibrium, where the transformation curve is tangential to the social

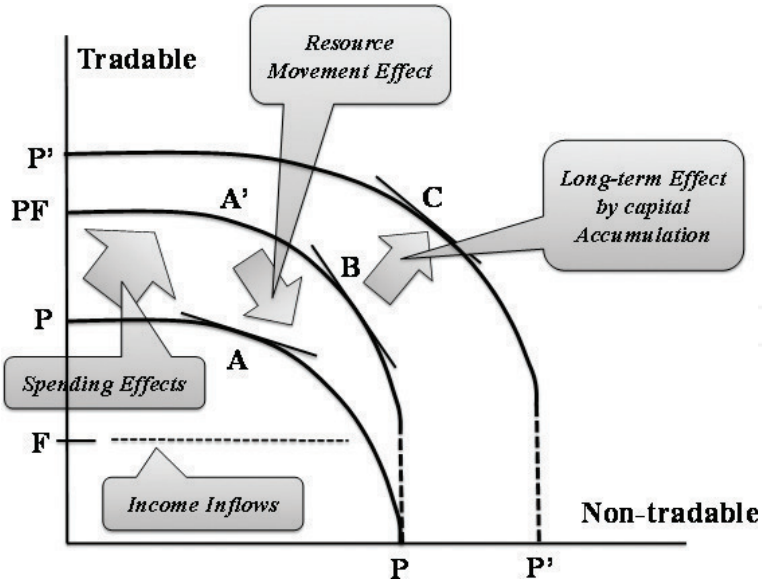

Figure 1. Theoretical framework of 'Dutch Disease'. Note: This diagram is based on Corden and Neary [2] and Bourdet and Falck [3].

indifference curve (not drawn) and the slope of the curves, that is, the relative price of non-tradable to tradable, is fixed at that point.

The transformation curve shifts upwards to P-PF with the introduction of the capital inflows shown at point F, since the supply of non-tradable is constant and the availability of tradable expands with higher disposal income. There would be excess demand for non-tradable with unchanged relatives price of non-tradable to tradable shown at point A', if we assume positive income elasticity of non-tradable. The price of non-tradable, therefore, has to go up to clear the market, and the relative price of non-tradable to tradable also rises, since the price of tradable is determined in the world market. This effect is referred to as an appreciation of real exchange rate (spending effect). The rise of relative price, then, encourages the movement of production factors from the tradable sector to the non-tradable sector, and leads to an expansion in the output of non-tradable and a decline in that of tradable from point A' to point B (resource movement effect).

Bourdet and Falck [3] added the following story from the longer-term perspective. They considered the role of capital accumulation, and argued that the transformation curve could shift further towards P'-P' when an economy utilized capital inflows for domestic capital accumulation. As a consequence, the relative price of non-tradable might be expected to fall from point B to point C, thereby facilitating the recovery of tradable sector. Thus, the 'capital accumulation effect' might offset or mitigate the economic damages caused by original Dutch Disease effect.

To sum up, the basic theory tells us that capital inflows reduce the production of tradable through real currency appreciation. In the longer term, however, capital inflows would lead to the increase in the outputs of both tradable and non-tradable because of capital accumulation. In short, capital inflows are not compatible with economic growth under Dutch Disease, but can be friendly with growth in the longer term.

3. Natural-resource abundance and the Dutch Disease

This section examines the Dutch Disease effects of 'natural-resource abundance' in Asian economies. We first clarify the sample economies and period for the analysis. We sample 37 economies in Asia for 1980–2014. Regarding the scope of Asia, we follow the definition of UNCTAD STAT.[1] As we stated, we divide sample period into 1980–1995 and 1995–2014 for comparing the Dutch Disease applicability. Regarding an analytical method, this study adopts a vector auto-regression (VAR) model with Granger causality and impulse response tests. The VAR makes it possible to trace directly the causality and dynamic responsive effect

[1]See the website: http://unctadstat.unctad.org/EN/. The 37 Asian economies are Afghanistan, Bahrain, Bangladesh, Bhutan, Brunei, Cambodia, China, Hong Kong, Macao, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Korea, Kuwait, Laos, Lebanon, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, Singapore, Sri Lanka, Syria, Thailand, Turkey, UAE and Viet Nam. The countries that belong to central Asia are excluded due to their lack of data before 1991.

from resource abundance to tradable production. For a VAR model estimation, we construct a panel data with 37 Asian economies for 1980–1995 and for 1995–2014.

We next specify the following key variables for the analysis. The first variable is 'natural-resources rents (*nrr*)' to represent natural-resource abundance in an economy. The data are retrieved from WDI of the World Bank as the series of 'total natural-resources rents (% of GDP)'. In this database, the total natural-resources rents are defined as the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents and forest rents. The second variable is 'real GDP per capita (*ypc*)' as a partner variable for simply observing the correlation with resource abundance. The data for real GDP per capita are retrieved from the UNCTAD STAT as the series of 'GDP by US Dollars at constant prices (2005) and constant exchange rates (2005) per capita'. The third variable is 'manufacturing-services ratio in GDP base (*mos*)'. This variable is introduced as a proxy of tradable non-tradable production ratio as in Ref. [10], for identifying 'resource movement effect' in the Dutch Disease theory. The manufacturing-services ratio is derived by dividing 'manufacturing in value-added term' by 'services in value-added one', both of which are retrieved from the UNCTAD STAT. The fourth variable is 'investment-consumption ratio in GDP base (*ioc*)'. This variable is for investigating the capital accumulation effect. The ratio is produced by dividing 'gross fixed capital formation' by 'final consumption expenditure', both of which are also retrieved from the UNCTAD STAT.

We take an overview on the Dutch Disease applicability in Asian economies by simply observing the relationship between natural-resources rents and the growth rates of real GDP per capita. **Figure 2** illustrates a scatter diagram between these two variables for the different phases: 1980–1995 and 1995–2014. It shows the negative correlation between natural-resources rents and the growth rate of real GDP per capita for both phases, but their weaker correlation for 1995–2014 than that for 1980–1995. It might come from the following alternation of some economies' position from 1980–1995 to 1995–2014. Firstly, although those economies with less resources rents such as Korea, Thailand and Singapore recorded higher growth of real GDP per capita for 1980–1995, they revealed the slowdown of their growth for 1995–2014, probably

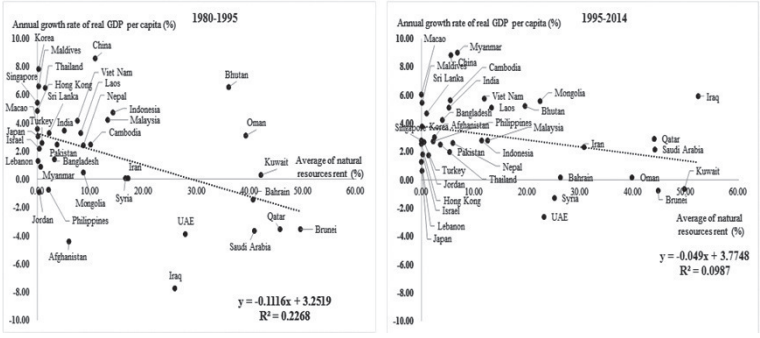

Figure 2. Natural resources rents and growth rate of real GDP per capita in Asia. Sources: World Development Indicators (World Bank) and UNCTAD STAT.

due to the convergence mechanics. Secondly, those emerging economies with middle-sized resources rents such as Laos, Vietnam and Myanmar improved their growth rates of real GDP per capita from 1980–1995 to 1995–2014.

We move onto a VAR model estimation. This study specifies a VAR model with panel data for estimation in the following way:

$$y_{it} = \mu + V_1 y_{it-1} + \varepsilon_{it} \tag{1}$$

where y_{it} is a column vector of the endogenous variables with country i and year t, that is, $y_{it} = (nrr_{it}\ mos_{it})'$ for examining resource movement effect, and $y_{it} = (nrr_{it}\ ioc_{it})'$ for examining capital accumulation effect, μ is a constant vector, V_1 is a coefficient matrix, y_{it-1} is a vector of the lagged endogenous variables and ε_{it} is a vector of the random error terms in the system. In the model, we insert a vector of the control variable of real GDP per capita (*ypc*), since manufacturing-services ratio might be also affected by development stages of an economy according to Petty-Clark's law (see [11]). The lag length (−1) is selected by the minimum Akaike Information Criterion (AIC) with maximum lag equal to (−2) under the limited number of observations. Based on the VAR model (1), we examine the Granger causalities between natural-resources rents (*nrr*) and manufacturing-services ratio (*mos*), and between natural-resources rents (*nrr*) and investment-consumption ratio (*ioc*), and also investigate the impulse responses of *mos* and *ioc* to the *nrr* shock, so that we can trace the 8-year dynamic effects.

The estimation outcomes of the VAR model, the Granger causalities and the impulse responses are reported in **Tables 1–2** and **Figure 3**, respectively. Regarding the Granger causalities shown in **Table 2**, as far as the causality between natural-resources rents (*nrr*) and manufacturing-services ratio (*mos*) is concerned, it was only in 1980–1995 when the causality from *nrr* to *mos* was identified at 99% level of significance. Considering the estimated VAR model in **Table 1**, this causality was supposed to be a 'negative' one. As for the causality from natural-resources rents (*nrr*) and investment-consumption ratio (*ioc*), on the other hand, it was in 1995–2014 when the positive causality was verified at the significant level. The impulse response analysis shown in **Figure 3** was focused on the two cases where the Granger causalities were identified above. The manufacturing-services ratio (*mos*) negatively responded to the shock of natural-resources rents (*nrr*) within a 95% error band after a 4-year lag during 1980–1995, and the investment-consumption ratio (*ioc*) positively responded to the shock from the beginning during 1995–2014.

The implications of the estimation outcomes above are summarized as follows. Regarding the applicability of the Dutch Disease, we could argue that Asian economies in 1980–1995 really suffered from the disease in which their resource abundance causes resource movement effect from tradable sector to non-tradable one. On the other hand, the disease could not be identified during the second phase of 1995–2014. As for the capital accumulation effect, the evidence implied that in 1995–2014 Asian economies accumulated domestic capital, whereas the 1980–1995 economies did not. In sum, the Dutch Disease does not seem to fit in with the recent Asian economies.

***nrr* vs. *mos*: 1980–1995**	***nrr***	***mos***
nrr-1	0.855*** [73.859]	−0.058*** [−5.427]
mos-1	−0.003 [−0.315]	0.870*** [95.501]
C	−0.415 [−0.434]	4.991*** [5.605]
ypc	0204* [1.702]	−0.067 [−0.598]
Adj. R²	0.929	0.949
***nrr* vs. *mos*: 1995–2014**	***nrr***	***mos***
nrr-1	0.960*** [96.652]	0.007 [0.935]
mos-1	−0.014 [−1.429]	0.962*** [122.582]
C	0317 [0.342]	1.230* [1.702]
ypc	0.078 [0.767]	−0.045 [−0.574]
Adj. R²	0.935	0.956
***nrr* vs. *ioc*: 1980–1995**	***nrr***	***ioc***
nrr-1	0.870*** [81.558]	−0.006 [−0.441]
ioc-1	−0.034*** [−3.004]	0.914*** [57.828]
C	2.152*** [4.717]	3.292*** [5.267]
Adj. R²	0.929	0.869
***nrr* vs. *ioc*: 1995–2014**	***nrr***	***ioc***
nrr-1	0.968*** [97.668]	0.060*** [3.692]
ioc-1	−0.011 [−1.4027]	0.929*** [70.960]
C	0.868** [2.569]	2.141*** [3.859]
Adj. R²	0.936	0.889

Note: ***, **, * denote rejection of null hypothesis at the 99, 95 and 90% level of significance, respectively.
Sources: World Development Indicators (World Bank) and UNCTAD STAT.

Table 1. Estimated VAR model.

The next question is what has made the difference in the applicability of the Dutch Disease from the first phase to the second phase. Van der Ploeg [12] argued that with good institutions the resource curse could be turned into a blessing. If we follow this argument, we could speculate that Asian economies have improved their institutional quality and transformed the effect of resource abundance on their growth. **Figure 4** exhibits the change in institutional quality from 1996 to 2014 in selected resource-rich Asian economies with better economic performance, the natural-resources rents of which are more than 6% on average and the annual growth rate of real GDP per capita of which is over 2% during 1995–2014. The institutional quality is shown as an average of the indexes for 'Government Effectiveness',

	Lags	Null hypothesis	Chi-sq
nrr vs. mos			
1980–1995	1	*mos* does not Granger Cause *nrr*	0.099
		nrr does not Granger Cause *mos*	29.456***
1995–2014	1	*mos* does not Granger Cause *nrr*	2.044
		nrr does not Granger Cause *mos*	0.875
nrr vs. ioc			
1980–1995	1	*ioc* does not Granger Cause *nrr*	9.029***
		nrr does not Granger Cause *ioc*	0.195
1995–2014	1	*ioc* does not Granger Cause *nrr*	2.038
		nrr does not Granger Cause *ioc*	13.631***

Note: *** denote rejection of null hypothesis at the 99% level of significance.
Sources: World Development Indicators (World Bank) and UNCTAD STAT.

Table 2. Granger causality tests.

'Regulatory Quality' and 'Rule of Law' in the Worldwide Governance Indicators by the World Bank. The index takes the value of −2.5 in the worst quality and of 2.5 in the best one. We could observe that the improvements in institutional quality from 1996 to 2015 are recorded in the oil-producing economies such as Iraq, Saudi Arabia and Qatar and also in emerging-market economies with middle-sized resource abundance such as Lao PDR, Vietnam and Myanmar. In fact, the three emerging-market economies that belong to Mekong region have made policy efforts for intensively promoting their industrialization under the framework of the Greater Mekong Sub-region since 1992. We speculate that the improvement of institutional quality and the progress in policy efforts might offset negative economic impacts of the Dutch Disease and even boost capital accumulation effect in the recent Asian economies.

In sum, the empirical outcomes identified the existence of the Dutch Disease in 1980–1995, but not in 1995–2014, and also represented capital accumulation effect in 1995–2014, but not in 1980–1995. Thus, the Dutch Disease does not fit in with the recent Asian economies. One of the interpretations on the transformation of the resource effects could come from the improvement of institutional quality and the progress in policy efforts in the recent Asian economies.

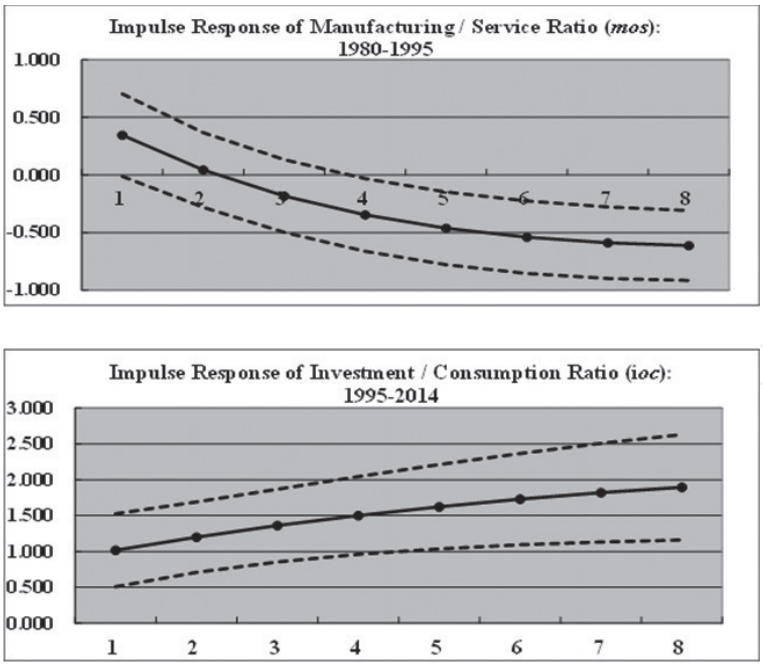

Figure 3. Impulse responses to shock of natural resources rents. Note: The dotted lines denote a 95% error band over an 8-year horizon. Sources: World Development Indicators (World Bank) and UNCTAD STAT.

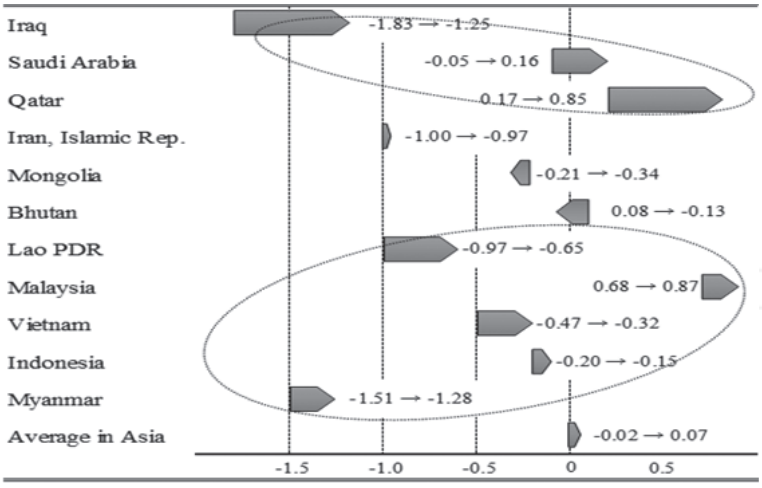

Figure 4. Change in institutional quality from 1996 to 2014. Note: (1) The figures on right and left sides are the ones in 1996 and in 2014, respectively. (2) Institutional quality is an average of the indexes for 'Government Effectiveness', 'Regulatory Quality' and 'Rule of Law' in the Worldwide Governance Indicators by the World Bank. Sources: Worldwide Governance Indicators (World Bank).

4. Foreign aids and the Dutch Disease

This section analyses the Dutch Disease effects of 'foreign aids' with a focus on CLMV. This section also adopts a VAR model as an analytical method. For the estimation, we construct a panel data with the four economies for the period from 1970 to 2013.

We specify the following key variables for the estimation as in Section 3. The first one is 'net ODA receipts in real term (*odar*)' to represent foreign aids received by an economy. The nominal data in the form of current US dollars are taken from WDI of the World Bank. The variable is, then, transformed in real term (2005 prices) by GDP deflator. The deflator is produced implicitly by dividing 'GDP in US dollars at current prices and current exchange rates' by 'GDP in US dollars at constant prices (2005) and constant exchange rates (2005)'. Both of them are retrieved from UNCTAD STAT. The second one is 'GDP in real term (*gdpr*)'. This is also taken from the same source as 'GDP in US dollars at constant prices (2005) and constant exchange rates (2005)'. The third one is 'manufacturing-services ratio in GDP base (*mosr*)', which is introduced for the same reason and from the same source as those in Section 3. The fourth one is 'inward foreign direct investment (FDI) in real term (*fdir*)'. The data are retrieved from UNCTAD STAT and are also expressed in real term by being deflated in GDP deflator. We insert a variable *fdir* as an exogenous variable in order to control the effects of inward FDI on manufacturing-services ratio and GDP growth, and to derive pure effects of ODA receipts on them.

We then turn to a VAR model estimation. Before the estimation, we investigated the stationary property of the constructed panel data by employing a unit root test, and finally decided to use the first difference series of the panel data based on the test results. We now specify a VAR model for estimation in the following way:

$$y_t = \mu + V_1 y_{t-1} + V_2 z_t + \varepsilon_t \tag{2}$$

where y_t denotes a column vector of the endogenous variables: $y_t = (d(aidr)_t\, d(mosr)_t\, d(gdpr)_t)'$, y_{t-1} does a vector of the lagged endogenous variables, μ does a constant vector, z_t does a vector of the control variable of $d(fdir)_t$, each of V_1 and V_2 does a coefficient matrix, and ε_t does a vector of the random error terms in the system. The lag length (−1) is chosen by the minimum Akaike Information Criterion (AIC) with maximum lag being equal to (−2) under the limited number of observations. Based on the VAR model (2), we investigate the bilateral Granger causalities among the endogenous variables: $d(aidr)$, $d(mosr)$ and $d(gdpr)$, and also investigate the impulse responses to the shock from net ODA receipts, $d(aidr)$, so that we can trace the 8-year dynamic effects in accumulated terms.

The estimation outcomes of the VAR model (2), the bilateral Granger causalities and the impulse responses are reported in **Tables 3–4** and **Figure 5**, respectively. Concerning the bilateral Granger causalities, the causality only from net ODA receipts to real GDP is confirmed at the 95% significant level, whereas no causality from net ODA receipts to manufacturing-services ratio is found. This result implies that foreign aid does not influence the output ratio of tradable over non-tradable, thereby suggesting the nonexistence of the Dutch Disease. The results also imply that foreign aid has a positive effect on the output of both

tradable and non-tradable. The outcome of causality test above brings us to examining the relationship between net ODA and real GDP into the impulse response test. **Figure 5** shows that real GDP positively responds to the shock from net ODA receipts at least within a 90% error band, although the response loses its significance at a 95% error band after 4 years. Thus, the impulse response analysis also identifies the positive dynamic effect of foreign aid on real GDP.

In sum, the foreign aids received by the CLMV have no Dutch Disease impact, or rather has a positive growth impact on their economies. We speculate these results as follows. The positive output effects of foreign aids received by the CLMV appear to have relationship with the properties of the ODA provided to Asian area. According to Statistics on Resource Flows to Developing Countries in 2014 by OECD, Japan as a donor member gives its ODA to developing

	d(aidr)	***d(mosr)***	***d(gdpr)***
d(aidr)	0.209*** [2.644]	0.007 [0.694]	0.009** [1.982]
d(mosr)	−0.366 [−0.640]	0.069 [0.883]	−0.010 [−0.301]
d(gdpr)	0.914 [0.887]	0.251* [1.775]	0.605*** [9.502]
C	−0.020 [−0.273]	0.000 [−0.011]	0.021*** [4.598]
d(fdir)	0.049 [1.102]	−0.004 [−0.769]	0.001 [0.516]
Adj. R^2	0.027	0.009	0.345

Note: ***, **, * denote rejection of null hypothesis at the 99, 95 and 90% level of significance, respectively.
Sources: Author's elaboration using World Development Indicator (World Bank) and UNCTAD STAT.

Table 3. Estimated VAR model for CLMV economies.

Variables	**Lags**	**Null hypothesis**	***F*-statistic**
odar &*gdpr*	1	*d(odar)* does not Granger Cause *d(gdpr)*	3.93**
		d(gdpr) does not Granger Cause *d(odar)*	0.51
odar & *mosr*	1	*d(odar)* does not Granger Cause *d(mosr)*	0.18
		d(mosr) does not Granger Cause *d(odar)*	0.35
mosr & *gdpr*	1	*d(mosr)* does not Granger Cause *d(gdpr)*	0.11
		d(gdpr) does not Granger Cause *d(mosr)*	3.02*

Note: **, * denote rejection of null hypothesis at the 95 and 90% level of significance, respectively.
Sources: Author's elaboration using World Development Indicator (World Bank) and UNCTAD STAT.

Table 4. Pairwise Granger causality tests for CLMV economies.

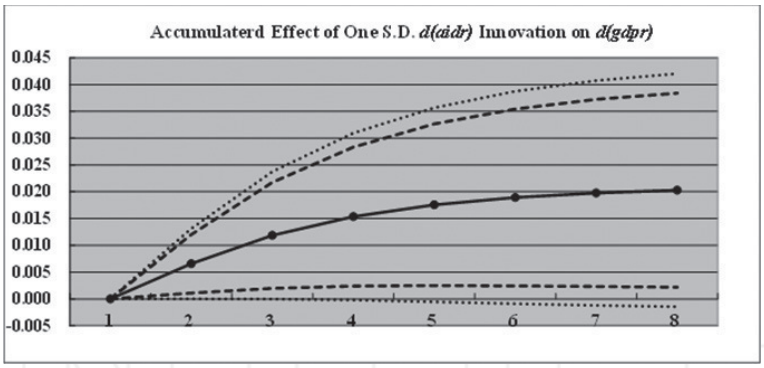

Figure 5. Impulse response of real GDP to aid shock for CLMV economies. Note: The coarse and fine dotted lines denote a 90 and 95% error band, respectively, over an 8-year horizon. Sources: Author's elaboration using World Development Indicator (World Bank) and UNCTAD Stat.

countries in Asia and Oceania by more than 70%, whereas the United States and EU countries provide their ODA in Africa and Middle East by 50–60%. Japan's ODA, thus, focuses on Asian area. At the same time, the major use of Japan's ODA focuses on 'Economic Infrastructure', for example, for transport and communications by around 50%, whereas those of the United States and EU countries have a less focus on that purpose. We speculate, from these observations, that the ODA received by the CLMV has been allocated for economic infrastructure to a large degree. The ODA for them, therefore, would give little room to expand consumption of non-tradable, and contribute directly to capital accumulation. We speculate, thus, that the CLMV economies have not suffered from the Dutch Disease and even have enjoyed capital accumulation effect.

5. Emigrant remittances and the Dutch Disease

This section investigates the Dutch Disease effect of 'emigrant remittances' focusing on the economies of Nepal and Bangladesh for the sample period for 1993–2013. This section also uses a VAR model as an analytical instrument.

We clarify the key variables for the estimation. The first one is 'remittances as a percentage of GDP (*roy*)'. The data for remittances and GDP are retrieved from WDI of the World Bank. The second one is 'real exchange rate (*rer*)', which is introduced to represent 'spending effect' in the Dutch Disease theory. The real exchange rate is computed in the following way (taking Nepalese one as an example):

$$rer_{\text{Nepal}} = \left\{ CPI_{\text{Nepal}} / er_{\text{RupeesperUSDollar}} \right\} / WIUV \tag{3}$$

where *CPI* represents consumer price index (2010 = 100) in Nepal; *WIUV* does the world import unit value, and *er* does nominal exchange rate in the unit of Rupees per US Dollar. The consumer price index, nominal exchange rate and the world import unit value are retrieved from International Financial Statistics of International Monetary Fund. The third one is

'manufacturing-services ratio in GDP base (*mos*)', which is introduced to show 'resource movement effect' in the Dutch Disease theory. The data are retrieved from the same source as that in Sections 3 and 4.

We then specify a VAR model equation for estimation in the following way:

$$y_t = \mu + V y_{t-1} + \varepsilon_t \quad (4)$$

where y_t is a column vector of the endogenous variables: $y_t = (roy_t\, rer_t\, mos_t)'$, μ is a constant vector, V is a coefficient matrix, y_{t-1} is a vector of the lagged endogenous variables and ε_t is a vector of the random error terms in the system. The lag length (−1) is chosen by the minimum Akaike Information Criterion with a maximum lag being equal to (−2) under the limited number of observations. Following the VAR model estimation, the Granger causalities among three endogenous variables and the impulse responses to the shock of remittance-GDP ratio are examined for identifying their dynamic effects.

The estimation outcomes of the VAR model (4), the bilateral Granger causalities and the impulse responses are reported in **Tables 5–6** and **Figure 6**, respectively. Concerning the Granger causalities shown in **Table 6**, we identified only the causality from remittances-GDP ratio (*roy*) to manufacturing-services ratio (*mos*) at the conventionally significant level in Nepal. When we consider the estimated VAR model in **Table 5**, this causality was assumed to be the 'negative' one. On the other hand, in Bangladesh we confirmed the weak 'positive' causality from remittances-GDP ratio (*roy*) to manufacturing-services ratio (*mos*). Regarding the impulse responses in **Figure 6**, the manufacturing-services ratio negatively responded to the

	roy	***rer***	***mos***
Nepal			
roy-1	0.982*** [5.968]	−0.012 [−0512]	−0.033*** [−2.926]
rer-1	2.571 [1.722]	0.463** [2.133]	−0.041 [−0.398]
mos-1	1.290 [0.951]	−0.328 [−1.662]	0.816*** [8.537]
C	−14.765 [−1.554]	3.322** [2.404]	0.740 [1.106]
Adj. R²	0.926	0.770	0.985
Bangladesh			
roy-1	1.017*** [12.264]	−0.088* [−1.948]	0.017 [1.272]
rer-1	0.088 [0.283]	0.519*** [3.048]	−0.154*** [−2.920]
mos-1	−0.528 [−0.666]	0.859* [1.987]	0.697*** [5.187]
C	1.390 [0.537]	−0.541 [−0.383]	1.692*** [3.855]
Adj. R²	0.954	0.454	0.865

Note: ***, **, * denote rejection of null hypothesis at the 99, 95 and 90% level of significance, respectively.
Sources: Author's elaboration using World Development Indicator (World Bank) and UNCTAD STAT.

Table 5. Estimated VAR model for Nepal and Bangladesh.

	Lags	Null hypothesis	*F*-statistic
Nepal			
roy & *rer*	1	*roy* does not Granger Cause *rer*	1.62
		rer does not Granger Cause *roy*	2.08
roy & *mos*	1	*roy* does not Granger Cause *mos*	8.85***
		mos does not Granger Cause *roy*	0.00
Bangladesh			
roy & *rer*	1	*roy* does not Granger Cause *rer*	0.28
		rer does not Granger Cause *roy*	0.01
roy & *mos*	1	*roy* does not Granger Cause *mos*	4.09*
		mos does not cut Granger Cause *roy*	0.39

Note: ***,* denote rejection of null hypothesis at the 99 and 90% level of significance, respectively.
Sources: Author's elaboration using World Development Indicator (World Bank) and UNCTAD STAT.

Table 6. Pairwise Granger causality tests for Nepal and Bangladesh.

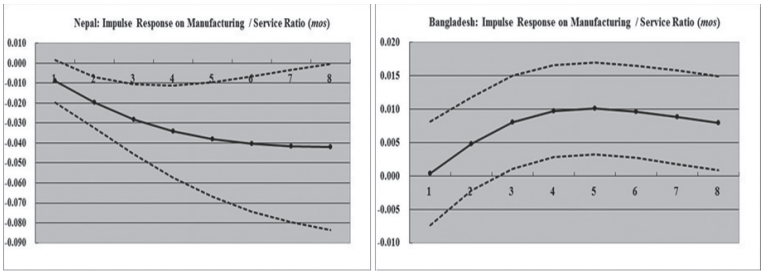

Figure 6. Impulse response to remittance shock for Nepal and Bangladesh. Note: The dotted lines denote a 95% error band over an 8-year horizon. Sources: Author's elaboration using World Development Indicator (World Bank) and UNCTAD STAT.

shock of remittances-GDP ratio within a 95% error band in Nepal, whereas the ratio positively responded to that shock in Bangladesh.

The interpretations of the estimation results above are summarized in the following ways. Firstly, the Dutch Disease would occur in Nepal. It should be, however, noted that real currency rate appreciation was not accompanied by an increase in remittances, judging from no causality from the remittances-GDP ratio to the real exchange rate. The existence of the Dutch Disease in Nepal could be interpreted in such a way that tradable sector have been shrunk by remittances directly through a decline in labour supply as Acosta et al. [9] suggested as an additional mechanism. Secondly, no Dutch Disease effects were found in Bangladesh, and tradable sector was even expanded there. This effect seems to come from capital accumulation as Bourdet and Falck [3] suggested as a longer-term impact of remittances, which is shown in Section 2.

The next question then arises as to what makes a contrast in the Dutch Disease effects of received remittances between Nepal and Bangladesh. The first perspective is the difference in their demand structure. According to the database of UNCTAD STAT, on the average for 2000–2013, the share of 'gross fixed capital formation' to GDP as well as that of 'exports of goods and services' has been larger in Bangladesh (26.2 and 15.9%) than in Nepal (20.6 and 14.1%), whereas that of 'household consumption expenditures' has been larger in Nepal (80.2%) than in Bangladesh (74.6%). This tells us that the received remittances have a tendency to be used more for investment in Bangladesh, thereby leading to capital accumulation there. In Nepal, on the other hand, the remittances have an inclination to be allocated more for consumption. In this respect, Bangladesh would fit the hypothesis of the long-term effects of remittances that Bourdet and Falck [3] proposed. The second interpretation is the contrast in government policies for industrial development between Bangladesh and Nepal. Nepalese government has not facilitated effective industrial policies as far as manufacturing sectors are concerned. On the other hand, Bangladesh has adopted a positive strategy to develop manufacturing industries since the 1990s. The strategy was typically found in the policy package in 2010 [13]. The package set a clear goal on manufacturing: an expansion in the industry sector's ration relative to GDP from the present 28 to 40% by 2021, and an increase in the share of the labours employed in industry relative to the country's total labour forces from the current 16 to 25% in 2021. For realizing the target, the government has provided industrial sectors with adequate infrastructure such as gas, water, electricity and other physical facilities such as telecommunications, road and rail transport. The government has also put a priority on setting up industrial zones and export-processing areas to attract foreign direct investments in manufacturing industries. This contrast in the policy stances between Nepal and Bangladesh might produce the difference in the Dutch Disease effects of emigrant remittances in both countries. To be specific, the manufacturing-oriented policies in Bangladesh might prevent the Dutch Disease from occurring, whereas no effective strategies in Nepal would allow it to appear.

To sum up, the empirical outcomes identified the existence of the Dutch Disease in Nepal, but not in Bangladesh. We speculate that the contrast in the Dutch Disease effects might come from the differences in the demand structure and policy efforts for manufacturing development between both economies.

6. Key findings and recommendation

This chapter analysed the effects of 'Dutch Disease' on three macroeconomic variables: natural-resource abundance, foreign aids and emigrant remittances. The analysis focused on Asian economies that are expected to sustain their growth, and adopted a vector auto-regression model with Granger causality and impulse response tests as an analytical framework. The main findings were as follows. Firstly, from the perspective of natural-resource abundance in Asian economies, the Dutch Disease was identified for 1980–1995, but not for 1995–2014, probably because of their institutional improvements. Secondly, in the economies of Cambodia, Lao PDR, Myanmar and Vietnam, their accepted foreign aids have not caused the Dutch

Disease and have rather promoted their economic growth, due to their aid contributions to infrastructure development. Thirdly, regarding the Dutch Disease effects of emigrant remittances, the disease was verified in Nepal but not in Bangladesh, due to their different demand structures and policy efforts.

The recommendation from key findings above is the significance in institutional quality and its reformation as Van der Ploeg [12] suggested. As long as Asian economies have accepted capital inflows in any forms, they have been accompanied with the risk of the Dutch Disease. To avoid the Dutch Disease risk, Asian economies should put a priority on 'capital accumulation effect' from the long-term perspectives as Bourdet and Falck [3] argued. It requires infrastructure development, human resource development and industrial policies to facilitate manufacturing production. These policy initiatives might be possible to be realized under qualified institutions with good governance in terms of government effectiveness, regulatory quality and rule of law.

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References

[1] Asian Development Bank. Asia 2050: Realizing the Asian Century. Manila: ADB; 2011

[2] Corden WM, Neary JP. Booming sector and de-industrialization in a small open economy. Economic Journal. 1982;**92**:825-848

[3] Bourdet Y, Falck H. Emigrants' remittances and Dutch Disease in Cape Verde. International Economic Journal. 2006;**20**(3):267-284

[4] Sachs JD, Warner AM. Natural resources and economic development: The curse of natural resources. European Economic Review. 2001;**45**:827-838

[5] Harding T, Venables AJ. The implications of natural resource exports for non-resource trade. OxCarre (Oxford Centre for the Analysis of Resource Rich Economies) Research Paper. 2013;103

[6] Ismail K. The structural manifestation of the 'Dutch Disease': The case of oil exporting countries. International Monetary Fund Working Paper. 2010;**10**:103

[7] Rajan RG, Subramanian A. Aid, Dutch Disease, and manufacturing growth. Journal of Development Economics. 2011;**94**(1):106-118

[8] Adam CS. Aid and the supply side: Public investment, export performance, and Dutch Disease in low-income countries. World Bank Economic Review. 2006;**20**(2):261-290

[9] Acosta PA, Lartey EKK, Mandelman FS. Remittances and the Dutch Disease. Journal of International Economics. 2009;**79**:102-116

[10] Lartey EKK, Mandelman FS, Acosta PA. Remittances, exchange rate regimes and the Ditch Disease: A panel data analysis. Review of International Economics. 2012;**20**: 377-395

[11] Clark C. The Conditions of Economic Progress. New York, NY: Macmillan; 1940

[12] Van der Ploeg F. Natural resources: Curse or blessing? Journal of Economic Literature. 2011;**49**:366-420

[13] Bhuyan AR. Bangladesh industrial policy 2010: A critical appraisal. Thoughts on Economics. 2010;**20**:1-16

Chapter 5

Ricardo's Law of Comparative Advantage and the Law of Association: A Subjective Analysis

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Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.68968

Abstract

The law of association, which is a generalization of Ricardo's law of comparative advantage, is one of the most fundamental laws in economics, which explains the benefits of international trade in the macroscopic level and the division of labour in the microscopic one. However, the derivation of the law is traditionally based on aggregate production criterions rather than on the producers' subjective preferences. An economic law, which ignores subjective preferences cannot be regarded as a fundamental one. In this chapter, a subjective analysis of the law is presented, to the best of our knowledge, for the first time. It is shown that when subjective considerations are introduced the tendency to trade can be reduced. An algorithm is presented to illustrate the dynamics of the process, in which the information regarding the subjective preferences is transferred via the previous trading prices. Furthermore, the effect of specialization on the production frontiers, which is absent in most economics derivations of the law, is taken under consideration. It is shown that even if both producers are identical a non-trading state is unstable. It is therefore shown that counter to mainstream thinking, *comparative advantage is neither necessary nor is it a sufficient condition for trading*.

Keywords: Ricardo, law of comparative advantage, law of association, subjective preference ranking, division of labour, trading

1. Introduction

The law of association (LA), which is a generalisation of Ricardo's well-known law of comparative advantage (LCA) [1–4], can be regarded as one of the main corner stones of both micro- and macroeconomics. In the microscopic regime, it explains the motivation for basic trade, the division of labour, allocations of goods and production preferences. In the macroscopic realm not only does it shed light on international trading, but it is also a clear testimony for free

trading and low tariffs. Despite its importance, this law is missing in most microeconomics and macroeconomics textbooks.

The LCA is usually known as Ricardo's law and we will also refer to it as such, albeit historical justice requires citing the fact that it should have been attributed to James Mill (for a discussion on this issue see Refs. [5, 6]).

Usually, the interested economists will find a discussion on the LCA in textbooks on international trading [7] or textbooks on general economics [8]. However, in these cases, the discussion usually focuses on international trading with a clear neglect of the law's implication on interpersonal exchange, namely, the LA.

A clear exception for this omission is the Austrian school of economics, which elaborates on the LA even in its most basic textbooks (see Refs. [9, 10]). They used this law, as was initially meant by Ricardo, to advocate for free trade and free interpersonal association, and as a tool to explain the process behind the division of labour between nations and individual.

However, there is some discrepancy in the Austrian adoption of the LCA. The Austrian school's approach is to avoid aggregate economic parameters, and yet, they use the LA to show that the aggregate production is raised due to trade. But does it mean that the conditions of both producers were improved as a consequence of trading? Despite Mises and Rothbard's attempt to claim that the LA does indicate mutual benefit, a complete Austrian analysis requires a subjective treatment, which is absent in their writings.

In all their writings, the Austrian economists stress that it is meaningless to discuss mutual utility. Only individual utility has a meaning. Moreover, they stress that utility has only ordinal meaning and not cardinal one [9, 10]. One can say that he prefers A over B, but it is meaningless to say by how much.

Therefore, even comparison between different individual's utility is, according to the Austrian school, meaningless. It should be stressed that this understanding was adopted by most modern schools of economics (on this subject see Ref. [11]).

The fact that two producers produce more of certain goods does not mean that they are better off. The problem can easily be emphasised by the following example: Suppose one individual is expert in making bread, and the other one is expert in making mud pies. Should one conclude from the LA that they both have to focus on the product they are best in producing? Surely not. The mud pie is useless for both. In this case, they both need to be focusing on producing bread. There is no point in wasting resources on producing mud pies.

Actually, it was Böhm-Bawerk, one of the prominent leaders of the Austrian school [12], who used the 'mud pie argument' to attack the classical economists in general and Karl Marx in particular for using the labour theory of value. The fact that a product 'costs' a certain amount of labour does not mean that it has some value.

The erroneous conclusions are a direct result of the absence of any subjective utility analysis in the derivation of the LA.

For a complete analysis, the subjective scale of preferences of the two producers/traders has to be incorporated in the analysis of the LA. The problem is that the traditional Austrian analysis is based on verbal arguments or very basic preference schedule tables. An extensive subjective Austrian treatment must incorporate two-dimensional preference matrices along the Ricardian's argument.

Another discrepancy arises in the literature in connection to specialisation. It was stated very clearly by many economists and can easily be grasped by the layman that specialisation increases the productivity of every one of the merchants prior to trading. Nevertheless, this effect is also neglected in the analysis or, at best, analysed separately from the benefits of trading.

See, for example, two contemporary economists (pages 4 and 48 in Ref. [7] and even Ref. [13]), which both recognise that specialisation increases the productivity of each one of the producers (not only the aggregate productivity), but they fail to incorporate this point in the LA analysis.

It is the object of this chapter to fix these two problems and to analyse the LA with subjective preferences and with the effect of specialisation.

2. The traditional Ricardo's law of comparative advantage

Let there be two individuals (1 and 2), both of them can produce two consumption commodities: A and B.

Let the maximum number of units of good A and of good B that the first individual (hereinafter we will adopt the title 'producer') produces are A_1 and B_1, respectively. Similarly, the maximum number of units of the same goods (A and B) that the second producer produces are A_2 and B_2, respectively. Therefore, the first producer is constrained by the equation

$$\frac{a_1}{A_1}+\frac{b_1}{B_1}\leq 1 \tag{1}$$

where a_1 and b_1 are the number of units the first individual produces, and similarly

$$\frac{a_2}{A_2}+\frac{b_2}{B_2}\leq 1 \tag{2}$$

where a_2 and b_2 are the number of units the second individual produces.

These constrain equations are usually termed: the production possibility frontier (PPF).

Now if $A_1 > A_2$, but $B_1 < B_2$, then it is clear that the first producer has an absolute advantage over the second one in producing units of good A and vice versa in producing units of good B. In this case, it is clear that trading will be beneficial to both producers.

The novelty of the LA is the notion that even in the case where $A_1 > A_2$ and $B_1 > B_2$, where clearly the second producer has no absolute advantage in the production of either commodities, they still can benefit from exchange.

$$\text{If } \frac{A_2}{B_2} < \frac{A_1}{B_1} \tag{3}$$

then, the first producer has a comparative advantage in producing A, while the second producer has a comparative advantage in producing B. It is easy to see that in this case, there is a common interest for the exchange. Suppose that ΔA units of A are exchanged for ΔB units of B, i.e. the first producer sells ΔA units of A for ΔB units of B. Clearly, the first producer would agree to this exchange provided the price, i.e. the ratio

$p \equiv \Delta A/\Delta B$ obeys the inequality

$$p = \frac{\Delta A}{\Delta B} < \frac{A_1}{B_1} \tag{4}$$

Otherwise, this producer can produce the commodity instead of buying it. Similarly, the second producer would agree to this exchange provided the price is larger than

$$p = \frac{\Delta A}{\Delta B} > \frac{A_2}{B_2} \tag{5}$$

for exactly the same reason.

Therefore, if inequality (3) holds, then there is a price regime in which they will both benefit from the exchange. This is the traditional LA.

3. Production maximization analysis

Clearly, aggregate production analysis cannot justify the subjective behaviour of the producers, however, the improvement in the producers' status can be quantified by the excess production with respect to the producer's PPF. The reason for that is the producer is indifferent to its position on the PPF. Thus, any improvement in its status is achieved by advancing in the perpendicular direction to the production frontier.

If after trading the first producer has a_1 units of A and b_1 units of B and the second producer has a_2 units of A and b_2 units of B, then the distances between their current status and their PPF (which quantifies their production improvement) are

$$\Delta D_1 = \frac{a_1/A_1 + b_1/B_1 - 1}{\sqrt{A_1^{-2} + B_1^{-2}}} \text{ and } \Delta D_2 = \frac{a_2/A_2 + b_2/B_2 - 1}{\sqrt{A_2^{-2} + B_2^{-2}}}, \tag{6}$$

respectively. After trading ΔA units of A for ΔB units of B

$$\Delta D_1 = \frac{-\Delta A/A_1 + \Delta B/B_1}{\sqrt{A_1^{-2} + B_1^{-2}}} \text{ and } \Delta D_2 = \frac{\Delta A/A_2 - \Delta B/B_2}{\sqrt{A_2^{-2} + B_2^{-2}}}. \tag{7}$$

One can therefore evaluate the price p^*, for which both producers have the same gain, i.e. $\Delta D_1(p^*) = \Delta D_2(p^*)$,

$$p^* = \frac{B_2\sqrt{A_1^2 + B_1^2} + B_1\sqrt{A_2^2 + B_2^2}}{A_2\sqrt{A_1^2 + B_1^2} + A_1\sqrt{A_2^2 + B_2^2}} = \frac{\cos\theta_1 + \cos\theta_2}{\sin\theta_1 + \sin\theta_2}, \tag{8}$$

$$\text{where } \tan\theta_1 \equiv A_1/B_1 \text{ and } \tan\theta_2 \equiv A_2/B_2. \tag{9}$$

At this price, the production gain of both producers is equal to

$$\Delta D_1(p^*) = \Delta D_2(p^*) = \Delta A\frac{\sin(|\theta_2 - \theta_1|)}{\sin\theta_2 + \sin\theta_1} = \Delta B\frac{\sin(|\theta_2 - \theta_1|)}{\cos\theta_2 + \cos\theta_1} \tag{10}$$

4. Subjective analysis

However, clearly something is missing in these production analysis. It is clear that production in itself is not the economic goal. Hence, in what sense, the producer condition is better after the exchange than before it?

One must assume that while the individuals have a comparative advantage in the production of one of the goods, they want or need both of them, and in the process of analysing the best option to act (producing or a combination of producing and trading), the individual chooses the option, which yields the best combination of goods. But what is the best combination? An evaluation method is required.Historically, the tool for situation evaluation was the utility function. However, as was realised by the Austrian school of economics and was later accepted among most economists [11], the situation preference ranking cannot have a cardinal meaning (as the utility function suggest) but only ordinal one.

The problem is, that creating a list, i.e. a table, of preferences, when there are multiple parameters or many degrees of freedom, is doable, but cumbersome and complicates the economic analysis. This may be the reason, that Rothbard, which used several times lists of preferences, used them only in relatively simple cases. In the problem under discussion, the actors are both producers and traders. Their decisions are based on two stages.

In what follows, we introduce the actors' ranking matrices: $R_1(a_1,b_1)$ and $R_2(a_2,b_2)$. That is, every state of the first producer is described by two parameter: the number of units in his/her possession of commodity A (a_1) and of commodity B (b_1). Similarly, the states of the second producer are described by the equivalent parameter a_2 and b_2, respectively. Therefore, instead of presenting the scenarios as a single list, which includes all options, we present them with two two-dimensional matrices $R_1(a_1,b_1)$ and $R_2(a_2,b_2)$.

Clearly, since A and B are goods, the utility increases with the number of units, i.e.

$$R_n(a_n+1,b_n) > R_n(a_n,b_n) \text{ and } R_n(a_n,b_n+1) > R_n(a_n,b_n) \tag{11}$$

for $n = 1,2$.

In the limit where the units of the goods are arbitrarily small, the continuum limit can be used, in which case, Eq. (11) can be written as $\frac{\partial R_n(a_n,b_n)}{\partial a_n} > 0$ and $\frac{\partial R_n(a_n,b_n)}{\partial b_n} > 0$.

The law of diminishing marginal utility (LDMU) is traditionally formulated by demanding a concave shape for the utility function. However, in the absence of a utility function, it is meaningless to apply this criterion on the preference ranking matrix. A better approach is to notice that the decline in the marginal utility of a certain good is actually manifested by the relative increase in the ranking of *other goods*. Therefore, the LDMU can be stated mathematically as

$$R(a,b+1) - R(a,b) \le R(a+1,b+1) - R(a+1,b)$$

Or, equivalently, in a more symmetric form

$$R(a,b+1) + R(a+1,b) \le R(a+1,b+1) + R(a,b) \tag{12}$$

Similarly, Eq. (12) can be rewritten in the continuum limit as $\frac{\partial^2 R(a,b)}{\partial a \partial b} \ge 0$.

Any individual would prefer to increase the value of its current ranking $R_n(a_n,b_n)$ (for $n = 1,2$) by changing his/her state parameters a_n and b_n (by producing and trading goods).

That is, if $R_n(a_n,b_n) > R_n(\bar{a}_n,\bar{b}_n)$, then the nth producer would prefer the state (a_n,b_n) over the state $(\bar{a}_n,\bar{b}_n)$. Clearly, if both $a_n > \bar{a}_n$ and $b_n > \bar{b}_n$, then $R_n(a_n,b_n) > R_n(\bar{a}_n,\bar{b}_n)$; however, in many cases, the ranking is improved even when $a_n > \bar{a}_n$ but $b_n < \bar{b}_n$ or when $a_n < \bar{a}_n$ and $b_n > \bar{b}_n$, which depends on the subjective ranking of both individuals.

Prior to trading the producer needs to produce the goods. The decision on the amount to produce depends on the ranking matrix under the relevant constrictions (1) and (2).

In **Figure 1**, such a two-dimensional ranking matrix is illustrated. For simplicity, we assume that the two producers have the same ranking, i.e. $R_1(a,b) = R_2(a,b)$ for any (a,b); however, this is not a restrictive assumption. Despite the fact that in this example, the two producers have the same preference ranking, their production's decision is different due to their different

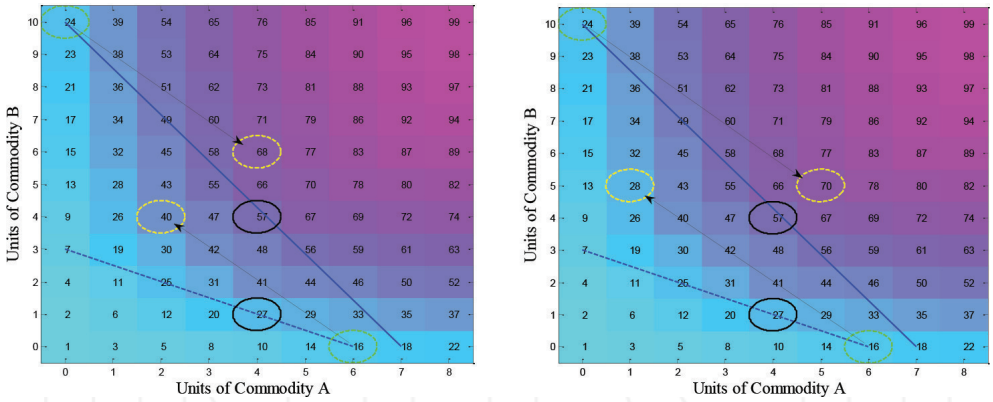

Figure 1. Two possible scenarios of trading. In the scenario on the left, the two producers temporally worsen their ranking, which decreases from 27 and 57 (without trading) to 16 and 24, respectively, to increase it to 40 and 68, respectively, after trading. On the right, the number of units, which exchange hands, was increased. As a result, the ranking of the first producer decreases to 28 but the ranking of the second producer increases to 70.

production abilities (different PPFs). Trading will take place provided there are Δa and Δb, which can be either positive or negative, so that

$$R_1(a_1 - \Delta a, b_1 + \Delta b) > R_1(a_1, b_1) \tag{13}$$

$$R_2(a_2 + \Delta a, b_2 - \Delta b) > R_2(a_2, b_2) \tag{14}$$

In the example presented in **Figure 1**, $A_2 = 7$, $B_2 = 10$, $A_1 = 6$ and $B_1 = 3$. Therefore, without trading, the best ranking that the production constrains allow for the first producer is $R_1(a_1 = 4, b_1 = 1) = 27$ and for the second producer is $R_2(a_2 = 4, b_2 = 4) = 57$. Since $0.7 = A_2/B_2 < A_1/B_1 = 2$, there is an advantage for the first producer to produce extra units of A and to sell them to the second producer for units of B.

In **Figure 1**, two such options are presented. In both cases the producers decided to specialise in a single product, the one which they have a comparative advantage with. By specialising they knowingly decreases *temporarily* their preference ranking. The preference ranking of the first producer reduces temporarily from the maximum 27 to 16, and the ranking of the second producer reduces from the maximum value 57 to 24. After trading, there is a substantial increase in the preference ranking. In the left scenario, the first producer's preference ranking increases to 40 and that of the second one increases to 68. It is shown that if the second producer wishes to increase its preference ranking even further to 70, it must be on the account of a substantial reduction in the preference ranking of the first producer (to 28), albeit it is still higher than the pre-trading maximum ranking (27). As was emphasised in Mises and Rothbard writings [9, 10], the final state depends on the bargaining merits of the two producers (now merchants). However, while Mises and Rothbards emphasised that the price is a matter of bargaining, they ignored the fact that the *amount of exchange good* is also a matter of bargaining *even for the same price*. In the two scenarios, which are presented in **Figure 1**, the

exchange price is the same, however, there is a difference in the number of units, which took place in the exchange. In both cases the price is 1 (1 units of A for 1 units of B), however, while the first producer prefers exchanging 5 units, the second producer prefers exchanging 6 units. So, the bargaining is not on the price but on the number of units, and the problem is that when the first one gains the second one losses and vice versa. This contradiction of wants did not occur in Mises and Rothbard writings because they *did not take the preference ranking into account*.

In **Figure 2**, we see two additional behaviours, which were neglected or ignored in previous writings. In the left panel, we can see a scenario in which non-specialisation yields better outcomes to both participants. The preference ranking of the first producer is improved (from 28 in the right panel of **Figure 1** to 30), and even the second producer gains, for this production scheme (1 unit of A and 8 units of B), do not consume all his temporal resources (since 8/10 + 1/7 < 1).

In the right panel of **Figure 2**, all the possible outcomes after trading are plotted by light circles. As can be easily seen, not all options, which were predicted by the LA are allowed and again the discrepancy is the fact that the traditional LA ignores the subjective preference scaling. For example, consider the scenario, in which they both specialise, i.e., the first producer produces 6 units of A and the second producer produces 10 units of B, and then 2 units of A are exchanged for 2 units of B. On the face of it, if the LA is considered, this is a legitimate transaction. However, while the first producer gains from that exchange (his preference ranking increases from the previous maximum of 27 to 41), the second producer clearly loses (from 57 to 51), and therefore, he/she will have no motivation to participate in such a transaction. He/she may, however, decide to produce 2 units of A and 7 of units of B and then trade 2 (or even better 3) units of A to 2 (or 3) units of B. In which case, they both gain (the first producer's preference ranking increases to 41 or 42 and the preference ranking of the second one increases to 66 or 67).

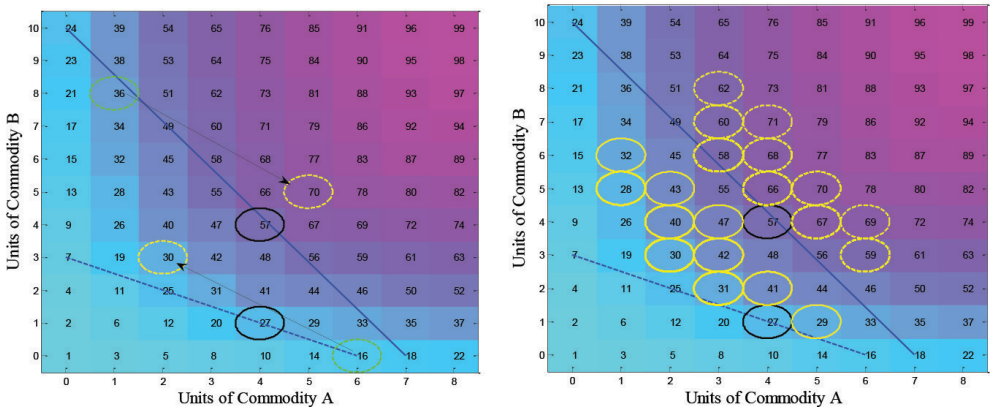

Figure 2. On the left panel, the final scenario is better than the right scenario in **Figure 1** despite the fact that the second producer produces less. On the right panel all the final trading scenarios are plotted. Due to the ranking matrix not every transaction is possible.

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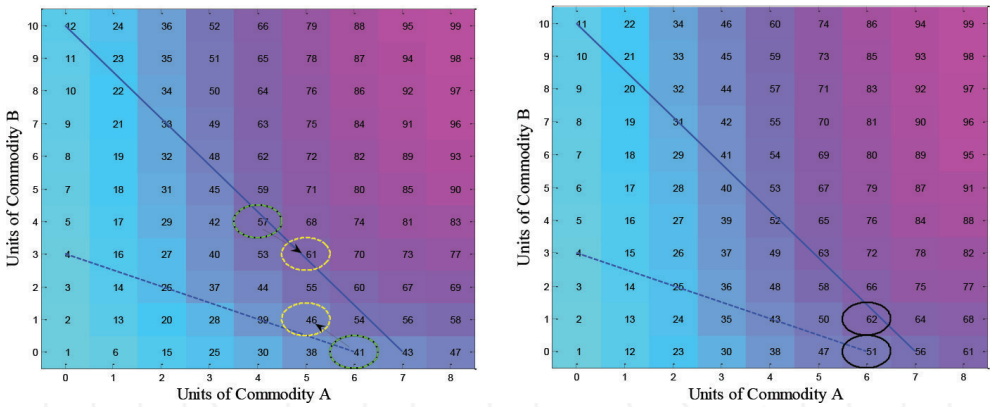

Figure 3. Two asymmetric scenarios. Despite the fact that there is a clear comparative advantage of the two producers, and in principle there are numerous trading options, in practice, due to the asymmetry between the utility of the two commodities (commodity A is more desirable than commodity B); then, the trading options are extremely limited. In the left panel there is only one option for trading, and in the right panel there is none.

In the previous ranking, the matrix was approximately symmetric with respect to the diagonal (for example, the ranking of 7 units of A and 2 of B is 50, while the ranking of 2 units of A and 7 of B is similar, i.e. 49). In **Figure 3**, this pseudo symmetry is broken. In the two scenarios, which are presented in **Figure 3**, the two producers clearly prefer units of A over units of B, and therefore trading is substantially depressed. In the left scenario, there is only one option for trading, and in any case, there is no clear motivation to the second producer to produce more units of B.

In the right scenario of trading is suppressed completely. The first producer cannot make anything which can motivate the second producer to trade with. In this latter scenario, the suppression of trading reduces also the motivation for the division of labour. Both producers behave like separate entities.

5. Dynamics

The main dilemma, which the producers must resolve, is that by specialisation they have to take a risk. When they specialise, they produce too many products which they do not need, and therefore, they temporarily reduce their preference ranking. The source of the problem is that they do not know the preference ranking of the *other* producers. It seems contradictory to base specialisation on subjective analysis, since if the producer is familiar only with his own preference scale, then how can he judge, what would the other producer want to buy from him?

Clearly, in a single trading event, this dilemma has no solution; however, in successive trading events (multiple iterations), the dilemma is solved, since *objective* information is transferred via the *price* of the previous trade.

The producers/traders follow the following *algorithm*. The algorithm consists of three stages: the initial condition, the entrepreneurial stage, and the bargaining stage. The last two stages (B and C) are repeated iteratively between one trading event and the next.

A. Initial state

$n = 0$ (iteration number)

Initial production values

$a_1^{(0)} = a_1^*$, $b_1^{(0)} = b_1^*$, $a_2^{(0)} = a_2^*$, $b_2^{(0)} = b_2^*$ (the asterisks stand for the best values prior to trading)

Initial price value

$\Delta A^{(0)} = \Delta A^*$, $\Delta B^{(0)} = \Delta B^*$ (the initial price is guessed by the producers)

B. Entrepreneurial stage

$n \leftarrow n + 1$ (increment the iteration index)

Each producer checks different production working points, i.e. they check the effect of different increment/decrement Δa_1 and Δa_2 (under the constrain of fixed prices, i.e. given $\Delta A^{(n-1)}$ and $\Delta B^{(n-1)}$).

Mathematically, it means vary Δa_1 and if

$$R_1\left(a_1^{(n-1)} + \Delta a_1 - \Delta A^{(n-1)}, b_1\left[a_1^{(n-1)} + \Delta a_1\right] + \Delta B^{(n-1)}\right) > R_1\left(a_1^{(n-1)}, b_1\left[a_1^{(n-1)}\right]\right)$$

then

$$a_1^{(n)} = a_1^{(n-1)} + \Delta a_1$$

Similarly, vary Δa_2 and if

$$R_2\left(a_2^{(n-1)} - \Delta a_2 + \Delta A^{(n-1)}, b_2\left[a_2^{(n-1)} + \Delta a_2\right] - \Delta B^{(n-1)}\right) > R_2\left(a_2^{(n-1)}, b_2\left[a_2^{(n-1)}\right]\right)$$

Then,

$$a_2^{(n)} = a_2^{(n-1)} + \Delta a_2.$$

where $b_1[x]$ and $b_2[x]$ represents the production frontiers of the two producers, i.e.

$$b_1[x] \leq floor[B_1(1 - x/A_1)]$$

$$b_2[x] \leq floor[B_2(1 - x/A_2)]$$

where *floor*[] is the floor rounding function (rounds the argument to the nearest integers towards minus infinity).

*Note that in this stage, every producer's decisions depend only on his/her own preference ranking matrix.

C. Bargaining stage

During the bargaining stage, the price values (ΔA and ΔB) vary until *both* conditions

$$R_1\left(a_1^{(n)} - \Delta A, b_1\left[a_1^{(n)}\right] + \Delta B\right) > R_1\left(a_1^{(n-1)}, b_1\left[a_1^{(n-1)}\right]\right)$$

and

$R_2\left(a_2^{(n)} + \Delta A, b_2\left[a_2^{(n)}\right] - \Delta B\right) > R_2\left(a_2^{(n-1)}, b_2\left[a_2^{(n-1)}\right]\right)$ apply.

In which case

$$\Delta A^{(n)} \leftarrow \Delta A$$

$$\Delta B^{(n)} \leftarrow \Delta B$$

D. Update the parameters and go back to the entrepreneurial stage (B)

It should be stressed that the iterations are essential for successful trading. Without iterations no knowledge can be transmitted between the producers, and the entrepreneurial act would be futile. A similar iterative process can formalise the Mengerian [14] and Misesian [15] origin of money.

6. The effect of specialisation

Plato [16] attributed the division of labour to the diversity in people's merits, i.e., the baker specialises in making bread, while the carpenter specialises in making tables because the baker has a talent for making bread and the carpenter has the talent for making tables. Smith [17] emphasised that the division of labour does not rely on diversity in the population inborn talents. The division of labour itself is beneficial and creates wealth to the community.

The classical LA does not take this effect into consideration. But the comparative advantage itself is a function of specialisation.

If when specialising the first producer can produce A_1 units of commodity A or B_1 units of commodity B, it does not mean that he/she can produce $A_1/2$ units of A and $B_1/2$ units of B. In fact, the joint production must be *lower* than that.

Therefore, formulation of the production possibility frontier by a straight line is a very loose constrain. In fact, the real constrain curve is more convex; an example of which is illustrated in **Figure 4**.

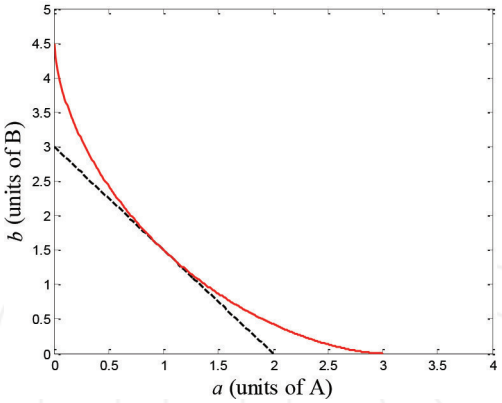

Figure 4. The effect of specialisation on the production frontier. The dashed line corresponds to the case before specialisation (in this case $A = 2$ and $B = 3$), while the solid curve stands for the convex production frontier in the presence of specialisation with the specialisation production gain factor of $F = 1.5$ (for which case $\alpha = 0.6309$).

We therefore present here, to the best of our knowledge, for the first time a mathematical presentation of a more realistic formulation of the production frontiers. Instead of Eqs. (1) and (2), the PPF can be written

$$\left(\frac{a_1}{A_1}\right)^{\alpha_1} + \left(\frac{b_1}{B_1}\right)^{\beta_1} \leq 1 \text{ and } \left(\frac{a_2}{A_2}\right)^{\alpha_2} + \left(\frac{b_2}{B_2}\right)^{\beta_2} \leq 1 \tag{15}$$

where α_1, β_1, α_2 and β_2 are constants smaller than 1.

In this case, the generic dynamics are essentially similar to the previous section except for the change in the production frontiers, namely

$$b_1[x] \leq floor\left\{B_1\left[1 - \left(\frac{x}{A_1}\right)^{\alpha_1}\right]^{1/\beta_1}\right\} \text{ and } b_2[x] \leq floor\left\{B_2\left[1 - \left(\frac{x}{A_2}\right)^{\alpha_2}\right]^{1/\beta_2}\right\}. \tag{16}$$

It can easily be shown that if $\alpha = \beta$, then the production is increased by a factor (see **Figure 4**)

$$F = 2^{1/\alpha - 1}. \tag{17}$$

In other words, if without specialisation the production frontier is bounded by $a/A + b/B = 1$, and specialisation increases its production by a factor of F, then the new production frontier under specialisation is

$$\left(\frac{a}{AF}\right)^{\alpha(F)} + \left(\frac{b}{BF}\right)^{\alpha(F)} = 1 \text{ when } \alpha(F) = \frac{1}{1 + \log_2 F}. \tag{18}$$

In **Figure 4**, the effect of specialisation on the production frontier is illustrated for $F = 1.5$, which corresponds to $\alpha = 0.6309$.

In **Figure 5**, for example, $\alpha_1 = \alpha_2 = \beta_1 = \beta_2 = 0.5$, which according to Eq. (17) corresponds to a production gain factor of $F = 2$. In general, the better the specialisation or the longer the internship required, the smaller is the related exponent, for example, if the second producer is an expert in producing A, then α_1 is small.

In this scenario, prior to trading, the first producer chooses to produce only six units of A and the second producer only two units of A and two of B. However, the knowledge of possible future trading persuade the second producer to abandon the production of A and to specialise only in B. After trading their preference, ranking is improved considerably from 16 to 40 for the first producer and from 25 to 68 for the second one.

The convexity of the specialisation curve increases dramatically the trading possibilities. As the right panel of **Figure 5** illustrates (compare it to **Figure 2**), there is another important conclusion from this analysis. The specialisation itself creates the incentive for exchange. In the classical LA, there should be a diversity in the producers' abilities. But this analysis demonstrates that even if the producers are initially *identical in any respect*, i.e. they have the same preference schedule (same ranking) and the same production constrains, the convexity of the production frontier creates the incentive for exchange.

For example, suppose the two producers have the same production capabilities, i.e. their production constrains are:

$$\sqrt{\frac{a}{7}} + \sqrt{\frac{b}{10}} \leq 1 \tag{19}$$

where a and b stand for both producers, i.e. for either (a_1,b_1) and (a_2,b_2).

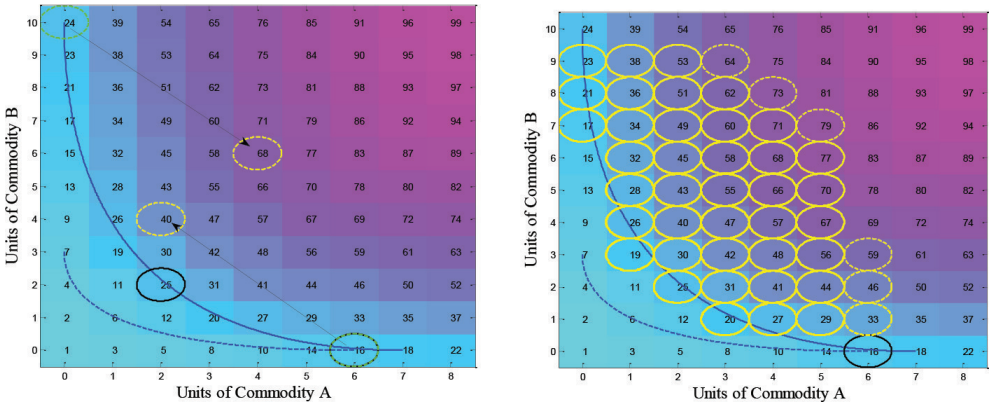

Figure 5. The effect of specialisation on the constrain curves and on the possibilities for trading. Due to specialisation, the production constrains curve become convex. On the left panel such a scenario is illustrated. The dotted and the solid curves represent the production boundaries of the first and second producers, which in the absence of trading the maximum achievable preference ranking is 16 and 25, respectively. With the possibility of trading the motivation for specialisation increases. Specialisation temporarily reduces the ranking of the second producer to 24, and after trading their ranking increases to 40 and 68, respectively. In the right panel all the possible trading scenarios are presented by light circles.

In which case without trading, they both prefer to produce two units of both A and B (gaining a ranking 25); however, this is not a stable situation, because the first entrepreneur, which will decide to produce more than 5 (6–10) units of B, which should not be too complicated a task, because his/her production limit is 10 units of B, can trade 2 (or more) units of B for a single units of A and to improve his/her preference ranking at least to 26. A similar argument applies to an entrepreneur, who decides to manufacture more than 5 units of A. He/she can trade 2 (or more) units of A for a single unit of B and to improve his/her ranking to (at least) 27. Moreover, the process cannot stop here, while one entrepreneur decides to specialise in one commodity, the motivation for the second one to specialise in the other commodity increases. The dynamic process, which is described in Section 5, can stop only at full production (note that leisure cannot be regarded as a commodity in this simple model) when one produces 7 units of A and the other produces 10 units of B. The eventual state of the two producers depends on their bargaining skills and cannot be determined *a priori*.

7. Instabilities

When applying the entrepreneurial-trading algorithm (Section 5) on the specialisation case, it can be shown that stable state in the absence of trading, i.e. the state the producer choose without the option of trading, becomes unstable in the case of trading. We will show that despite the fact that the two producers are identical ($\alpha_1 = \alpha_2$, $\beta_1 = \beta_2$ and $R_1 = R_2$), the non-trading status is unstable, the logic of which was explained in the previous section. In this section, it will be shown mathematically.

For simplicity we choose $\alpha = \beta$ (Eq. (18)) for *both* producers, but it can easily be generalised to $\alpha \neq \beta$. Moreover, to simplify the analysis we use dimensionless variables, i.e. Eq. (18) can be rewritten as

$$\xi^{\alpha} + \eta^{\alpha} = 1, \tag{20}$$

where $\xi \equiv a/AF$ and $\eta \equiv b/BF$.

Now, suppose that prior to trading the highest preference ranking is reached at $\xi_0 \equiv a_0/AF$ and $\eta_0 \equiv b_0/BF$. Any decision to deviate from this optimal point will worsen their status and reduce their ranking. However, the deviations are not symmetric, i.e. if one producer decides to produce more of A, i.e. $\xi_0 + \delta$ and the other decides to produce less, i.e. $\xi_0 - \delta$ then, for an arbitrary small perturbation δ their production of B corresponds to

$$\eta_{before}(\xi_0 \pm \delta) \cong (1 - \xi_0^{\alpha})^{1/\alpha} \mp \delta\xi_0^{\alpha-1}(1 - \xi_0^{\alpha})^{1/\alpha-1} + \frac{1}{2}\delta^2(1-\alpha)\xi_0^{\alpha-2}(1 - \xi_0^{\alpha})^{1/\alpha-2} \tag{21}$$

The subscript stands for '*before* trading'.

Since (ξ_0, η_0) is the point with the highest ranking, then at this point the gradient of the ranking matrix is perpendicular to the slope of the production frontier, i.e. any advancement

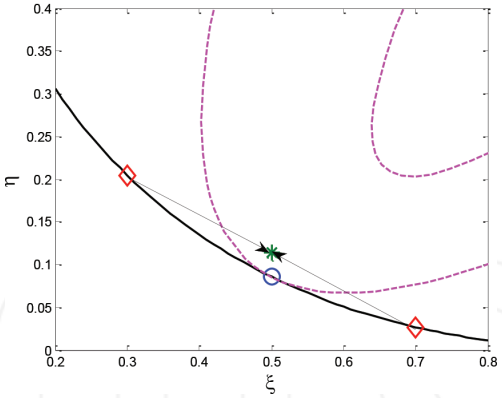

Figure 6. Illustration of the instability created by specialisation. The circle represents the pre-trading stable point ($\xi_0 = 0.5, \eta_0 = 0.0858$), the diamonds represents the perturbed (Eq. (21) with δ= 0.2) pre-trading condition. The arrows describe the trading process (from the diamonds to the asterisk, which represents Eq. (23)). The dashed curves represents indifference curves, while the solid curve stands for the production frontier.

in the normal direction (perpendicular to the production frontier) will necessarily improve the producers' ranking.

The trading occurs in the linear regime, i.e. δ units of ξ can be traded for $\delta\xi_0^{\alpha-1}(1-\xi_0^{\alpha})^{1/\alpha-1}$ units of η, i.e. for the price

$$\Delta B/\Delta A = B\Delta\eta/A\Delta\xi = (B/A)\xi_0^{\alpha-1}(1-\xi_0^{\alpha})^{1/\alpha-1}. \tag{22}$$

Therefore, after trading their status exceeds the production frontier (see **Figure 6**)

$$\eta_{after}(\xi_0 \pm \delta) \cong (1-\xi_0^{\alpha})^{1/\alpha} + \frac{1}{2}\delta^2(1-\alpha)\xi_0^{\alpha-2}(1-\xi_0^{\alpha})^{1/\alpha-2} > \eta(\xi_0) \tag{23}$$

whose distance from the production frontier is approximately

$$\Delta D \cong \frac{1}{2}\delta^2 \frac{(1-\alpha)\xi_0^{\alpha-2}(1-\xi_0^{\alpha})^{1/\alpha-2}}{\sqrt{\xi_0^{2\alpha-2}(1-\xi_0^{\alpha})^{2/\alpha-2}-1}}. \tag{24}$$

Thus, we see that if trading is an option, then the stable maximum ranking point (ξ_0, η_0) becomes unstable, since any deviation from this point will necessarily improve the producers' ranking.

8. Summary and conclusions

The law of association is well known as one of the most fundamental laws in economics. It is traditionally believed that advantage, either absolute of comparative, is a sufficient condition

for trading. It is shown in this chapter that one of the sources of this belief is that no subjective analysis is used in the derivation of the LA. This is a major flaw in the law's derivation, since it is well known that the utility is a subjective property and any fundamental law should be based on subjective grounds.

We first presented the traditional law of association (Section 2). In the absence of subjective analysis, we used the distance from the production frontier to quantify the improvement in the status of both producers as a consequence of specialisation and trading (Section 3). Using this tool, we derive the price, in which the gain of both producers is the same.

Then, we present an analysis, which is based on subjective preference ranking. It is shown that comparative advantage is an insufficient condition for trading (Section 4).

In Section 5, we present the dynamic of the process, which is based on subjective analysis. The object of this section is to answer one of the main dilemmas in specialisation—the lack of information regarding the *other* producers' preference ranking. An algorithm, which solves this dilemma, is presented, where the information is carried via the objective price level of the previous trading.

In Section 6, we investigate the effect of specialisation, which is also absent in the traditional analysis of the LA. It is shown that the specialisation bend the production frontier to a convex curve (a novel mathematical presentation for this bending is suggested). As a consequence, the motivation for trading increases, and therefore, there is no need for any advantage (absolute or comparative) to encourage trading. The producers can have identical production frontier and identical preference ranking and yet they would prefer to trade.

In Section 7, we show that specialisation breaks the stability of the pre-trading status, and creates trading opportunities even when the producers are identical.

Thus, when subjective considerations are introduced to the analysis, advantage between producers is neither necessary nor sufficient a condition for trading.

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References

[1] D. Ricardo. On the Principles of Political Economy and Taxation. UK, John Murray, 1817

[2] Maneschi A. Comparative Advantage in International Trade: A Historical Perspective. Cheltenham, UK: Edward Elgar; 1998

[3] Hollander. The Economics of David Ricardo. Toronto. Univ. Tronto Press; 1979

[4] M. Blaug. Ricardian Economics. A Historical Study. Whitefish, MT: Literary Licensing, LLC; 2012. ISBN 9781258447861

[5] Thweatt WO. James Mill and the early development of comparative advantage. History of Political Economy. 1976;**8**:207–234

[6] Rothbard MN. Classical Economics: An Austrian Perspective on the History of Economic Thought, Vol II. Cheltenham, UK: Edward Elgar Publishing; 2006

[7] P. R. Krugman and M. Obstfeld. International Economics: THEORY & POLICY . Boston, MA, 8th ed. Addison-Wesley; 2009

[8] Baumol WJ, Blinder AS. Economics: Principles and Policy. San Diego: Harcourt Brace Jovanovich; 1979

[9] von Mises L. Human Action: A Treatise on Economics. Yale University Press: Ludwig von Mises Institute; 1949

[10] Rothbard MN. Man Economy and State. 2nd ed. Ludwig von Mises Institute, Scholar's Edition; 2009

[11] J. Hicks,. Value and Capital: An Inquiry into Some Fundamental Principles of Economic Theory. Oxford. Oxford University Press; 1961

[12] Böhm-Bawerk E. Capital and Interest. Vol. 1. History and Critique of Interest Theories. London, UK: McMillan and Co.; 1890

[13] Murphy RP. Choice Cooperation, Enterprise and Human Action. Oakland: Independent Institute; 2015

[14] Menger C. On the Origin of Money. Ludwig von Mises Institute; 2009

[15] von Mises L. The Theory of Money and Credit. New Haven: Yale University Press; 1953

[16] Plato, The Republic, London. Penguin Classics edition, 2nd ed.; 2003. ISBN-13: 978-0140449143

[17] Smith A. An Inquiry into the Nature and Causes of the Wealth of Nations. Chicago: University of Chicago Press; 1976

INTECH

Chapter 6

International Trade: The Position of Africa in Global Merchandise Trade

Nahanga Verter

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.68897

Abstract

Even though global trade has fluctuated over the years, it has also rapidly increased. However, the structure and pattern of trade vary significantly by-products and regions. Undoubtedly, trade has come with both benefits and daunting challenges to countries involved, especially in African nations, where primary and intermediate merchandise formed a substantial share of exports. Because advanced and newly industrialized economies have better technology and know-how, manufacturing industries, access to finance, and market than Africa, they have a greater market proportion in the world trade. Arguably, African countries have been left in the cold as they struggle to compete with advanced economies. As presented in this chapter, Africa has been struggling to be relevant in the world market. However, its global share of merchandise trade has reduced over the decades. This is partly because the continent has concentrated on the exportation of few primary commodities (i.e., mineral fuels, iron ores, gold, cocoa beans) with volatile prices and demand in the global markets. The frequent global oil crunch other raw products are a wake-up call for a rapid industrialization and diversification for competitiveness in Africa. The World Trade Organization (WTO) has to ensure that defensive trade remedies should not be the next frontier of protectionism. Finally, for trade, growth, and development to be stimulated, African countries should urgently open their markets to expand intra-African trade.

Keywords: exports, economies of scale, trade, technology, market access, Africa

1. Introduction

The movement of goods, services, finance, and human resources across national borders has been driving socioeconomic and political globalization, especially in the past six decades. Historically, international trade theories have attempted to explain the reasons why countries

trade and the benefits are derived from such transactions. For instance, classical or traditional theories, such as absolute advantage [1], comparative advantage [2], and Heckscher-Ohlin's factor endowments [3, 4], argue that countries involve in cross border commerce largely because of the relative costs of production or factor endowments over other nations. Consequently, it has become imperative for nations to trade by exporting products that they have a comparative or competitive production factor(s) and importing products that are scarce domestically. This partly explains why African countries largely export primary commodities and import processed or manufactured goods. On the other hand, modern trade theories [5–10] stress that there are many factors beyond the relative costs of production or factor endowments. They argued that the gains from trade are heavily determined by imperfect competition, increasing economies of scale, technological advancement, tastes, and the levels of per capita income in countries.

Similarly, world organizations, and scholars, especially economists, opine that trade is a catalyst for growth in countries that are poised to develop. Thus, they have some arguments for cross border trade: trade brings a wide variety of goods and services that spur choices of consumers in the countries involved. To some extent, trade maintains stable demand and supply that allows efficient exchanges that stimulate economic growth and development in countries [11, 12]. Also, due to uneven distribution of natural resources and the climatic conditions across the globe, it has made a trade inevitable, as it could either complement or supplement domestic production to the countries involved in such transactions [13–15].

Although tariffs have been significantly reduced in various products, commodities that African countries have the advantage to produce and export still face stringent constraints largely because of restrictions and other distorting measures. Nonetheless, the trends in trade have remarkably risen since the creation of the World Trade Organization (WTO), as a body of trade negotiations, policies, and rules. Even though the WTO has made progress in pressuring countries to reduce restrictions, trade policies and rules may have favored developed economies at the expense of weak economies, especially in Africa [16].

Against this background, this chapter aimed at assessing the performance and challenges of trade in Africa in the present era of trade liberalization. Given that agriculture is the primary export commodities in Africa, this chapter will also focus on the performance of agricultural trade in the continent. To achieve the aims of this study, secondary data are obtained from agencies, such as the United Nations Conference on Trade and Development (UNCTAD) annual statistical reports; WTO, International Trade Centre (ITC), and World Bank (WB).

2. Trends in merchandise trade

Historically, between seventeenth and early twentieth centuries, the share of agricultural trade as a percentage of total global trade was above 50%. Nonetheless, this has steadily decreased over the decades as fuels and mining and manufacturing products have taken over.

Even though trade has substantially grown, it has also been diverse across regions and continents. Developing countries' share on the total merchandise trade has also increased. Developed countries' relative importance as key suppliers in global markets has declined. Nonetheless, they account for slightly above half of the value of merchandise exports. World trade fell in 2015 partly as a result of a reduction in oil and other commodity prices. China was once again the global leading merchandise exporter, followed and the USA and Germany. These three countries are jointly accounted for over one-third of world exports in 2015 **(Table 1**). Also, merchandise exports in individual countries such as China (13.7% of global exports), the USA (9.1% of global exports), Germany (8% of global exports), Japan (3.8% of global exports), the Netherlands (3.4% of global exports), the UK (2.8% of global exports), Italy (2.8% of global exports), and Canada (2.5% of global exports) were more than Africa (2.4% of global exports) as a whole in 2015. No African country was among the top 30 exporters of goods and services in the world in the same period under study.

On the regional levels, just recorded in Africa as a whole, the share of the African regional blocs—East African Community (EAC), Economic Community of Central African States (ECCAS), Southern African Development Community (SADC), and Economic Community of West African States (ECOWAS)—in the merchandise exports also substantially reduced in the same period under study. Nevertheless, SADC has continued to lead, followed by ECOWAS, just as South Africa and Nigeria are the first and second largest exporters from the continent. African merchandise trade has risen faster than those of the developed and developing economies. However, the continent still accounts for a very low share of world trade [17], and it has been decreasing instead of increasing (**Tables 1** and **11**). Although the value of export in Africa has also increased, its export share as a proportion of global exports has been decreasing steadily.

Merchandise exports from African countries and other least developed countries (LDCs) have been marginally affected by sharp falls in the prices of crude oil, mining, and other primary agricultural products. The level of African export merchandise trade rose from $3.4 billion in 1948 to about $92 billion in 1993. It then increased to reach its peak in 2013 ($601 billion) and steadily declined in 2014 ($552 billion) and then substantially decreased to about $396 billion in 2015 (**Table 2**). The share of the continent in the global merchandise export also shrank from 7.3% in 1948 to 2.4% in 2015 (**Table 1**).

Africa's merchandise exports witnessed a significant declined (−28.4%) in dollar terms in 2015. Accounting for about 40% decline in the region's exports, in the oil-exporting countries, such as Nigeria (−45%), Angola (−44%), and Algeria (−40%), in 2015. This slowdown has been partly occasioned by an ample of other factors, including political turmoil in some countries in the continent. The overdependence of some oil-producing countries on oil exports in the region resulted in the decline of Nigeria's share of the world merchandise exports from 0.9% in 2012 [17] to 0.31% in 2015. On individual country levels, **Table 2** indicates that South Africa, Nigeria, Algeria, Angola, and Morocco were the leading merchandise exporters in Africa in 2015. The share of these five countries in the continent rose to 47% in 1948 to 57% in 2015. However, these countries' export values in the world market shrank from 3.5% in 1948 to 1.4% in 2015 **(Table 3)**.

Economy/year	1948	1953	1963	1973	1983	1993	2003	2014	2015
World (US$ billions)	59	81	157	582	1858	3782	7590	18,996	16,552
World share (%)	100	100	100	100	100	100	100	100	100
Developing economies	31.8	30.1	23.0	20.4	27.0	27.3	32.5	44.6	44.8
Developed economies	65.5	66.0	71.8	75.4	67.6	71.0	64.8	51.4	52.1
America	39.33	31.44	25.58	21.63	21.05	20.42	18.30	16.75	17.18
The USA	21.59	15.20	14.30	12.17	11.07	12.29	9.55	8.53	9.09
SCA	9.87	8.56	5.61	4.04	4.78	4.01	4.91	5.54	5.44
Asia	12.40	14.04	13.82	17.13	24.81	30.70	31.89	40.69	41.42
China	0.89	1.26	1.30	1.01	1.20	2.43	5.77	12.33	13.74
Europe	37.02	44.25	52.30	54.19	48.26	44.93	46.23	38.09	37.59
Germany	1.4	5.3	9.3	11.7	9.2	10.06	9.90	7.87	8.03
Oceania	3.82	3.4	2.50	2.26	1.47	1.52	1.22	1.56	1.42
Africa	7.43	6.8	5.80	4.79	4.41	2.42	2.36	2.91	2.39
EAC	0.45	0.3	0.36	0.21	0.10	0.06	0.06	0.08	0.09
ECCAS	0.71	0.94	0.62	0.47	0.40	0.28	0.30	0.55	0.40
ECOWAS	1.32	1.25	0.94	1.02	0.87	0.44	0.49	0.73	0.53
SADC	3.25	3.30	2.77	1.88	1.47	1.00	0.82	1.07	0.96
G20	61.26	58.29	58.95	60.32	59.55	64.27	60.93	59.65	61.01
EU28	32.11	38.19	44.84	47.50	40.41	40.88	41.59	32.40	32.55
SSA	5.37	5.29	4.42	3.35	2.69	1.67	1.55	2.11	1.77

Source: Compiled from UNCTAD. Note: SCA stands for South and Central America.

Table 1. World merchandise exports (US$ billions, current and share), 1948–2015.

Economy/year	1948	1953	1983	1993	2003	2014	2015
Africa (US$ billions)	4.36	5.49	81.92	91.57	179.35	552.97	395.96
Balance (US$ billions)	−0.66	4.83	−3.68	−3.0	13.83	−81.57	−159.31
Share (%) in Africa exports							
South Africa	26.88	25.15	22.59	26.45	20.34	16.46	20.63
Nigeria	5.78	6.34	12.64	10.82	13.40	17.04	12.96
Algeria	9.59	7.23	15.36	11.37	12.92	11.37	9.54
Angola	1.38	2.24	2.22	4.11	5.30	10.70	8.38
Morocco	3.30	4.91	2.45	4.04	4.89	4.31	5.53
Top five African countries	46.92	45.87	55.27	56.79	56.85	59.88	57.03
Share in (%) regional exports							
South Africa (% of S*. Africa)	100.0	98.9	91.0	86.4	85.5	85.	86.51
Nigeria (% of West Africa)	32.6	34.3	63.3	57.9	64.3	67.3	57.4
Algeria (% of North Africa)	31.9	29.9	38.7	36.0	35.9	40.4	35.3
Angola (% of Middle Africa)	14.3	16.3	24.9	36.0	42.4	56.7	50.9
Share (%) in world exports							
South Africa	2.00	1.71	1.00	0.64	0.48	0.48	0.49
Nigeria	0.43	0.43	0.56	0.26	0.32	0.50	0.31
Algeria	0.71	0.49	0.68	0.28	0.31	0.33	0.23
Angola	0.10	0.15	0.10	0.10	0.13	0.31	0.20
Morocco	0.24	0.33	0.11	0.10	0.12	0.13	0.13
Top five African countries	3.49	3.12	2.44	1.37	1.34	1.74	1.36

Source: Compiled from UNCTAD data. Note: S* stands for Southern Africa.

Table 2. Top five African merchandise exporters ($ billions, current, and share), 1948–2015.

Indicator/year	1995	2010	2013	2014	2015
[TOTAL] Total of all products	111,076	514,079	597,906	560,069	387,719
[054] Vegetables	688	2987	3851	4403	4207
[057] Fruits and nuts (excluding oil nuts)	1830	5761	7158	7961	7893
[071] Coffee and coffee substitutes	2056	2022	2354	2650	2551
[072] Cocoa	2248	9699	7573	9170	8930
[121] Tobacco, unmanufactured	929	1905	2607	2696	2547
[281] Iron ore and concentrates	582	6484	10,376	9017	3433
[287] Ores and concentrates	738	6826	6643	6466	5197
[321] Coal, whether or not pulverized	1731	5580	6171	5538	4562
[333] Petroleum oils, oils from bitumen	30,444	224,637	256,179	217,057	116,427
[334] Petroleum oils, bituminous >70% oil	6187	26,119	28,476	31,214	18,563
[343] Natural gas, whether or not liquefied	2478	30,148	37,446	34,428	21,721
[522] Inorganic chemical element, oxides & hal. salts	1399	3812	3814.2	3863	3577
[562] Fertilizers (other than of group 272)	1218	4211	4655.9	4306	3614
[667] Pearls, precious and semiprecious stones	5800	6400	12,034	13,505	9420
[671] Pig iron, spiegeleisen*	1326	5570	4328	4880	3270
[681] Silver, platinum, metals of the platinum	2,34	9458	8643	6649	6616
[682] Copper	1090	8367	10,782	11,426	8841
[773] Equipment for distributing elect, n.e.s.	386	3921	4916	5487	4913
[781] Motor vehicles	1270	4974	5177	6568	6926
[971] Gold, nonmonetary (e.g., gold ores)	1791	8221	20,169	18,387	14,354
Fuels (% of total exports) ([333–355] [342–344])	36.0	56.8	55.8	52.6	42.1

Source: Compiled from UNCTAD. Note: *671 Pig iron & spiege., sponge iron, iron/steel granules & powders.

Table 3. Major merchandise export trade matrix in Africa ($, millions, current), 1995–2015.

The value of African merchandise import has increased over the decades (**Table 5**). However, just as in export, the continent remains a marginal player in the world imports, declined 8.1% in 1948 to 3.3% of the global share in 2015 (**Table 4**). The proportions of Africa, Sub-Saharan Africa (SSA) and other African regional bodies, in the world exports and imports have fallen sparingly over the period under review. As shown in **Table 3**, African primary export commodities are crude oil and natural gas, gold, pearls and precious and semiprecious stones, copper, cocoa products, fruits and nuts, and silver, platinum, and other metals.

With the increasing integration of markets as a result of globalization and liberalization, Africa faces a more fiercely competitive external trading environment. This may have distorted export-led growth hypothesis and a robust product diversification of export products emanating from Africa. Tariff regime is more pronounced in processed agricultural products

Economy/year	1948	1973	1983	1993	2003	2014	2015
World value ($ billions)	62	596	1901	3845	7780	18,997	16,607
World share (%)	100	100	100	100	100	100	100
Developing economies	31.6	18.1	25.7	28.7	29.2	42.0	42.0
Developed economies	66.0	77.6	69.4	69.7	68.9	55.1	55.7
America	28.7	21.5	22.1	24.2	24.7	21.3	22.7
The USA	21.6	12.2	11.1	12.3	9.6	8.5	9.1
SCA	9.1	3.9	3.2	4.5	4.3	5.7	5.8
Asia	13.33	16.2	23.8	28.3	27.9	37.7	37.1
China	0.9	1.0	1.2	2.4	5.8	12.3	13.7
Japan	0.4	6.4	7.9	9.6	6.2	3.6	3.8
Europe	46.9	56.6	48.1	43.4	43.9	36.1	35.3
EU28	41.3	49.3	40.9	39.8	40.3	31.8	31.4
Oceania	3.0	1.8	1.6	1.6	1.5	1.6	1.6
Africa	8.05	3.86	4.50	2.46	2.13	3.34	3.34
SSA	5.35	2.73	2.75	1.54	1.42	2.20	2.21
ECCAS	0.63	0.29	0.29	0.14	0.17	0.36	0.34
SADC	3.70	1.52	1.32	0.91	0.85	1.09	1.07
EAC	0.42	0.23	0.16	0.11	0.10	0.21	0.21
ECOWAS	0.86	0.76	1.00	0.40	0.33	0.61	0.59

Source: Compiled from UNCTAD.

Table 4. World merchandise imports by region ($ billions and %), 1948–2015.

Economy/year	1948	1953	1983	1993	2003	2014	2015
Africa (US$ billions)	5.02	5.91	85.56	94.56	165.51	634.54	555.27
Share in Africa imports (%)							
South Africa	30.94	21.49	18.47	21.14	24.01	16.51	16.27
Egypt	14.25	8.74	12.00	8.69	7.82	10.52	10.90
Algeria	9.61	9.79	12.15	9.29	7.48	9.23	9.27
Nigeria	3.37	5.13	14.32	5.86	6.56	9.46	8.64
Morocco	5.61	8.27	4.20	7.12	8.61	7.22	6.76
Top five economies	63.79	53.41	61.14	52.09	54.49	52.95	51.85
Share in regional imports (%)							
South Africa (% of S. Africa)	100.0	98.25	85.39	80.81	84.90	84.13	83.30
Nigeria (% of West Africa)	31.40	30.02	63.56	35.00	40.99	50.70	47.94
Share of world import (%)							
Africa	8.05	6.93	4.50	2.46	2.13	3.34	3.34
South Africa	2.49	1.49	0.83	0.52	0.51	0.55	0.54
Egypt	1.15	0.61	0.54	0.21	0.17	0.35	0.36
Algeria	0.77	0.68	0.55	0.23	0.16	0.31	0.31
Nigeria	0.27	0.36	0.64	0.14	0.14	0.32	0.29
Morocco	0.45	0.57	0.19	0.18	0.18	0.24	0.23
Top five economies	5.13	3.70	2.75	1.28	1.16	1.77	1.73

Source: Compiled from UNCTAD.

Table 5. Top five African merchandise importers ($ billions, current, and share) in 2015.

such as cocoa, tea, hides and skins, sugar, meat, coffee, and fruits (**Table 12**), which are among the primary export commodities in Africa. Arguably, developed countries' hidden agenda may be to ensure that African nations remain suppliers of industrial raw materials to their matured industries and, in return, import their manufactured or processed products as postulated by the dependency theories**(Table 5)**.

As a consequence, African countries, being peripherals, are still widely exporting mainly primary commodities, such as crude oil and gas, ores and metals, gold, copper, nickel, lead, cocoa beans, coffee, hides, skins and furskins, vegetables and fruits, sesame seeds, cigarettes, and rubber. On the other hand, they are mainly importing manufactured commodities, such as synthetic rubber, electrical machinery, apparatus, textile yarn and related products, motor

vehicles and bicycles, machinery and transport equipment, medicines, fuels, wheat, paste of tomatoes, chocolate, refined sugar, tractors, and other modern technologies (**Tables 6** and **7**). Arguably, exporting primary commodities means that African countries have been exporting their jobs and wealth to other continents, while importing manufactured products means importing poverty and misery to the continent.

Table 6 shows the list of top seven exported and imported products (at two-digit level) as a share of total exports and imports in Africa between 2001 and 2015. Data from UNCTAD [18] and ITC [19] trade map show that mineral fuels, mineral oils, and products are by far

Code	Product label	2001	2005	2009	2012	2014	2015
Export—share (%)							
Code	All products	100	100	100	100	100	100
27	Mineral fuels, mineral oils	43.5	41.4	50.6	58.9	52.7	44.1
71	Natural/cultured pearls*	9.2	9.2	6.1	7.7	7.4	8.1
26	Ores, slag, and ash	1.9	2.4	3.4	3.1	3.8	3.5
85	Elect. Machinery/equipment and parts	2.0	2.4	2.3	1.7	2.4	3.2
87	Vehicles other than railway/ tramway	2.1	2.9	2.1	1.7	2.3	3.1
74	Copper and articles thereof	0.8	1.1	1.6	1.8	2.3	2.8
18	Cocoa and cocoa preparations	1.6	1.8	2.2	1.5	1.7	2.6
Total of top seven exported product groups		61.1	61.2	68.3	76.4	72.6	64.8
Import—share (%)							
Code	All products	100	100	100	100	100	100
27	Mineral fuels, mineral oils	11.6	13.5	12.6	16.6	16.4	14.0
84	Machinery, mechanical appliances	12.5	12.3	13.6	11.3	11.6	11.1
85	Elect. Machinery/equipment and parts	8.0	8.3	8.9	7.2	7.8	8.8
87	Vehicles other than railway/ tramway	6.6	8.7	9.3	9.3	8.3	7.6
10	Cereals	4.9	3.9	4.0	4.4	4.1	3.9
39	Plastics and articles thereof	3.2	3.0	3.3	3.2	3.6	3.8
30	Pharmaceutical products	2.4	2.4	2.4	2.3	2.5	2.9
Total of top seven imported product groups		49.2	52.1	54.1	54.3	54.1	52.1

Source: Compiled from ITC. Note: *71 Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal, and articles thereof; imitation jewellery; coin.

Table 6. Africa trade: top seven product groups (at two-digit level) in 2015.

the topmost export products in Africa, and the continent is the net exporter of fuels based on Standard International Trade Classification (SITC 3) as also revealed in **Table 7**. However, when divided according to the SITC 4, Africa is the net importer of some manufactured fuel products, such as petroleum gas and other gaseous hydrocarbons (code 2711). Also, Africa is the net exporter of aggregate cocoa products but the net importer of chocolate and other food preparations containing cocoa (code 1806). Similarly, the continent is the net importer of raw hides, skins, and furskins and a net importer of leather further prepared after tanning or crusting (code 4107).

Indicator/year	1995	2000	2005	2009	2010	2012
Total of all products	−0.06	0.08	0.08	−0.02	0.04	0.02
Primary commodities (SITC 0 to 4 + 68)	0.36	0.47	0.53	0.44	0.47	0.41
All food items (SITC 0 + 1 + 22 + 4)	−0.07	−0.10	−0.16	−0.15	−0.16	−0.30
Agric raw materials (SITC 2 < 22, 27+ 28)	0.29	0.34	0.31	0.18	0.32	0.21
Ores and metals (SITC 27 + 28 + 68)	0.58	0.58	0.52	0.59	0.62	0.53
Fuels (SITC 3)	0.60	0.68	0.72	0.62	0.63	0.61
Manufactured goods (SITC 5–8 < 667, 68)	−0.49	−0.45	−0.51	−0.58	−0.56	−0.61
Machinery and transport equipment (SITC 7)	−0.70	−0.67	−0.68	−0.71	−0.69	−0.71
Iron and steel (SITC 67)	−0.20	−0.04	−0.21	−0.53	−0.34	−0.50
Manufactured goods by degree of manuf.	−0.49	−0.45	−0.51	−0.58	−0.56	−0.61
Labor- and resource-intensive manufactures	−0.12	−0.11	−0.21	−0.30	−0.33	−0.43
Low-skill and tech-intensive manufactures	−0.40	−0.30	−0.42	−0.57	−0.48	−0.58
Cereals and cereal preparations	−0.85	−0.86	−0.83	−0.80	−0.82	−0.87
Vegetables and fruits	0.43	0.42	0.45	0.39	0.40	0.32
Sugar, sugar preparations, and honey	−0.23	−0.16	−0.21	−0.36	−0.40	−0.51
Coffee, tea, cocoa, spices, and manuf.	0.69	0.61	0.59	0.69	0.70	0.56
Chocolate, food preparations with cocoa	−0.21	−0.24	0.02	−0.07	−0.03	−0.38
Tea and mate	0.16	0.19	0.25	0.22	0.27	0.18
Hides, skins and furskins, raw	0.58	0.61	0.65	0.67	0.63	0.64

Indicator/year	1995	2000	2005	2009	2010	2012
Crude rubber	0.30	0.12	0.17	0.28	0.43	0.35
Synthetic rubber	−0.59	−0.54	−0.47	−0.56	−0.49	−0.56
Crude vegetable materials, n.e.s.	0.49	0.38	0.43	0.47	0.72	0.28
Medicinal and pharma products	−0.86	−0.83	−0.86	−0.85	−0.86	−0.88
Cotton	0.67	0.77	0.73	0.74	0.68	0.83
Textile yarn and related products	−0.56	−0.63	−0.71	−0.67	−0.67	−0.71
Iron and steel	−0.20	−0.04	−0.21	−0.53	−0.34	−0.50
Copper	0.51	0.41	0.16	0.41	0.53	0.47
Nickel	0.40	0.31	0.48	0.17	0.66	0.69
Agricultural machinery and parts	−0.79	−0.80	−0.81	−0.85	−0.85	−0.85
Electrical machinery, apparatus	−0.60	−0.43	−0.42	−0.51	−0.51	−0.52
Road vehicles	−0.60	−0.59	−0.62	−0.67	−0.67	−0.70
Motorcycles and cycles	−0.88	−0.87	−0.89	−0.88	−0.91	−0.92
Arms and ammunition	−0.72	−0.68	−0.18	−0.48	−0.71	−0.66

Source: Compiled from UNCTAD.

Table 7. Merchandise trade specialization index in Africa, 1995–2012.

Africa has experienced negative trade balance in recent years (**Table 2**). For instance, in 2015, only ten African countries (Angola, Nigeria, Equatorial Guinea, Côte d'Ivoire, Guineas Bissau, Gabon, Swaziland, DR Congo, Congo, and Chad) were recorded as net exporters, albeit with minimal amount. The total net merchandise exports for the ten African countries were $20.1 billion [18]. This partly explains why Africa has been a net importer of merchandise products. It is worth mentioning that Nigeria, Angola, and Equatorial Guinea have recorded a positive trade balance mainly because fuels accounts for over 90% of the total exports. This means that outside oil, they may also record as net importers in the regions. In Africa, apart from a few primary commodities and tropical products, all other products are in net import status, and this situation is likely to continue over the next decade unless industrialization and intra-regional trade in the continent are intensified.

The merchandise trade specialization index (TSI) according to specific products in Africa (**Table 7**) shows the sluggish performance of the continent and country in the global market. The positive values signify that Africa has been a net exporter of these products. African countries are net exporters of tropical agricultural commodities and some other raw materials, such as fuels (**Table 7**), which need to be given serious attention, as it suggests that the continent may have had a comparative advantage in those products. Therefore, there is a need

for the specialization in the production and exportation of those products as postulated by Ricardo's comparative advantage [2] and the Heckscher-Ohlin model [3, 4] for growth and development to be ensured. Also, negative values suggest that Africa imports more than its exports (net consumption); it should either step up production or continue to import if they cannot cheaply produce in large quantities at home.

Sadly, even though agriculture is the mainstay of Africa's economy, the continent has performed badly in the world markets. The continent recorded negative trade balance not only in labor- and resource-intensive manufactured but also in low-skill and tech-intensive manufactured (**Table 7**). It is worth reiterating that Africa needs to increase production and the level of industrialization to process or manufacture most of the products it consumes. The continent has abundant factor endowments as postulated by the Heckscher-Ohlin model [3, 4] that need to be typed for industrial and commercial purposes.

3. Trade similarity and complementary

Trade similarity index, as developed by modern trade theories [6, 8, 20], is an indicator that helps to verify whether the structures of two economies or continents' products traded are similar or dispersed. The index ranges from 0 to 1. A value closer to 1 indicates the higher similarity or identical products trade structure between economies or continents, also known as overlap of trade. Trade similarity index in developing countries has increased over time, from 0.72 in 1995 to 0.81 in 2013, reaching the same levels with advanced economies. Implying that trade between developing countries has been intensified with identical products. Even though Africa has performed above Oceanic, as its index improved from 0.41 in 1995 to 0.47 in 2013, it was still below developing countries, South America and South Asia's averages. This implies that the continent's export structure has not proportionally matched with that of its imports from its partners as proposed by intra-industry or Linder's similarity [6] trade theories. Also, Middle, Western, and Eastern African regions poorly performed in the trade compositions during the period under scrutiny (**Table 8**). The structure of African trade shows that the continent mostly imports finished products and exports raw materials (**Table 7**), which are heterogeneous in compositions. As a consequence, its trade structure has not been at par with advanced and newly industrialized economies.

Trade complementarity index (TCI) is an overlap index, which provides significant information on intra-regional trade [21, 22]. It reveals the structures of nations' or continents' exports or imports complement the imports or exports of its trading partners. The values range from 0 to 1. A value closer to 1 may indicate ideal trading partners as they stand to benefit from increased trade, while a value closer to 0 suggests that no nation or continent traded merchandise products. In other words, a high index might signify that two nations stand to benefit from increased mutual trade. The index is likely to be significant in assessing prospective bilateral or regional trade agreements (RTAs). The TCI in developing countries has increased over time at the expense of developed economies. Even though Africa has improved, it is still below Eastern Asia, South America, and developing countries' averages. This implies that the

continent's export structure has not proportionally matched that of its importing partners. Middle Africa recorded with the lowest index, followed by the Western and Eastern African regions, reflecting a poor match between the relative composition of trade for the period in 1995 and 2013 (**Table 8**).

	Trade complementarity					Trade similarity index				
Indicator/year	**1995**	**2000**	**2010**	**2012**	**2013**	**1995**	**2000**	**2010**	**2012**	**2013**
Developing economies	0.72	0.74	0.79	0.80	0.80	0.72	0.74	0.79	0.80	0.81
Developed economies	0.87	0.86	0.81	0.81	0.81	0.88	0.87	0.82	0.81	0.81
Africa	0.42	0.39	0.44	0.46	0.46	0.41	0.38	0.44	0.46	0.47
Eastern Africa	0.28	0.28	0.31	0.34	0.34	0.28	0.28	0.31	0.34	0.34
Middle Africa	0.15	0.15	0.18	0.19	0.19	0.16	0.16	0.19	0.19	0.19
Northern Africa	0.29	0.28	0.35	0.37	0.38	0.29	0.28	0.35	0.38	0.39
Southern Africa	0.49	0.45	0.43	0.41	0.42	0.48	0.45	0.44	0.41	0.42
Western Africa	0.21	0.21	0.26	0.29	0.30	0.20	0.22	0.27	0.29	0.31
SSA	0.42	0.39	0.41	0.42	0.42	0.41	0.39	0.41	0.43	0.43
South America	0.50	0.49	0.49	0.51	0.50	0.49	0.49	0.49	0.51	0.50
Eastern Asia	0.60	0.62	0.61	0.60	0.60	0.62	0.62	0.60	0.60	0.60
EU28	0.83	0.82	0.77	0.77	0.78	0.84	0.83	0.78	0.77	0.78

Source: Compiled from UNCTAD.

Table 8. Trade complementarity and similarity indices, 1995-2013.

4. Product concentration and diversification

The Herfindahl-Hirschman index (HHI) also known as the Herfindahl index measures concentration or anticompetitive behavior of countries [23]. The product concentration index indicates how exports and imports of a country or continent (or regional groups) concentrate on a few products or otherwise distributed in a more homogeneous manner among a broad range of products. In other words, the index measures the dispersion of export's or import's values across exporter's or importer's products. The index value ranges from 0 to 1. A value closer to 1 indicates that an economy concentrated in few goods and/or sectors for trade, thus its vulnerability to trade shocks, whereas a nation or continent with a completely diversified portfolio will have an index close to 0. Globally, nations or firms spread their risks by diversifying in many baskets of markets or products as much as possible. Product and market diversification is promoted to avoid countries or companies from being vulnerable to the market shocks, usually occasioned by price, demand, and market access directions. The diversification index

signifies whether the structure of exports or imports by-product of a given nation or continent varies from the global pattern. The index value ranges from 0 to 1. A value closer to 1 indicates lower diversification and vice versa.

Table 9 presents export merchandise product diversification index (EPDI), export product concentration index (EPCI), and the total number of products (N. p) that have been exported by individual economies. Both EPDI and EPCI show that Africa has concentrated only in

Year	1995			2010			2015		
Economy/ indicator	**No. p**	**EPCI**	**EPDI**	**No. p**	**EPCI**	**EPDI**	**No. p**	**EPCI**	**EPDI**
World	261	0.05	0.00	260	0.08	0.00	260	0.06	0.00
Developing countries	261	0.09	0.28	260	0.12	0.21	260	0.09	0.19
Developed countries	260	0.05	0.12	260	0.07	0.18	260	0.07	0.18
EU28	260	0.05	0.16	260	0.07	0.22	259	0.07	0.21
America	260	0.06	0.19	260	0.07	0.18	258	0.08	0.19
Asia	261	0.08	0.23	260	0.10	0.20	260	0.09	0.20
Europe	260	0.05	0.14	260	0.07	0.18	259	0.06	0.18
Oceania	258	0.10	0.53	255	0.22	0.62	254	0.18	0.64
Africa	259	0.25	0.59	260	0.41	0.56	259	0.27	0.54
SSA	259	0.21	0.59	260	0.42	0.58	259	0.30	0.58
ACP	261	0.18	0.58	260	0.38	0.56	260	0.27	0.57
EAC	220	0.27	0.74	249	0.14	0.67	247	0.13	0.65
ECCAS	188	0.59	0.84	229	0.81	0.81	228	0.73	0.83
ECOWAS	238	0.47	0.80	248	0.60	0.74	253	0.46	0.74
SADC	259	0.12	0.51	260	0.26	0.54	257	0.20	0.54
Côte d'Ivoire	151	0.34	0.82	164	0.37	0.73	186	0.42	0.75
Ghana	129	0.36	0.83	202	0.51	0.80	214	0.44	0.81
Nigeria	168	0.85	0.89	201	0.79	0.81	231	0.72	0.83
Angola	31	0.90	0.86	89	0.97	0.84	72	0.93	0.89
Cameroon	109	0.32	0.82	168	0.37	0.75	174	0.38	0.79
Botswana	132	0.71	0.88	193	0.57	0.84	159	0.80	0.91
South Africa	255	0.11	0.51	256	0.14	0.54	251	0.12	0.50

Source: Compiled from UNCTAD. Note: No. p, number of products; EPCI, export product, concentration index; EPDI, export product diversification index.

Table 9. Product concentration and diversification indices by economy, 1995–2015.

few product groups for exports. Even though the share of the seven products in the total export products declined from 76% to about 65% in 2015, it is still huge. In the same fashion, although the proportion of mineral fuels (code 27) in the total African merchandise exports declined from 57% in 2010 to 42% in 2015 (**Table 3**), it has revealed that the continent's export has not been diversified. Also, pearls, precious stones (code 71), and ores, slag and ash (code 26), accounted for 8.1% and 3.5% of total exports respectively in 2015 in the continent.

The situation is even worrisome in some leading exporting countries in the continent. For instance, evidence from the ITC [19] shows that in 2015, Algeria's oil export accounted for 95% of total exports of the country. The value oil export in Algeria declined by −43%, sugars and sugar confectionery (−35%) and raw hides and skins (−39%), in 2015. Angola's oil export accounted 97% of total exports of the country, while pearls, precious stones, metals, and coins (code 71) accounted for 2% of the total exports in 2015. The value oil export in the country declined by −44% in 2015. Nigeria's oil exports accounted 94.5% of total exports of the country, and the value of the products exported dropped by −44% in 2015. Libya's oil exports accounted 94.3% of total exports of the country, and the value of the goods shipped was decreased by −50% in 2015. Zambia's copper exports (code 74) accounted for 74% of total exports in 2015; it dropped by −29% in the same year. Equatorial Guinea's oil export declined by −48%; mineral fuels accounted for 93% of total exports in 2015. Congo's oil exports decreased by −47%; mineral fuels accounted for 73.5% of total exports in 2015. Copper accounted 15% of total exports, but fell by −13% in 2015. Côte d'Ivoire's cocoa accounted for 43% and oil 17% of total exports in 2015. Ghana's pearls, precious stones, and metals (code 71), cocoa (code 18), and oil accounted for 34.4%, 26%, and 18%, respectively, of total exports in 2015. Also, Ghanaian oil exports declined by −50% in the same year under study. This shows that the continent is vulnerable to the global shocks of these few export products. The global oil crunch and other raw products are a wake-up call for a rapid industrialization and diversification for a sustainable export competitiveness, and export-led growth hypothesis to be achieved in Africa.

5. Intra- and extra-African trade

Intra-industry trade (IIT) is in sharp contrast with the traditional trade theory, which is based on constant returns to scale and perfect competition. The IIT model stressed that international trade takes place as a result of economies of scale, product differentiation, and imperfect competition between and within industries and countries. It emphasizes on the levels of overlap of imports and imports, also known as two-way trade in homogeneous products. The first far-reaching study of the extent of IIT was carried out by Grubel and Lloyd [8]. They developed an index called the Grubel-Lloyd index (GL index) to measure the degree of the structure of trade overlap in countries. The GL index ranges from 0 to 1, where the value closer to 1 indicates intra-industry trade, implying that the nation or region exports the homogeneous quantity of products as much it imports. Conversely, the GL index that is closer to 0 denotes zero IIT, only interindustry trade (or extra- trade), suggesting that the country or region, either substantially exports or imports certain products more than it imports or exports.

Also, studies by Grubel and Lloyd [8] confirm high ratios in the industrialized economies. In the same direction, the results of this study also show that IIT exists more in developed countries than in developing countries. Similarly, the findings show that Oceanic, SSA and Africa as a whole have been far from witnessing IIT. As compared to other continents, such as Europe and Asia, intra-African trade in overall total trade and food export have been below expectations as Africa lags behind. Even though Africa's trade with the world has improved, trade within African remains low. Even though the intra-African exports in total merchandise exports in the continent rose to 17.7% in 2015 from 12.4% in 1995, it was still low compared with 58% in developing nations, 60% in Asia, 61.6% in the EU (28), and 51% in America (**Table 10**). Despite the fact that intra-African imports in total merchandise imports in Africa rose from 11.3% in 1995 to 13.6% in 2015, it was still low compared to 59% in developing economies and about 63% in Asia (**Table 10**). On the regional levels in Africa, EAC and SADC performed more than African average. Intra-industry trade in SADC increased from 15% in 1995 to 21% in 2015, while EAC rose from 17% in 1995 to 19% in 2015, albeit below the developing countries average. Also, EAC and SADC performed better than the African average in intra-regional imports during the same time under review. On the other hand, ECCAS has the worst results in both intra-regional imports and exports in the region. Intra-regional trade in ECOWAS relatively remained the same and less than EAC and SADC. This is substantially because Nigeria, Cote d'Ivoire, and Ghana, which have been the leading traders in the region, mostly export primary commodities (mainly crude oil, cocoa, and gold) to other continents and also import manufactured goods from other regions outside Africa.

Even though agriculture has substantially contributed to the GDP and export value in African countries, the continents share in the global markets, and the annual growth rates have diminished and stagnated over the years [12]. For instance, as shown in **Table 11**, global agricultural exports by region showed Europe (40.8%) with the highest share in the world, followed by Asia (22.4%) and North America (15.7%) and South and Central America (12%), while Africa, which has heavily depended on agriculture for food, economic growth, and development, merely accounted for 3.6% of total global food exports in 2014 [24].

As seen in the previous subchapters, global trade has risen over the decades, and developing countries' share on the total merchandise trade has also increased. Nevertheless, trade in agriculture products has grown more in developed countries than African nations that are regarded as agrarian nations. Also, the developing countries' share in agricultural exports to other developing countries has also increased, albeit not as manufactured products. However, their share of agricultural exports to developed countries has stagnated. Arguably, advanced economies' trade restrictions especially on processed agricultural products (**Table 12**) have stifled trade in Africa [11, 12, 16, 24].

From the foregoing, African countries are still lagging behind from attaining IIT, similarity, or complementarity trade proponents as compared to developed countries. The low level of industrialization in Africa may have partially constrained the scope for intra-industry

Economy/year	1995			2010			2015		
	Intra-g	ROR	ROW	Intra-g	ROR	ROW	Intra-g	ROR	ROW
Export									
World	100.0	–	0.0	100.0	–	0.0	100.0	–	0.0
Developing countries	42.0	–	58.0	54.8	–	45.2	58.0	–	42.0
Developed countries	74.4	–	25.6	68.6	–	31.4	67.3	–	32.7
America	53.2	–	46.8	55.3	–	44.7	55.9	–	44.1
Asia	52.9	–	47.1	59.7	–	40.3	60.1	–	39.9
EU28	67.8	8.4	32.2	64.8	10.4	35.2	61.6	10.1	38.4
Oceania	12.9	–	87.1	8.6	–	91.4	8.0	–	92.0
Africa	12.4	–	87.6	13.8	–	86.2	17.7	–	82.3
SSA	14.9	4.3	85.1	17.2	2.9	82.8	20.2	2.7	79.8
EAC	17.2	40.7	82.8	18.6	49.9	81.4	18.8	50.3	81.2
ECCAS	1.3	66.9	98.7	1.7	71.7	98.3	1.8	73.3	98.2
ECOWAS	10.4	20.3	89.6	8.1	49.5	91.9	10.8	40.7	89.2
SADC	15.0	14.8	85.0	18.2	14.5	81.8	20.9	13.9	79.1
Import									
Developing countries	37.9	–	62.1	57.2	–	42.8	59.1	–	40.9
Developed countries	73.8	–	26.2	60.4	–	39.6	60.2	–	39.8
Asia	54.1	–	45.9	63.5	–	36.5	62.6	–	37.4
Africa	11.3	–	88.7	14.8	–	85.2	13.6	–	86.4
SSA	14.7	3.8	85.3	19.4	5.4	80.6	17.3	6.4	82.7

Source: Compiled from UNCTAD. Note: ROR (rest of the region); ROW (rest of the world).

Table 10. Intra-trade and extra-trade in economies, 1995–2015.

trade in the continent. Intra-African trade has tremendous potential to create jobs, boost investment, and stimulate growth and development in Africa. African countries have made several efforts to exploit its trade potentials for growth and development since gaining political independence in the 1950s and 1960s. To boost intra-regional trade, African regional bodies such as the ECOWAS, EAC, and SADC have launched Customs Unions to abolish duties and taxes of equivalent effect and remove nontariff measures that constraint

Indicator	Value	Share in region's exports		Share in world exports		Annual percentage change		
	2014	2010	2014	2010	2014	2010–2014	2013	2014
World	1,765.4	100.0	100.0	100.0	100.0	6.6	5.2	1.6
Europe								
World	719.5	100.0	100.0	41.8	40.8	6.0	8.1	1.4
Europe	546.1	78.7	75.9	32.9	30.9	5.0	7.7	1.4
Asia	54.7	6.2	7.6	2.6	3.1	11.3	9.9	4.1
North America	31.4	4.0	4.4	1.7	1.8	8.1	7.1	6.2
Africa	30.4	3.6	4.2	1.5	1.7	10.1	10.4	6.5
Asia								
World	395.7	100.0	100.0	21.4	22.4	7.9	2.0	2.1
Asia	232.0	59.0	58.6	12.6	13.1	7.7	0.9	1.4
Europe	49.6	13.8	12.5	3.0	2.8	5.3	2.4	1.9
North America	46.0	11.5	11.6	2.5	2.6	8.1	-3.9	8.8
Africa	24.7	5.3	6.2	1.1	1.4	12.3	3.8	5.5
Africa								
World	63.6	100.0	100.0	3.8	3.6	5.3	6.7	2.8
Europe	22.0	39.5	34.5	1.5	1.2	1.9	7.0	0.1
Africa	17.1	24.9	26.9	0.9	1.0	7.4	9.8	0.1
Asia	14.2	16.7	22.2	0.6	0.8	13.1	4.9	17.5
North America	2.8	4.7	4.4	0.2	0.2	3.6	-8.1	6.1

Source: Compiled from WTO.

Table 11. Exports of agrarian products (US$ billion and %) of regions by destination, 2014.

trade within the continent. Also, in 2012, the African Union (AU) held a summit aimed at boosting intra-African trade and speeding up the establishment of a free-trade area in the continent.

Despite advances in the regional integration, barriers to intra-African trade remain a challenge in the continent. The continent has committed to intra-regional free trade, nevertheless there have been a widespread smuggling of products between countries. This is partly due to inconsistency in trade policies and administrative bottlenecks in countries. Sadly, African trade among African countries or extra-Africa has been dominated with primary product because value addition or industrial development has been below the global average (**Table 7**).

Indicator		The USA		Japan		The EU	
Product	level	2010	2014	2007	2014	2010	2016
Cocoa							
	Beans	0	0	0	0	0	0
	Powder	10	0.1	29.8	29.8	8.0	8.0
	Chocolate	10	5.6	21.3	29.8	43	38.0
Sesame	Raw seed	0	0	0	0	0	0
	Sesame oil	0.3	0.2	3.1	1.9	7.4	6.4
Coffee							
	Husks and skins	0	0	0	0	0	0
	Roasted	0	0	12	12	7.5	9.5
	Substitutes	0.3	0.3	12	12	11.5	11.5
Cotton	Lint	0	0	0	0	0	0
	Yarn	5.9	5.9	5.6	5.6	4.0	4.0
Oranges	Fresh	1.8	1.5	24	24	12	16.7
	Juice	22.5	13.2	25.5	25.5	33.4	31.7

Source: Compiled from ITC market access map.

Table 12. Africa: tax escalation (average applied MFN tariffs) in main importing partners.

6. Constraints to trade

6.1. Market access

Is the doctrine of mercantilism dead or still alive? Mercantilism model seems to have gone; however, trade in manufactured products, especially processed agriculture, is still protected which was seen as the key features of mercantilism. For instance, export subsidies, quotas, tariffs, and other forms of trade distortions by various governments worldwide, especially the advanced economies, may have profoundly hurt LDCs, which exports primary and semi-processed agricultural products mostly. Arguably, the doctrine of encouraging local production for exports and discouraging imports as postulated by mercantilism is still alive in agriculture [16] and other commodities that African countries have an advantage for exports, albeit in different forms.

The constraints to trade in Africa are multidimensional, both internal and external dimensions. The external constraints, such as the market access, volatility of commodity prices, domestic support and export subsidies, quality standards, and competitiveness, have been identified among the major factors that are militating trade and development in Africa. Thus, some of these factors are briefly highlighted below.

Tariff and nontariff measures (NTMs) and technical and nontechnical measures[1] are among the key trade restrictions and constraints to trade in agricultural commodities. African countries increase tariffs to raise revenues and to protect infant industries, whereas developed countries increase the tax to curtail trade so as to protect domestic producers that are vulnerable to global competition. *Tax escalation* means higher tariffs on processed commodities than on raw materials [19]. This type of trade restriction in developed economies in processed or manufactured products from Africa other LDCs is incredibly outrageous, making it almost impossible for exporters to develop and benefit substantially from trade. Arguably, advanced economies' hidden agenda might be to ensure that developing countries, especially Africa, remain suppliers of primary products to their well-established manufacturing industries and, in return, import manufactured or processed commodities as postulated by the dependency theories.

This progress in tariff reduction can be largely attributed to the WTO persistent efforts in reducing trade barriers for mutual benefits, growth, and development in the countries involved. Even though countries' taxes have been cut, especially since the beginning of the current Doha Round in November 2001, it persists in many commodity chains, especially in processed products. This to some extent impedes exports in Africa. Sadly, the intra-African trade has also substantially faced with market access issues including tariffs. Regrettably, African countries have been complaining about market access in developed countries but have not significantly traded among themselves. This is partly occasioned by trade barriers that exist within the continent and lack of region.

Sanitary and phytosanitary (SPS) are another form of technical trade obstacles that have impeded trade in LDCs. The quality of products is identified as among the key constraints faced by African exporters when exporting to OECD markets, notably, the EU, Japan, and the USA. Implementing SPS measures, more than trade costs, presents a specific challenge to the African producers and exporters. For instance, owing to Nigeria's inability to adhere to international food and feed safety and standards, in June 2015, the EU banned some food exports from the country for a year period. African products are prohibited partly because of producers and exporters in the continent's poor awareness and understanding of the applicable global standards and best practices. High level of chemicals, insufficient information on nutritional content, inadequate labeling, and high levels of pesticide are the main reasons; some African products are frequently banned in the global markets. Many countries from Africa seem to lack expertise and equipment at the standard setting and the enforcement stage, including the border. The continent also lacks clearly defined mandates, insufficient testing capacity, and catapulting in uncoordinated and overlapping technical regulations and other activities, which lead to confusion, delays, and duplicating costs. Consequently, African

[1]Technical measures: sanitary and phytosanitary measures, technical barriers to trade (testing, certification, labeling, origin marking and packaging requirements, marketing standards, health and safety regulations), pre-shipment inspection, and other formalities. Nontechnical measures: contingent trade-protective measures, nonautomatic licensing, quotas, prohibitions, and quantity-control measures other than for SPS or TBT reasons; price-control measures, including additional taxes and charges; finance measures; measures affecting competition; trade-related investment measures; distribution restrictions; restrictions on post-sale services; subsidies (excluding export subsidies under p7); government procurement restrictions; intellectual property; and rules of origin. Exports: export-related measures [17].

processors and exporters are being marginalized and excluded from taking competitive advantage in the global markets, thus partly impeding production, trade, and development in the continent. According to Moïsé and Le Bris [25], even though attaining the standard requirements leads to additional production and trade costs, it might also facilitate trade as it stimulates demand for commodities as consumers get information on how to use and quality of the products being traded.

Industrialization and trade policy bottlenecks: As shown in the previous subchapters, African exports are dominated by raw or intermediate products. Although African trade policies address a broad range of regulatory barriers, for instance, by prohibiting export licensing regimes, establishing a duty-free status for certain products, and promoting harmonization and mutual recognition of standards in the continent, these policies are poorly implemented in reality. Africa has been negotiating bilateral and multilateral trade agreements that require reciprocity, but it has to preserve flexibility. This is crucial to guarantee that its priority to industrialization efforts is not undermined. Also, this process requires strategic trade policies that do not discourage or limit South-South or North-South trade dynamics [26], which has been a big challenge in the continent. An essential factor for trade policy to advance industrialization is the inevitable balancing between promotion of relatively well-developed sectors and simultaneous protection and support infant or fragile sectors in economies in Africa. Undoubtedly, this is a tedious task but a feasible one as has been successfully carried out by most advanced and newly industrialized countries.

Domestic support and export subsidies: Because producers and exporters (farmers) in the advanced economies have been heavily protected and backed up by their states, they enjoy modern technology, increasing economies of scale, and value chains that have been the case in African countries [11, 26]. Since those countries' output and exports surpass African countries (see **Tables 1** and **11**), the large-scale import suggests having hampered domestic producers and exporters in the continent as they cannot favorably compete with external competitors regarding price, quality, and quantity. Also, the West (i.e., the USA and EU) spends a substantial amount of money to support producers or farmers, without which most of them would not still be in the agricultural markets. For instance, Common Agricultural Policy (CAP)[2] of the EU has taken the highest share of the Union's annual budget. In 2014, about €58 billion or 40% of the EU's total budget were for CAPs. The amount was more than 70% in some decades ago [12]. On the other hand, producers and traders in many African countries find it difficult to have access to finance for production and exports as governments and the financial institutions' provision of affordable loans and support has remained a major challenge on the continent.

Commodity price fluctuations in the world markets: Price volatility characterizes most agricultural commodity markets. The consistent price fluctuations of primary products in the

[2]Common Agricultural Policy (CAP) is the EU's comprehensive system of agricultural subsidies, schemes, and marketing measures designed to manage agricultural production and trade within the EU member countries and across the globe. The policy provides an affordable and a wide range of food for the EU citizens and as well as fair standard of living for farmers in the countryside. The CAP stresses that farming is not just about food; it is also about rural communities or countryside and its precious natural resources. Consequently, the CAP also provides funds for rural development in the EU member states.

global markets might have had adverse effects on export and earnings in Africa. Since world prices of African primary commodities are notoriously volatile, it creates bottlenecks for producers and exporters needing to take proactive investment decisions and for resource-constrained consumers. Arguably, the extreme world price volatility leads to insecurity for all the exporters involved. Also, Africa continues to export a broad range of primary products that are highly vulnerable to shocks in demand in the global commodity markets, which lead to disincentives to production and trade when the prices sharply shrink. The inability of African countries to favorably compete in the world markets has been partially reflected in their negative trade balance and decline in the proportion of global merchandise trade.

Poor infrastructure and productive capacity constraints: African producers and exporters have faced with critical infrastructure and capacity constraints from the production to trade. The ability of African countries to integrate efficiently into the world market to a great extent depends on the quality of both hard and soft infrastructure, ranging from transportation, customs practices and procedures, and financial services to border processes and regulatory environments [27]. The ability of Africa to aggressively expand export is partially associated with its capacity to produce or manufacture and export. To determine the levels of countries' infrastructure development, the World Bank [28] develops Logistics Performance Index (LPI). It uses the LPI to carry out a survey in partnership with academic, global institutions, private companies, and individuals that engaged in international logistics. It evaluates eight markets on six core dimensions of trade (i.e., infrastructure quality, custom performance, logistics competence, tracking and tracing, and timeliness of shipments) on a scale from 1 (worst) to 5 (best). Also, the markets are chosen based on the most applicable export and import markets of the respondent's nation. The LPI results (quality of trade and transport infrastructure) in some selected countries for the period between 2007 and 2016 are presented in **Table 13**. The result shows that apart from South Africa, African countries have been consistently scored below the global average in global overall in quality of trade and transport infrastructure. Despite this development, challenges remain prevalent in logistics infrastructure. Weak infrastructure partly delays production and trade in African countries. Similarly, global competitiveness ranking for 2015–2016 shows infrastructure as among the most problematic factors for doing business in Africa [29]. The development of infrastructure and productive capacities is essential for improving economies of scale, competitiveness, and intra-African trade [26].

Trade costs have become a focal point of discussion in the WTO and academic circles in recent years, partly due to the increased visibility in reducing traditional trade restrictions [25]. Arguably, "high trade costs effectively nullify comparative advantage by rendering exports uncompetitive. High trade costs deny firms access to technology and intermediate inputs, preventing their entry into, or movement up, global value chains. High trade costs also erode consumer welfare narrowing the range of good and services on offer and pushing up prices. While trade costs do not alone explain the development pathways of economies"; they play a vital role in explaining why some African countries and LDCs are unable to grow and diversify as expected [27]. Intranational trade costs are approximately four to five times higher in some SSA countries than in developed countries [30].

Country	2007	2010	2014	2016	Country	2007	2010	2014	2016
Algeria	1.86	2.06	2.54	2.58	Malaysia	3.33	3.5	3.56	3.45
Cote d'Ivoire	2.22	2.37	2.41	2.46	North America	4.01	4.09	4.12	4.14
Colombia	2.28	2.59	2.44	2.43	Niger	1.40	2.28	2.08	2.22
Czech Republic	3.00	3.25	3.29	3.36	Nigeria	2.23	2.43	2.56	2.40
Germany	4.19	4.34	4.32	4.44	OECD	3.55	3.61	3.69	3.70
Ethiopia	1.88	1.77	2.17	2.12	South Africa	3.42	3.42	3.20	3.78
EU	3.34	3.34	3.5	3.56	SSA	2.11	2.05	2.27	2.30
Ghana	2.25	2.52	2.67	2.48	World	2.58	2.64	2.77	2.75

Source: Compiled from the World Bank.

Table 13. Logistics performance index (LPI): quality of trade and transport infrastructure (1 = low to 5 = high), 2007–2016.

Also, average time takes exporters 20 days to export goods, while import takes an average of over 30 days in African countries and other LDCs across the globe [27]. This delay partly leads to high costs of trade, which hinders small-scale exporters to trade across national borders. Trade costs as well as bureaucratic or procedural bottlenecks at home and the border, coupled with high transportation costs, appear among the factors that are constraining trade SSA countries. High trade costs that are related to border procedure compliance, transportation, are likely to have a greater share of the impact on the price of most products, especially raw commodities which form a large proportion of African exports.

Finally, recommendations for necessary measures to stimulate production and trade in Africa in the present era of free trade and negotiations at the WTO and other regional bodies are summarized here as follows: African countries should create a friendly environment and provide/guarantee affordable/soft loans to producers and traders to support their services and productive initiatives. They should also set standards to make sure that quality control met international standards and best practices and provides sound legal and regulatory frameworks for production and trade. African countries should as a matter of urgency provide transport and other critical infrastructure facilities to ease movement of inputs to the sites and output to the markets for global competitive supply chains to be ensured. In the spirit of global partnership for development, world organizations and emerging and advanced economies should continue to provide technical know-how and facilitate trade in Africa. Globally, WTO seems to be at the crossroad at the moment in ensuring that all the agreements are implemented for mutual trade benefits. The WTO has to ensure that defensive trade remedies, such as SPS, should not be the next frontier of protectionism as these measure to some extent curtail trade from Africa and other LDCs. Finally, African countries complain about market access in advanced and newly industrialized nations without fully opening their markets to trade within the region. To stimulate production and trade for growth and development within the continent, markets should be urgently opened to expand intra-African trade.

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References

[1] Smith A. An Inquiry into the Nature and Causes of the Wealth of Nations. 1st ed (vol. I). London: R. Strahan; 1776. 517 p

[2] Ricardo D. On the Principles of Political Economy and Taxation. Cambridge: Cambridge University Press; 1817

[3] Heckscher E. The effect of foreign trade on the distribution of income. Ekonomisk Tidskrift. 1919; 21: 497-12

[4] Ohlin B. 1933. Interregional and international trade. Political Science Quarterly. 1933; 49: 126-128

[5] Leontief W. Domestic production and foreign trade; the American capital position re-examined. Proceedings of the American Philosophical Society. 1953; 97: 332-349

[6] Linder SB. An Essay on Trade and Transformation. New York: John Wiley; 1961

[7] Raymond V. International investment and international trade in the product cycle. The Quarterly Journal of Economics. 1966; 80: 190-207. Doi: 10.2307/1880689

[8] Grubel HG, Lloyd P. The empirical measurement of intra-industry trade. Economic Record. 1971; 47: 494-517. DOI: 10.1111/j.1475-4932.1971.tb00772.x

[9] Helpman E, Krugman PR. Market structure and foreign trade: Increasing returns, imperfect competition, and the international economy. Journal of Economic Literature. 1986; 24: 713-715

[10] Porter ME. The Competitive Advantage of Nations. New York: Free Press; 1990

[11] Stiglitz JE, Charlton E. Fair Trade for All: How Trade can Promote Development. Revised ed. Oxford: Oxford University Press, 2007

[12] Verter N. Analysis of external influences on agricultural performance in Nigeria. Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis. 2016; 64:1805-1821. Doi.org/10.11118/actaun201664051805

[13] Krugman PR, Obstfeld M, Melitz MJ. International Economics: Theory and Policy. 9th ed. Pearson Addison-Wesley; 2010

[14] Mou D. State Power, Agrarian Policies and Peasant Welfare: Politics of Agricultural Marketing and Commodity Boards in Nigeria. London: Authorhouse; 2014

[15] Verter N, Bečvářová V. The impact of agricultural exports on economic growth in Nigeria. Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis. 2016; 64: 691-700. Doi.org/10.11118/actaun201664020691

[16] Verter N. The application of international trade theories to agriculture. Mediterranean Journal of Social Sciences. 2015; 6: 209-219. DOI: 10.5901/mjss.2015.v6n6s4p209

[17] UNCTAD. Classification of non-tariff measures. Geneva: UNCTAD; 2013

[18] UNCTAD. Statistical reports [Online]. Available from: http://bit.ly/1Sb48JD [Accessed: 2017 January 25]

[19] ITC. Trade map: Trade statistics for international business development [Online]. Available from: http://bit.ly/2nPWaxL (Accessed: 2016 December 20)

[20] Finger JM, Kreinin ME. Measure of ‚export similarity' and its possible uses. The Economic Journal. 1979; 89: 905-912

[21] Michaely M. Trade preferential agreements in Latin America: an ex-ante assessment. Policy Research Working Paper (No. 1583); 1996

[22] Frankel JA, Romer D, Cyrus T. Trade and growth in East Asian countries: Cause and effect? National Bureau of Economic Research (No. w5732); 1996

[23] Frandsen TF. Geographical concentration: The case of economics journals. Scientometrics. 2005; 63: 69-85

[24] WTO. World Trade Organization annual report. Geneva: WTO; 2015

[25] Moïsé E, Le Bris F. Trade costs- what have we learned? A synthesis report (OECD Trade Policy Papers, No. 150). 2013; Paris: OECD; 2013. Doi.org/10.1787/5k47x2hjfn48-en

[26] United Nations Economic Commission for Africa. Economic report on Africa: Industrializing through trade. Addis Ababa: United Nations; 2016. 166 p

[27] OECD and WTO. Aid for trade at a glance 2015: reducing trade costs for inclusive, sustainable growth. Paris: OECD Publishing; 2015

[28] World Bank. Logistics performance index (LPI). [Online]. Available from: http://bit.ly/11WxALV [Accessed: 2017 January 10]

[29] World Economic Forum. The global competitiveness report 2015-2016. Geneva: World Economic Forum; 2016

[30] Atkin D, Donaldson D. Who's getting globalized? The size and implications of intranational trade costs (NBER Working Paper No. 21439). Cambridge: National Bureau of Economic Research; 2015; 59 p

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