VIETNAM DEVELOPMENT RESEARCH INSTITUTE

INPUT-OUTPUT ANALYSIS OF VIETNAM ECONOMY

NATIONAL ECONOMICS UNIVERSITY PUBLISHING HOUSE
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CO-EDITORS

Nguyen Quang Thai and Bui Trinh

AUTHORS

Bui Kieu Anh

Nguyen Lan Anh

Vu Tuan Anh

Nguyen Thi Ai Lien

Nguyen Hong Nhung

Kim Kwang Moon

Hoang Ngoc Phong

Nguyen Viet Phong

Bui Quoc

Nguyen Quang Tung

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PREFACE

The Vietnam Development Research Institute was jointly established in 2016 by the Vietnam Economic Associationand the Hanoi University of Business and Technology and officially launched on October 12, 2016. The Institute has a Science Council of 17 members, chaired by Prof. Tran Phuong. The Institute's leaders include Professor-Doctor of Science Nguyen Quang Thai and 4 Deputy Directors who are Dr. Vu Tuan Anh, Prof.-Dr. Vu Van Hoa, Assoc. Prof. Dr. Nguyen Manh Quan and Prof. Dr. Dinh Van Tien.

During the three-year period of 2016-2019, the Institute has conducted many studies on macroeconomic analysis and prediction, towards green development, inclusive development, etc. The Institute is also the core of conducting research, working on the orders of the Social Science Programs (Enhancing national competitiveness, inclusive harmonious development) and key State Science and Technology (sustainable development in coastal areas of key economic regions), making major contributions to the implementation of the project - consultative consultant of Vietnam Union of Science and Technology Associations "Assessment of economic growth associated with economic restructuring until 2020", the Institute and the Association conducted scientific discussions and recommendations to the Central Government for extension, postponing the consideration of the Law on Special Economic Zones to make further preparations when conditions permit with the motto "slow but steady".

Within the Institute, a number of studies are conducted to assess the quality of economic growth and green growth, towards sustainable development and inclusive development; developing higher education in the context of revolution 4.0 ... Some research results have been published in domestic and foreign scientific conferences, domestic and foreign scientific journals (see the attached appendix).

In particular, the Institute also presided over the publication of the "Write under the renovation line" consisting of two volumes of over 800 pages of articles published from the renovation years of the senior economist Dao Xuan Sam (1926-2019). With a thorough examination of specific to keep the original, this book was published before his death at the age of 94 late 2019. The Institute also supports Dr. Pham Sy Liem's research efforts on New Institutional Economics, published by Knowledge Publisher.

In 2019, the Institute's members have been at the core of carrying out two tasks on "Development perspectives for the implementation of the Socio-Economic Strategy to

2030" and "Solutions to realize the Strategy's goals up to 2030". assigned to serve the drafting of documents for the 13th Congress of the Party. The Institute has organized a series of scientific meetings with partners of Vietnam Economic Association and its partners to organize a series of scientific seminars and field trips, collecting ideas from experts in Hanoi City and other Northern provinces; Can Tho City, Soc Trang and An Giang in the Mekong Delta region; Da Nang city and experts in the Central region and Central Highlands; Ho Chi Minh City and the southern provinces. The research results have contributed in the Report of Vietnam Economic Science Association to the senior leadership agencies.

In particular, the Institute has organized a scientific research group on the inter-sectoral and inter-regional balance sheet "I-O Table" (I / O Analysis), co-chaired by Prof. Dr. Nguyen Quang Thai and Dr. Bui Trinh. These studies have been conducted both in theoretical and practical research. Many articles have been published at home and abroad, including Institute conferences, nationally and internationally.

The book was published on the occasion of the Institute's three-year anniversary, so the annexes also noted some research results (incomplete) and will be updated later.

On the occasion of the three-year establishment of the Institute, we would like to introduce the monograph on 11 research articles/presentations that have been published internationally (in English) for the three years 2017-2019.

Co-editor

Nguyen Quang Thai and Bui Trinh

LỜI NÓI ĐẦU

Viện Nghiên cứu phát triển Việt Nam được Hội Khoa học Kinh tế Việt Nam và Trường Đại học Kinh doanh và Công nghệ Hà Nội cùng chủ trì thành lập năm 2016 và chính thức ra mắt ngày 12/10/2016. Viện có Hội đồng Khoa học gồm 17 thành viên, do GS Trần Phương làm Chủ tịch. Lãnh đạo Viện gồm Viện trưởng GS.TSKH Nguyễn Quang Thái và 4 Phó Viện trưởng là các vị TS. Vũ Tuấn Anh, GS.TS Vũ Văn Hóa, PGS.TS Nguyễn Mạnh Quân và GS.TS Đinh Văn Tiến.

Trong thời gian ba năm hoạt động 2016-2019, Viện đã tiến hành nhiều nghiên cứu về phân tích và dự báo kinh tế vĩ mô, hướng tới phát triển xanh, phát triển hài hòa,... Viện cũng là nòng cốt thực hiện các nghiên cứu theo đặt hàng của các Chương trình KHXH (Nâng cao năng lực cạnh tranh quốc gia, phát triển hài hòa) và KHCN trọng điểm Nhà nước (phát triển bền vững ven biển các vùng KTTĐ), đóng góp chủ lực thực hiện đề tài tư vấn phản biện của Liên hiệp các Hội Khoa học và Kỹ thuật Việt Nam "Đánh giá tăng trưởng kinh tế gắn với cơ cấu lại nền kinh tế đến 2020", Viện cùng Hội đã tiến hành thảo luận khoa học và kiến nghị Trung ương cho dãn, hoãn việc xem xét Luật đặc khu kinh tế để chuẩn bị thêm khi điều kiện cho phép với phương châm "chậm mà chắc".

Trong phạm vi Viện đang tiến hành một số nghiên cứu đánh giá chất lượng tăng trưởng kinh tế, tăng trưởng xanh, hướng tới phát triển bền vững, phát triển bao trùm; phát triển giáo dục đại học trong điều kiện cách mạng 4.0... Một số kết quả nghiên cứu đã được công bố trong các hội thảo khoa học trong và ngoài nước, các tạp chí khoa học trong và ngoài nước (xem phụ lục kèm theo).

Đặc biệt, Viện cũng chủ trì công bố ấn phẩm "Viết theo dòng đổi mới" gồm hai tập trên 800 trang các bài viết đã công bố từ những năm đầu đổi mới của nhà kinh tế lão thành Đào Xuân Sâm (1926-2019). Với sự kiểm tra công phu để giữ như nguyên tác, cuốn sách này đã được ấn hành trước khi giáo sư mất ở tuổi 94 cuối năm 2019. Viện cũng ủng hộ nỗ lực nghiên cứu của TS Phạm Sỹ Liêm về Sách Tân kinh tế học thể chế, được Nhà xuất bản Tri thức ấn hành.

Năm 2019 các thành viên của Viện đã là nòng cốt trong việc thực hiện hai nhiệm vụ về "Các quan điểm phát triển thực hiện Chiến lược KTXH đến 2030" và "Các giải pháp thực hiện mục tiêu của Chiến lược đến năm 2030" được giao để phục vụ soạn thảo văn kiện Đại hội lần thứ XIII của Đảng. Viện đã cùng một số cán bộ của Hội Khoa học Kinh tế Việt Nam và các đối tác tổ chức một loạt các hội thảo khoa học và đi điền dã, thu thập ý kiến của các chuyên gia ở Thành phố Hà Nội và các tỉnh phía Bắc; Thành

phố Cần Thơ, Sóc Trăng, An Giang thuộc vùng Đồng bằng sông Cửu Long; Thành phố Đà Nẵng và các chuyên gia thuộc khu vực Miền Trung, Tây Nguyên; Thành phố Hồ Chí Minh và các tỉnh phía Nam. Các kết quả nghiên cứu đã góp trong Báo cáo của Hội Khoa học Kinh tế Việt Nam trình các cơ quan lãnh đạo cấp cao.

Đặc biệt, trong Viện đã tổ chức một Nhóm nghiên cứu khoa học về bảng Cân đối liên ngành, liên vùng "I-O Analysis" (Phân tích bảng vào-ra) do GS.TSKH. Nguyễn Quang Thái cùng TS. Bùi Trinh đồng chủ trì. Các nghiên cứu này đã được tiến hành cả về nghiên cứu lý luận và thực tiễn. Nhiều bài viết đã được công bố trong và ngoài nước, kể cả các hội thảo trong Viện, trong nước và quốc tế.

Cuốn sách được công bố đúng dịp kỷ niệm ba năm thành lập Viện, nên trong phụ lục cũng ghi nhận một số kết quả nghiên cứu (chưa đầy đủ) và sẽ được cập nhật thêm sau này.

Nhân dịp ba năm thành lập Viện, xin trân trọng giới thiệu cuốn sách chuyên khảo về 11 công trình nghiên cứu đã được công bố quốc tế (bằng tiếng Anh) trong ba năm 2017-2019.

Đồng chủ biên

Nguyễn Quang Thái và Bùi Trinh

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The Discussion on Input – Output Framework Extended for Analyzing on Relationship between Demographic and Economic

Nguyen Quang Thai[1], Bui Trinh[1], Nguyen Hong Nhung[2]

[1]PhD, Vietnam Development Research Institute, Vietnam

[2]Vietnam Development Research Institute, Vietnam

Correspondence: Bui Trinh, PhD, Vietnam Development Research Institute, Vietnam.

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Abstract

So far, many studies on economic structure have been proposed, Studies on the relationship between demographics and communication economics basically consider changes in age structure, leading to changes in saving and investment capacity. In Miyazawa's demographic-economic model, the focus has been on quantifying the relationship of final consumer groups and corresponding income groups. This study tries to establish the relationship between age and output and income. This study tries an attempt to extended Miyazawa's model which gross capital formation at columns and operating surplus at rows. That means the input – output system was not only extended aging group at consumption of employees at rows and final household consumption at columns, but alsoadd to gross capital formation at columns and total income of producers (operating surplus and exogenous income) at rows. In this system, it is allowed to consider changing population structure which not only affects economy through saving or investment but also the structure of final consumption by age also spreads to output and income. So, in this research is not only this related inter-sartorial at first-time distribution for considering but also the impact of demographic to economic activities and re-distribution income follow by type of aging group.

Keywords: consumption, demographic, economic, gross capital formation, input, output, value added

1. Introduction

The attempt to find an interaction between population and economy seems to be the goal of economic researchers; typical classical economists interested in the demographic-economic relationship are TR Malthus (1766 -1834)[1], Adam Smith (1723 - 1790) and David Ricardo (1772 - 1823). However, their theory is rarely expressed in the form of mathematical expressions.

Coale& Edgar M. Hoover (1958) argued that structural change of the number leads to changes in the structure of the economy through savings and investment, from changes in population structure can leading to economic growth and it is considered a demographic gift. David Bloom and Jeffrey Williamson (1997), Ahlburg, Dennis A (1987) and Barro, Robert J. (1997)found the impact between economic growth and Population Growth in development countries.

Since, Leontief's Input-Output System (IOS) came out into (1936, 1941), it has been further developed and expanded in many ways by various researchers. Moreover, including originally inter-regional input-output table by Isard (1951), multi-regional input-output model (MRIO) by Chenery (1954) and Moses (1955) and Miller, Blair (1985); Social accounting system by Stone (1961) Pyatt and Rose (1977). Demographic – economic model was parallel developed with social accounting matrix by Miyazawa (1976) and Madden and Batey (1983), Demographic – economic model has been developed by Miyazawa for analyzing the structure of income distribution by endogenous consumption expenditures in the standard of Leontief system. It means the Leontief

[1]Malthus was an English reverend (1766-1843), who in his book "An Essay on the Principles of Population" wrote an argument against his contemporary Mr. Godwin, who believed in unlimited population growth. *Malthusian population theory* warned of the possibility, that while the population grew geometrically, food resources grew only in arithmetical proportion, thus creating the conditions for a shortage in the long term that would require an adjustment in the birth rate.

system was extended by a group of consumption expenditures in column and corresponding group of row income. In 2019, Nhung N.H, Thai N.Q, Trinh. B, Phong N.V (2019) applied this model for analyzing on rural and urban in Vietnam economic structure.

There are some research on economic structure based on input – output analysis such as Hussain AliBekhet (2009) also used input – output approach in order to decompose of Malaysian production structure and calculating output, income, employment multipliers in Malaysian Economy, this author also used input – output system for ranking Sectors Changes of the Malaysian economy (2010), B.Trinh, B.Quoc (2017) applied input – output system in order to research on industrial Structure, GDP Growth and sustainability of Vietnam, Bui Trinh, Kiyoshi Kobayashi, T. D. Vu, P. L.Hoa & Nguyen Viet Phong (2012) also used input – output model for forecasting Economic Structure for Vietnam Toward Sustainable Economic Growth in 2020

This study tries an attempt to extended Miyazawa's model which investment at columns and operating surplus at rows. That means the input – output system was not only extended by type of aging groups at consumption of employees at rows and final household consumption at columns, but also gross capital formation at columns and total income of producers (operating surplus and exogenous income) at rows. In this system, it is allowed to consider changing population structure which not only affects economy through saving or investment but also the structure of final consumption by age also spreads to output and income. So, in this research is not only this related inter-sartorial at first-time distribution for considering but also the impact of demographic to economic activities and re-distribution income follow by type of age group.

Study was using input - output tables in 2012, 2016 and merging the data sources of input-output system, population census and household expenditure surveys for finding the change on impact of demographic to economy

2. Methodology

This research uses type I and type II of Leontief system.

Type I of input-output analysis is based on standard equation of Leontief system:

$$X = (I - A^d)^{-1}.Y^d \quad (1)$$

In this type, We get power of dispersion and sensitivity of dispersion for output and income matrix that is included impacts by factors of final demand. In this case, X is matrix of output that induced by factors of final demand, I is unit matrix, A^d is domestic direct input coefficient, Y^d is matrix of domestic final demand that defined as:

$$Y^d = Y^d(C_1, C_2, C_3, I, G, E) \quad (2)$$

C_1, C_2, C_3 are final consumption present before working ages, in the working ages, past the working ages corresponding, I is vector of gross capital formation, G is vector of Government consumption expenditure, E is vector of export. In order to estimate value added induced by a unit of final demand the equation (1) can rewritten as below:

In order to estimate value added induced by a unit of final demand the equation (1) can rewritten as below:

$$V = v.X = v.(I - A^d)^{-1}.Y^d \quad (3)$$

Where: V is matrix of value added with rows presents type of income and columns are sectors; v is matrix value added coefficient, with: $v_{ij} = V_{ij}/X_j$

And:

$X \div Y^d$ present impacts of factors of final demand to output

$V \div Y^d$ presents impacts of factors of final demand to value added

Here: ÷ shows scalar division

The equation (2) shows induced impacts of each factor of final demand to components of value added, for example, it can measure how much final consumption of type of ages induce to components of value added. This shows that the structure of age does not only affect the economy from changes in savings / investment but also depends on the final consumption factor of each type of age spreading to the production and income.

Type II is an expansion Leontief system and Miyazawa model. The study considers the following systems:

$$A.X + c_1.T_1 + c_i.T_i + \ldots + c_n.C_n + k.Tc + E = X \quad (4)$$

$$v_i . X + V'_i + V''_i + V'''_I + V''''_i = T_i \quad (5)$$

$$v_c.X + V'c = Tc \quad (6)$$

Where: $v_i.X = V_i$; $v_c.X = V_c$; i = (1,n) is number of type aging groups

V_i and V_c are production income of labor and capital corresponding, X is an vector of output;

And:

A is matrix of direct input coefficients;

V'_i (i = 1,n) is exogenous income of aging group i that receipted by other aging groups

V''_i (i = 1,n) is exogenous income of aging group i that receipted by transferring of Government institutional

$V'''i$ (i = 1,n) is exogenous income of aging group i that receipted by production sector

$V''''i$ (i = 1,n) is exogenous income of aging group i that receipted by transferring from abroad.

T_i is total income of aging group i, Tc is total income on capital, it includes share of capital ($v_c.X$) and capital transfer (V'c),

c_1, c_n are coefficients vectors of final household consumption of household by aging group i^{th}, household consumption of product i ($C_i(i)$) defined as below:

$$c_i(i) = C_i(i) / T_i(i) \quad (7)$$

k is a vector coefficient of gross capital formation (K), that element k_i was defined:

$$k_i(i) = K_i/Tc(i) \quad (8)$$

Tc is total income on capital (including operating surplus and capital transfer income),

Put:

$$B = \begin{pmatrix} A & c_i & k \\ v_i & & \\ v_c & & \end{pmatrix} \quad (9)$$

The equation system (1), (2), (3),(4),(5) and (6) can be rewritten in a matrix form like standard Leontief equation with endogenous and exogenous variables of incomes and expenditures and we have:

$$\begin{pmatrix} X \\ T_i \\ T_C \end{pmatrix} = (I - B)^{-1}. \begin{pmatrix} E \\ \theta \\ V'_C \end{pmatrix} \quad (10)$$

Where I is an unit matrix, $\theta = V'_i + V''_i + V'''_I + V''''_i$

And Put: $L = (I - B)^{-1}$

$$L = (I - B)^{-1} = \begin{pmatrix} L^A & L^{Ci} & L^k \\ L^{V_i} & H & \\ L^{Vc} & & \end{pmatrix} \quad (11)$$

L is computed based on Sonis and Hewings work (1993) where:

L^A is called enlarged Leontief inverse matrix. It includes multiplier effects $(I - A)^{-1}$ and induced feedback effects by L^{Ci}, and L^k. To be explicit, we have:

$$L^A = (I - A - c_i.T_i - k.T_c) \quad (12)$$

L^{Vi}, and $L^k$are income multipliers that spillover effects caused by final consumption and gross capital formation, we have:

$$M(L^{Vi}, L^k) = M(V_i,V_c)L^A \quad (13)$$

Applying Miyazawa explained matrix, we have:

$$M(L^{ci},L^k)= (I - A)^{-1}.M(c_i,k).H = L^A. M(c_i,k) \quad (14)$$

With: $M(c_i,k)$ is sub-matrix of extended matrix B and $M(L^{c1},L^{c2},L^{c3},L^k)$ is sub- matrix of matrix L. The number of row of this matrix is equal to the number of sectoral of the input-output table, and its number of column is the additional numbers of row as of Leontief extended matrix.

H is an enlarged matrix of Miyazawa interrelation income multipliers. This means exogenous income induced impact on redistribution of income. It causes spillover effects to production through household consumption by age, since we have:

$$H = I + M(V_{1i}, V_C). L^A.M(c_i,k). \quad (15)$$

It implies that final expenditure stimulates income outside of production

So, Formula (10) can be rewritten:

$$L = \begin{bmatrix} L^A & L^A.M(c_i,k) \\ M(V_i,Vc).L^A & I + M(V_i,Vc).L^A.M(c_i,k) \end{bmatrix} \quad (16)$$

3. Conclusion

With the above arguments, it is hoped to find new conclusions: With the same input conditions, it is hoped that the output of this extension model can obtain "non-linear" results, depending on belonging to "integrated"relations. This research question is being applied to Vietnam's economy data and new search results will be presented in a subsequent article.

We hope that in the future, it will present some findings based on the proposed model with data based on the use of input tables - outputs for 2012, 2016 and consolidation of system data sources. input, census and household expenditure survey in Vietnam. Hopefully there will be "non-linear" results, which are not linear and relations have been "integrated".

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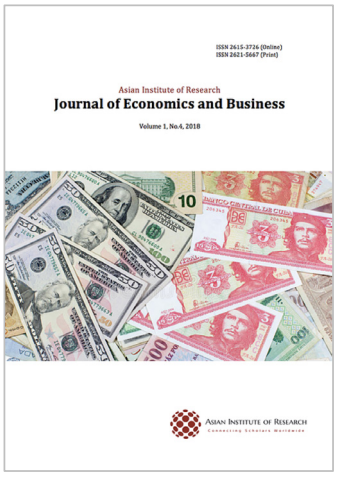

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The RAS Method with Random Fixed Points

Bui Trinh[1], Nguyen Viet Phong[2], Bui Quoc[3]

[1] Ph.D., Vietnam development research Institute, Association of Regional Econometrics and Environmental Studies (AREES) Japan

[2] Director at construction and capital department – Vietnam GSO

[3] Student at mathematical faculty – Vietnam National University

Abstract
Today many economists believe that RAS is the initials of economist Richard Stone, who is also the father of the National Financial System (SNA). This idea was introduced to update and reconcile the total supply and total use vectors in the input output table (I.O.T), supply and use tables (S.U.T) and social account matrix (SAM). This article attempts to explain and devise new algorithms so that the user can easily feel the practical application with more variable customized assumptions based on the application of information technology to the processing of the algorithm. This article appears to be a continuation of the article "A Short Note on RAS Method" at Advances in Management and Applied Economics (2013) vol.6, Issue 4.

Keywords: RAS method, Supply-Use tables, Input-Output Tables, Correct Row Total, Correct Column Total.

JEL Classification Numbers: I32, I31, C43

I. Introduction

For many researchers around the world and statistical offices of some countries, the application of the RAS method can be said in both easy and difficult ways. In this study, we want to give readers the best way to understand the balance of the supply and use tables or the input-output table in the normal process. This job will become easier if there is effective software to automatically make all necessary balancing steps in the quickest and easiest way.GDP can be estimated by three approaches: income, expenditure, and production, see Lee (2011) and Lequillier and Blades (2006). In theory, these three approaches will yield the same estimate; In fact, they are different because they are based on different data sources, each with its own fault structure as well as different estimation methods. The Swedish Statistical Office has developed A System for Product Improvement, Review and Evaluation basic indicators of the National Accounts system called ASPIRE.

The difference between the GDP estimates generated by each approach is called "statistical error." The size of the statistical error is a measure of the quality of Country account statistics. In many statistical agencies, including Sweden, steps are taken to balance different estimates of GDP. A number of techniques are used but are usually based on the RAS methodology, and the Trinh and Phong (2013) research are applied in a number of countries, especially Sweden, which are named of economist Richard Stone, who proposed this idea.

In previous research by B. Trinh and N.V. Phong (2013) molecules of the origin, matrix are allocated with the equal role of the elements, meaning that all elements in the original matrix can be modified upon updating. But

when updating a table S.U.T or table, I.O.T may be some element in the matrix is constant. This article attempts to solve this problem. This article appears to be a continuation of the article "A Short Note on RAS Method" at Advances in Management and Applied Economics (2013) vol.6, Issue 4

II. Problem solving

The main objective of the RAS method is to balance the columns and rows of the input - output table or supply and use tables when updating or modifying these tables. The basic equations are cycles depending on the degree of difference. These equations are described as follows:

$X_C^{new}(tn).\ X_C^{new}(tn-1)..X_C^{new}(t1).A.X_R^{new}(t1)\ldots\ X_R^{new}(tn-1).\ X_R^{new}(tn) = A^{new}$ (1)

With:

X_C^{new} (ti) is a diagonal matrix with elements on the diagonal that is the element of the column vector of new output in the time ti; X_R^{new} (ti) is a diagonal matrix with elements on the diagonal that is the element of the row vector of new output in the time ti; A is coefficients of direct input matrix or original matrix that can be updated by time. X_C^{new}(ti) has form;

$$X_C^{new}(ti) = \begin{matrix} X_{C1}^{new}(ti) & 0 & 0 \\ 0 & Xci^{new}(ti) & 0 \\ 0 & 0 & Xcn^{new} \end{matrix} \quad (2)$$

Same with X_R^{new}(ti)

$$X_R^{new}(ti) = \begin{matrix} X_{R1}^{new}(ti) & 0 & 0 \\ 0 & X_{Ri}^{new}(ti) & 0 \\ 0 & 0 & X_{Rn}^{new} \end{matrix} \quad (3)$$

In the case where matrix A has fixed elements in the time of update or modification, then analysis of matrix A:

$A = A_1 + A_2$ (4)

A_1 is a matrix with mutable elements, A_2 is a matrix with immutable elements, such as A_{i1} and A_{1n} are constant,

Matrices A, A1, and A2 are shown below:

$$A = \begin{matrix} A_{11} & A_{1i} & A_{1n} \\ A_{i1} & A_{ii} & A_{in} \\ A_{n1} & A_{ni} & A_{nn} \end{matrix} \quad (4)$$

$$A1 = \begin{matrix} A_{11} & A_{1i} & 0 \\ 0 & A_{ii} & A_{in} \\ A_{n1} & A_{ni} & A_{nn} \end{matrix} \quad (5)$$

And:

$$A2 = \begin{matrix} 0 & 0 & A_{1n} \\ A_{i1} & 0 & 0 \\ 0 & 0 & 0 \end{matrix} \quad (6)$$

Or:

$$A_2 = \begin{matrix} A_{11} & A_{1i} & A_{1n} & 0 & 0 & 1 \\ A_{i1} & A_{ii} & A_{in} & 1 & 0 & 0 \\ A_{n1} & A_{ni} & A_{nn} & 0 & 0 & 0 \end{matrix} \quad (7)$$

Put: $B = \begin{matrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{matrix}$

Matrix B implies that elements of the original matrix A are fixed in the update, and thus relational (7) is easily simulated using a simple software.

A2 is the constant consisting of constant elements, the remainder being 0
And

$A^{new} = A_1^{new} + A_2$

A_1^{new} apply relationship (1)

III. Case study

The original matrix with dimension is (10 x 10) shown in table 1, two columns and rows are the sum of them and correct vectors (column and row) that need to adjust origin matrix. The vectors to be adjusted are the CORR COLUMN. SUM and CORR. ROW

Table 1. Origin matrix

	1	2	3	4	5	6	7	8	9	10	Row SUM	Corr. Row
1	41,845	16,269	47,279	93,040	29,050	88,709	88,072	20,847	57,283	7,502	489,896	489,891
2	41,176	72,797	17,788	71,340	25,068	11,251	21,610	55,919	61,651	58,134	436,734	436,736
3	29,401	22,413	93,191	30,336	87,009	49,762	61,830	9,813	74,335	49,266	507,356	507,359
4	54,873	45,663	78,843	6,113	65,307	42,004	83,710	65,059	89,662	44,981	576,215	576,208
5	93,838	76,045	77,752	22,148	3,088	37,941	52,996	5,670	87,146	43,373	499,997	500,005
6	60,949	36,728	69,028	89,716	44,044	31,459	52,891	80,338	52,734	33,153	551,040	551,044
7	89,093	85,460	45,861	94,053	69,782	49,051	38,189	63,176	76,580	96,277	707,522	707,526
8	93,430	31,165	31,492	48,101	89,338	74,046	16,372	11,045	38,275	30,581	463,845	463,842
9	88,845	88,563	19,492	47,562	37,621	64,296	3,073	15,736	26,801	34,550	426,539	426,537
10	23,190	30,187	74,229	19,800	39,272	97,604	86,543	47,041	98,545	87,367	603,778	603,774
Col. SUM	616,640	505,290	554,955	522,209	489,579	546,123	505,286	374,644	663,012	485,184	5,262,922	5,262,922
Corr. SUM	616,634	505,295	554,958	522,200	489,573	546,119	505,291	374,642	663,018	485,192	5,262,922	

After that determine the constant elements in the original matrix ($A = (A_{ij})$), the determination of the A_{ij} values unchanged in the above matrix is done customarily. In the example above, the A_{ij} defined as constant are: $A_{1,4}$; $A_{1,7}$; $A_{2,1}$; $A_{2,5}$; $A_{2,8}$; $A_{3,3}$; $A_{3,8}$; $A_{4,6}$; A49; $A_{6,1}$; $A_{6,8}$; $A_{7,2}$; $A_{7,5}$; $A_{7,9}$; $A_{8,4}$; $A_{9,3}$; $A_{9,10}$; $A_{10,7}$; $A_{10,9}$.

Table 2. Matrices define constant variables

Mã	1	2	3	4	5	6	7	8	9	10
1	-	-	-	1	-	-	1	-	-	-
2	1	-	-	-	1	-	-	1	-	-
3	-	-	1	-	-	-	-	1	-	-
4	-	-	-	-	-	1	-	-	1	-
5	-	-	-	-	-	-	-	-	-	-
6	1	-	-	-	-	-	-	1	-	-
7	-	1	-	-	1	-	-	-	1	-
8	-	-	-	1	-	-	-	-	-	-
9	-	-	1	-	-	-	-	-	-	1
10	-	-	-	-	-	-	1	-	1	-

Applying the algorithm above gets the matrix to be adjusted.

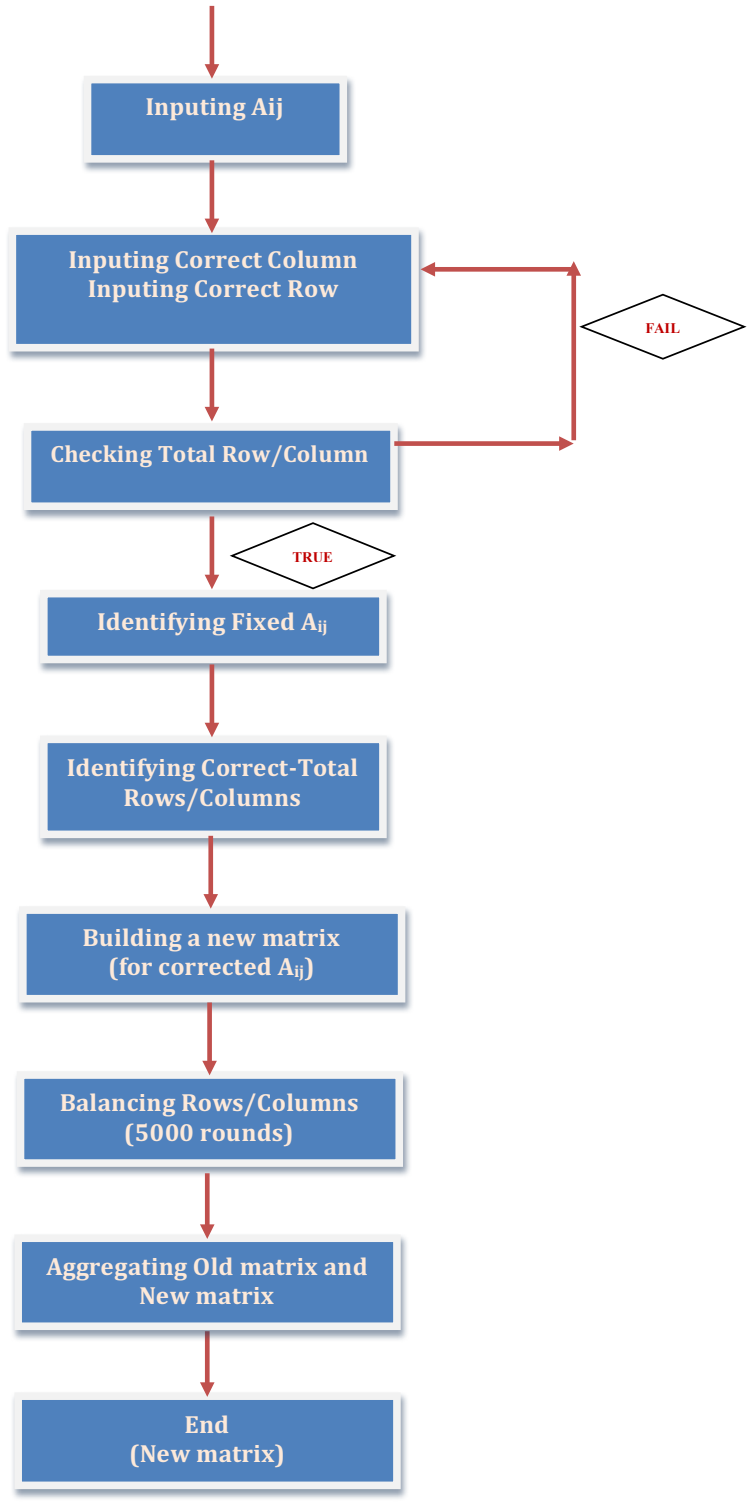
Table 3. Adjusted matrix

	1	2	3	4	5	6	7	8	9	10	Row SUM	Corr. Row
1	41,844	16,269	47,279	93,040	29,049	88,707	88,072	20,847	57,283	7,502	489,891	489,891
2	41,176	72,798	17,788	71,338	25,068	11,251	21,610	55,919	61,652	58,135	436,736	436,736
3	29,401	22,413	93,191	30,335	87,009	49,762	61,831	9,813	74,336	49,267	507,359	507,359
4	54,871	45,663	78,842	6,113	65,305	42,004	83,710	65,058	89,662	44,981	576,208	576,208
5	93,838	76,047	77,754	22,148	3,088	37,941	52,997	5,670	87,148	43,374	500,005	500,005
6	60,949	36,729	69,029	89,714	44,044	31,459	52,892	80,338	52,735	33,154	551,044	551,044
7	89,093	85,460	45,862	94,051	69,782	49,051	38,190	63,177	76,580	96,280	707,526	707,526
8	93,428	31,165	31,492	48,101	89,337	74,045	16,372	11,045	38,275	30,581	463,842	463,842
9	88,844	88,564	19,492	47,561	37,621	64,296	3,073	15,736	26,801	34,550	426,537	426,537
10	23,190	30,187	74,229	19,799	39,271	97,603	86,543	47,040	98,545	87,368	603,774	603,774
Col. SUM	616,634	505,295	554,958	522,200	489,573	546,119	505,291	374,642	663,018	485,192	5,262,922	5,262,922
Corr. SUM	616,634	505,295	554,958	522,200	489,573	546,119	505,291	374,642	663,018	485,192	5,262,922	

IV. Discussions

In previous studies, the RAS method was mostly used to balance the supply and use tables (or input output table) when the total input or output varied. It does not solve the problem when the total input or output changes but some elements in the matrix of the intermediate cost or the coefficient of the make matrix do not change, such as a sector or a group of industries has a dramatic change in technology in the years following the year in which the supply and use tables can be investigated, and only some industries have changed the Aij coefficient in the intermediate cost matrix or the main product and by-product ratios in the production. This method makes it easy to update the supply and uses tables, and it is also easy to write application software for the RAS method with random fixed points. The steps for solving in the diagram below:

The RAS method with random fixed points



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Some Problems on the Sectoral Structure, GDP Growth and Sustainability of Vietnam

Bui Trinh* and Bui Quoc

Association of Regional Econometrics and Environmental Studies (AREES)), Japan

Abstract: The Vietnam development has been enjoying a great deal of rapid economic growth in the last decades, which thank to the opening of market-oriented economy system. However, the economic growth is slowly recent years and the increase of environmental issues. The reason for this situation is that misallocation of resource, the sectoral development policies as well as the development orientation of the government. In order to find the solution, this research applies the input output model to analysis the sectoral structure and economic growth as well as the sustainability of economic growth and the effect of economics on the environment. Then, this research recommends the better sectoral structure for Vietnam in order to allocate resources efficiently and forward to the sustainable development.

The purpose of this study was to point out the instability of Vietnam, not only for the environment but also for the whole economy. Research shows that VN is not only the face of environmental pollution, but also uncertainty about macroeconomic. It also pointed out the need to change the economic structure for economic development that the environment in a sustainable way. This research based on Leontief and Ghosh systems

Keywords: Economic, Environmental, structure, sustainability.

I. INTRODUCTION

Most natural disasters are derived from human. For over a decade the Vietnam's GDP growth rate is high (6.5% - 7%) and structural order of priority sectors with mining and manufacturing, Services and Agriculture. In the official report of Vietnam always take GDP growth and sectoral structure as above is a proud achievement. In developing countries such Vietnam is often focused on economic growth but ignoring environmental hazards. In Vietnam, in period 2000 – 2012 The forest area fires and deforestation is about 85000 ha and each year the forest area lost about 6500 ha. Forest loss causes floods in the central provinces of Vietnam worsening. Rapid urbanization rate causing many canals and rivers are disappearing or just dead river. This is the cause of flooding in big cities like Hanoi and Ho Chi Minh City cannot corrective. The government has spent a lot of money to fix flooding in big cities but not effective because the underlying causes are already forcing suicide rivers or water sources. Inefficient investments could increase GDP in the short term but in the medium and long term is not going to spread that environment only exacerbates graphics canceled. While living standard has not improved and the environment is destroyed, what is the economic growth for?

The Vietnam development has been enjoying a great deal of rapid economic growth in recent decades, which is thanked to the opening of market-oriented economy system. It is, however, controversies over environmental issues as side-effect of speedy growth have been reported national wide. A great number of research has extensively considered environmental issues as a threaten reason, which might impose negative impacts on the benefits of growth itself, or that may keep current economic trends from being sustainable. Through the development of environmental accounts, the country can track and analyze how its economy and its environment depend on each other in the growth process. The accounts make it possible to identify policy choices that will allow growth to occur without harming the environment or harming humans through environmental degradation, and will ensure that current growth patterns will not be reversed because of the environmental harm they cause. Recently, Vietnam's leaders were making slogans rapidly developing economy and sustainability, but in my mind this problem is only talking. The status deforest is until not change, the rivers has been filled. Vietnam is an outsourcing economy and selling resources. In the report of the central and local Government achievement growth is still seen as a proud achievement. Section on the environment is very superficial. The first the Vietnam Government need to set up a framework in order to management disasters.

The linkage between pollution matrix and intersectoral structure was many researchers mentioned such as W. Leontief (1970), Schoonbeek, L. (1990), Ebiefung, A.A., Udo, G. (1999), Dobos, I. and Floriska, A. (2005), Yu Fan *et al*. (2016). Nowadays,

*Address of correspondence to this author at the Association of Regional Econometrics and Environmental Studies (AREES)), Japan;
Tel: +81.47.491.6072; E-mail: buitrinhcan@gmail.com

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parallel with the system of National Account (SNA) the United Nation introduced the System of Environmental – Economic Accounts (SEEA), which added the environment account. If traditional I/O table is the center of SNA, "Hybrid IO framework" is the center of SEEA system.

In Vietnam, there are also some studies on using input-output system to analyze and measure the linkages between economic and environmental as K. Kobayashi and T. Bui (2011), T.Bui & Phong N. V (2013), T. Bui & Hoa P. L (2017). In these papers, in order to estimate emissions for Vietnam by sector they have to borrow direct emission coefficient vector of others countries, in paper of T. Bui and Hoa P. L borrowed this vector of China in order to measure the impacts of economic activities to environmental. In this research used direct GHG emission coefficient vector of Vietnam themselves.

The purpose of this study is to find out the inadequacies of the economy, thereby helping policy makers make decisions that better economic and environment. The input – output system is applied for the purpose of this study. This study tried to estimate greenhouse gas (GHG) emissions in production processing of a value added unit. It also find how current economic structure impact to environment (GHG emissions). We tried to be looking for which sectors good for economy but damaging the environment, which sector has not spread further to the income, caused trade deficit but has caused environmental damage. The research results indicate mistakes in the allocation of resources that the economy at risk in the medium to long term and not sustainable.

II. METHODOLOGY

This research applies the Leontief and Ghosh systems in order to estimate GHG emissions when GDP growth, sectorial structure and investigating in the allocation of capital for Vietnam's policy makers oriented on their policies.

The Leontief standard relationship as below:

$$X + A.X = Y \quad (1)$$

Where: $A = (a_{ij})_{nxn}$; n is number of sector; A; aij = X_{ij}/X_j, with Xij present sector j used product I in production processing of industry j, Xj is output of sector j matrix A call direct input coefficient matrix and Y is final demand matrix

Transpose input – output framework the equation (1) is recalled as below:

$$X = A^*X + V \quad (2)$$

With: $A^* = (a^*_{ij})$ nxn and: $a^*_{ij} = Xij/ Xi$ and V is value added matrix, This equation shows the inputs depend on structure of intermediate demand, So It can re-write:

$$X = (I-A^*)^{-1}V \quad (3)$$

Put: $e_i = E_i/X_i$ (4)

With $e = (e_i)_{1xn}$ and $E = (E_i)_{1xn}$ and Ei is pollution of sector i in productions procession

Multiplying both sides of equation (4) with e:

$$E = e(I - A^{*'})^{-1}. V \quad (5)$$

In the case the economy invest for abating pollutions, the gross capital formation we was broken down to I_1 and I_2, I_1 is investment for abating of emissions and I_2 is investment for production. The investment I_1 can be moved to technical norms of internal economy, in this case GDP will reduce and emissions also reduce, In Miyazawa's concept, the input – output model was extended with household consumption group and income group. In this case the exogenous variables become endogenous variables. Based on Miyazawa's concept, in this research extended the input – output framework a column on investment for abating pollutants and a row of a part of operating surplus. The equation will be below:

$$X = (I – A – I_1.C_1)^{-1}.Y^* \quad (6)$$

Where: C_1 is operating surplus ratios for total income from capital and I_1 is a corresponding vector of gross capital formation coefficients and Y* is remain of final demand.

On the other hand, in order to investigate on capital allocation, we can considerate below:

Putt: $k_i = K_i/X_i$

$k = (k_i)_{1xn}$ and $K = (K_i)_{1xn}$

Where : K_i is capital stock of sector i

Multiplying both sides of equation (3) with k we have:

$$K = k(I-A^{*'})^{-1}.V \quad (7)$$

$$\Delta K = k_1(I-A^{*\prime})^{-1}.\Delta V \quad (8)$$

Note that: $\Delta K = K(t+1) - K(t) = I(t)$

From (8):

$$I(t) = k_1(I-A^{*\prime})^{-1}.\Delta V$$

Data Source

This study use the input-output table in 2012 of Vietnam[1] aggregated follow 17 sectors (Appendix 1) and coefficients of direct air emissions by 17 sector of Vietnam[2] (Appendix 2).

III. SOME FINDINGS

The greenhouse gas (GHG) emissions calculated based on two scenarios (1) the average growth of GDP annually from 2012 to 2020 was 6.5% structure of agricultural added value down 15% by 2020, industry and services 85% (CN: 40%; DV: 45%) and scripts (2) agricultural structure reduced to 10%, industry and services 90% (CN: 45%; DV: 45%) and the trend dose not improvement in reduce waste by sector.

In scenario 1 the volume of CO2 emissions increased from 155 million tons in 2010 to 263 million tons in 2020 and increased the total greenhouse gas from 298 million tons to 480 million tons in 2020. In this scenario average growth on CO2 is about 6.8%, while GDP average growth is 6.5%.

In scenario 2 the amount of CO2 emissions from production in during 2012 – 2020 increasing from 155 million tons to 288 million tons, and the total greenhouse gas increase from 298 million tons in 2012 to 491 million tons in 2020. We can see the structure of industry in GDP is increasing, the environmental hazards as adjacent.

In the case move a part of investment for pollution abatement (10%), the CO2 emissions in 2020 reduce about 12,5% and greenhouse gas reduce 13.8%. compare with scenario 2. But greenhouse gas increase about 41% and average increase each year 4,4%. In this case GDP growth is only about 3.3%.

Thus, in order to reduce pollution and maintain GDP growth, Vietnam need to combine economic structural change and investing for reducing pollution from within the production process.

The sectors have greenhouse gas emissions larger than the average level (greater 1) and the sectors have greenhouse gas emissions smaller than the average level (less than 1). The Figure **1** shows manufacturing sectors group such as sector 3, sector 5, sector 6, sector 7, sector 8, sector 10 and sector 11 caused greenhouse gas highest.

However, while the manufacturing sectors group emit greenhouse gas high but spread to the factors of low added value. Note that a final demand unit induced to the operating surplus of construction sector is very high, while induced to income of labor is very low. The final demand of some sectors such as Agriculture, Forestry, Animal Husbandry& Fishery (sector 1), Manufacture of Foods, Beverage & Tobacco (sector 3), Manufacture of Textile, Wearing Apparel & Leather Products (sector 4), Other Manufacture (sector 10), Production and Supply of Electric Power, Heat (sector 12), Transport, Storage, Post, Information Transmission, Computer Services & Software (sector 13), Financial Intermediation (sector 16) and Other Services (sector 17) have spread from the final demand to high-income and low greenhouse gas emissions.

Final demand of Manufacturing group do not induce to value added but emit to environment very high GHG emissions and strong stimulate imports caused the trade deficit. Thus, we can see the manufacturing of Vietnam essentially outsourcing with outdated technology to be not friendly with environment. This Verdict is consistent with T. Bui and PL United (2017) when they compare economic structure of Vietnam and China "Vietnam seems to have not any auxiliary product. The products label Vietnamese brand, but it is the fact that these products are also imported products"

Considering the resource allocation and economic effectively, the research analysis the capital and labor allocation. In this part the input – output table was aggregated to three sectors, first sectors is Agriculture, Forestry, Animal Husbandry& Fishery, second sectors is mining and manufacturing and third sectors is services. Calculating capital requirement of three sectors to get a value added unit, when using competitive – import type of input – output table, we can find that the capital requirement to get a Value Added unit when using the domestic input is much lower than that using imported input. T. Bui al all

[1]www.gso.gov.vn

[2]The Ministry of Natural Resources and Environment "The initial biennial updated report of Vietnam to the United Nations framework convention on climate change", Vietnam Publishing house of natural resources, Environment and Cartography, 2014.

Table 1: Greenhouse Gas Follow Scenario 1

	GHG emissions (2012)	GHG emissions (2020)	Average growth
CO2 (Thousand ton)	155	263	6.84%
CH4 (Thousand ton)	95	144	5.35%
N2O (Thousand ton)	49	73	5.29%
Total GHG	299	480	6.13%
GVA (100million USD)			6.50%

Table 2: Greenhouse Gas Follow Scenario 2

	GHG emissions (2012)	GHG emissions (2020)	Average growth
CO2 (Thousand ton)	155	288	7.47%
CH4 (Thousand ton)	95	134	4.44%
N2O (Thousand ton)	49	68	4.33%
Total GHG	299	490	6.07%
GVA (100million USD)			6.50%

Table 3: Greenhouse Gas Emissions when Investing for Reducing Pollution

	GHG emissions (2012)	GHG emissions (2020)	Average growth
CO2 (Thousand ton)	155	252	106.26%
CH4 (Thousand ton)	95	111	101.96%
N2O (Thousand ton)	49	60	102.56%
Total GHG	299	423	104.43%
GVA (100million USD)			3.30%

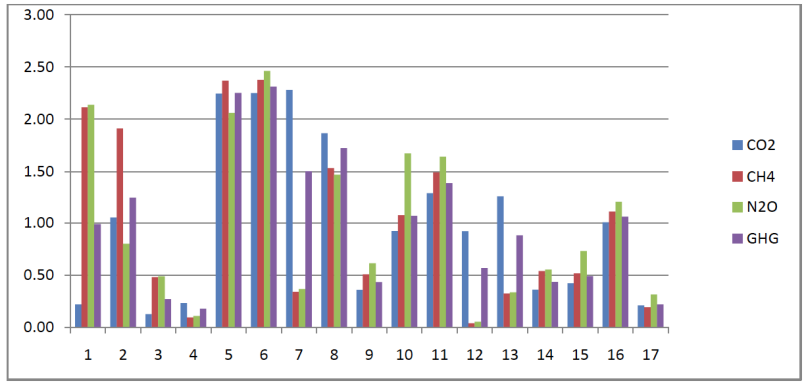

Figure 1: Sensitively on air emissions created of a value added unit.

explained that "the investment efficiency will be improved if Vietnam develops supporting industries…" The Figure **4** also shows the mining and manufacturing sector group requires a huge amount of investment to get a value added units compared to sector group I and sector group III. This result also indicates the resource allocation unreasonable in the Vietnamese economy, the mining and manufacturing sector group causing pollution, spread to low-income; stimulate import but absorbing capital resources of the economy. Such,

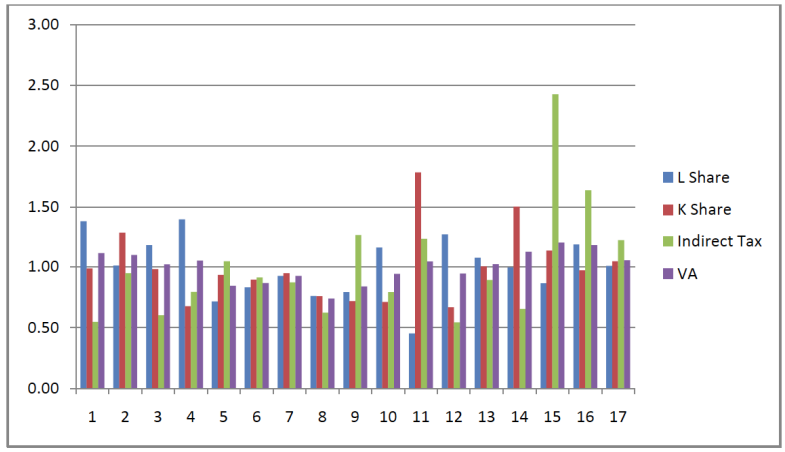

Figure 2: Induced impact of final demand to factor of value added.

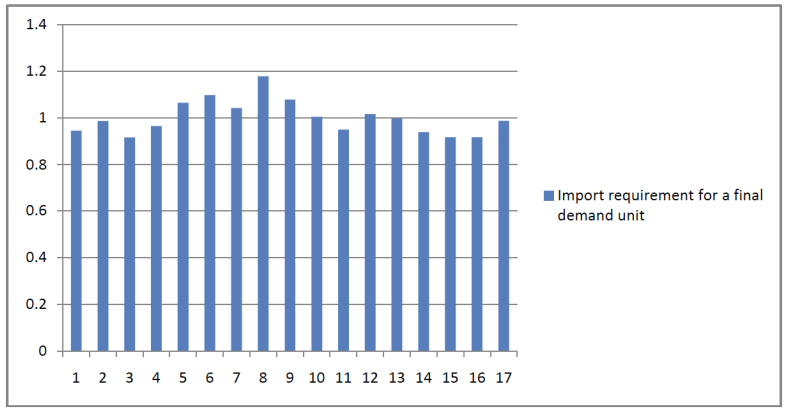

Figure 3: Import requirement for a final demand unit.

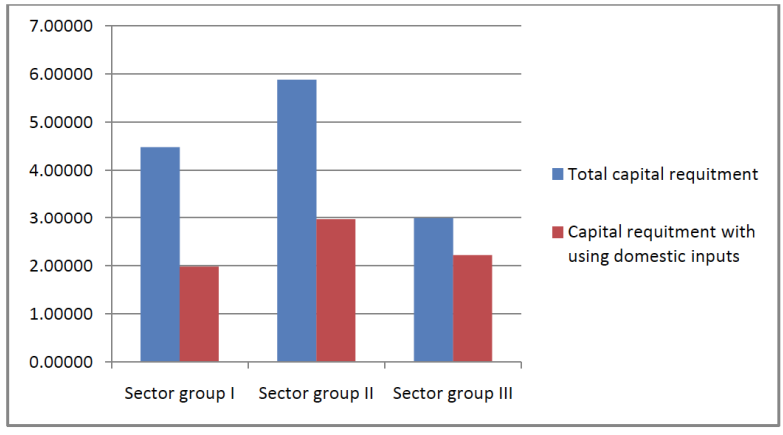

Figure 4: Capital requirement for a unit value added.

Source: Calculated based on the Input output table and Vietnam annual enterprise surveys in 2012.

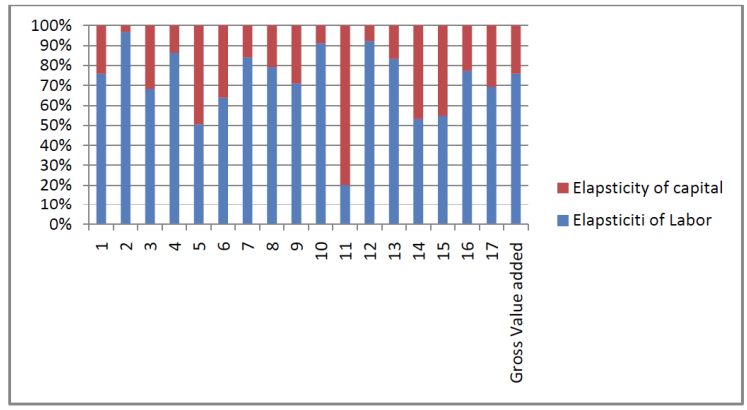

Figure 5: Elasticity of Labor and capital of 17 sectors (under the assumption yields unchanged (α + β = 1)).

dose development priority policy this sector group to be a wrong policy?

On the other hand, the input – output table of Vietnam shows the structure of factors as labor share and capital share in gross value added of economy present illogical. The partial elasticity of labor(α) in gross value added is 76% and elasticity of capital (β)is only 24% (α+β=1), this means Vietnam's economy is an economy of labor-intensive, labor productivity is very low, it takes a huge amount of new capital can create growth. Figure **5** shows the sectors number 2.4, 7, 8, 9, 10 has the elasticity of low capital; this suggests that there must be a huge amount of capital newly acquired value added (at basic price), this calculation seems consistent with the statement most industrial sectors (mining and manufacturing) are not create more value added or require a huge amount of new capital to create value added. Another interesting thing is the construction sector seems to be highly profitable (Purchase price higher than producer price so much)? This can lead to high risk of bad debts of the banking system.

IV. CONCLUSION

The manufacturing sectors group of VN basically outsourcing (Appendix 3), so the export products of these sectors are essentially export for other countries. If VN does not change the economic structure with GDP growth based on export products of manufacturing and mining to not only face environmental risks but also caused economic regardless in the medium and long term.

The sectors should be focusing resources on capital and priority policy to be the sectors cause less harm to the environment, spreading to higher income and use many domestic products with technological processes eco-friendly bare.

When Vietnam allocation reverse of resources will lead to hard on the budget, the budget constraints will lead to new revenue and the recovery of resources would make the economy continuing to weaken in the next cycle.

APPENDIX

Appendix 1: 17 Sectors in the Economy (Input – Output Tables)

No.	Sectors	No.	Sectors
1	Agriculture, Forestry, Animal Husbandry& Fishery	10	Other Manufacture
2	Mining	11	Construction
3	Manufacture of Foods, Beverage & Tobacco	12	Production and Supply of Electric Power, Heat
4	Manufacture of Textile, Wearing Apparel & Leather Products.	13	Transport, Storage, Post, Information Transmission, Computer Services & Software
5	Coking. Gas and Processing of Petroleum	14	Wholesale and Retail Trades, Hotels and Catering

6	Chemical Industry	15	Real Estate, Leasing & Business Services
7	Manufacture of Nonmetallic Mineral Products	16	Financial Intermediation
8	Manufacture and Processing of Metals and Metal Products	17	Other Services
9	Manufacture of Machinery and Equipment		

Source: General Statistics Office.

Appendix 2: Direct Coefficients Vector of GHG Emissions

No.	Sectors	2010 GHG emissions (GgCO2eq.)/ *100 million USD of output*			
		CO2	CH4	N2O	Total
1	Agriculture, Forestry, Animal Husbandry& Fishery	3.02	105.38	56.15	164.55
2	Mining	6.62	70.71	0.02	77.35
3	Manufacture of Foods, Beverage & Tobacco	7.14	0.01	0.03	7.18
4	Manufacture of Textile, Wearing Apparel & Leather Products.	16.51	0.03	0.07	16.62
5	Coking. Gas and Processing of Petroleum	15.60	0.01	0.03	15.65
6	Chemical Industry	14.11	0.02	0.04	14.17
7	Manufacture of Nonmetallic Mineral Products	252.41	0.24	0.50	253.15
8	Manufacture and Processing of Metals and Metal Products	10.57	0.02	0.04	10.63
9	Manufacture of Machinery and Equipment	9.89	13.81	11.85	35.55
10	Other Manufacture	36.62	23.30	29.96	89.88
11	Construction	7.77	7.77	7.77	23.31
12	Production and Supply of Electric Power, Heat	146.36	0.05	0.37	146.78
13	Transp ort,Storage,P o st, Information Transmission, Computer Services & Software	150.57	0.50	0.42	151.49
14	Wholesale and Retail Trades, Hotels and Catering	6.20	8.06	4.35	18.61
15	Real Estate, Leasing & Business Services	5.15	5.15	10.30	20.60
16	Financial Intennediation	6.19	6.19	6.19	18.56
17	Other Services	6.25	3.12	6.25	15.62

Source: The Ministry of Natural Resources and Environment.

Appendix 3: Some Analyze Indicators for 138 Sectors of Vietnam Economy

		Backward linkage	Import multiplier	Sensitive of dispersion of electricity	Ratios of Value added per Gross output	Value added induced by Export
1	Paddy (all kinds)	90.1%	88.0%	34.0%	56.9%	5.9%
2	Sugarcane	94.5%	94.6%	42.7%	47.5%	0.3%
3	other crops	98.7%	97.7%	47.9%	41.1%	1.7%
4	Raw rubber	76.9%	92.9%	30.4%	64.8%	0.8%
5	coffee beans	87.2%	108.0%	50.1%	41.9%	1.7%
6	tea, processed (all kinds)	77.9%	94.4%	32.6%	62.2%	0.2%
7	other perennial plants	85.9%	106.1%	47.6%	44.8%	3.2%
8	buffaloes, cows	114.9%	72.4%	32.3%	60.4%	0.1%
9	Pigs	179.4%	75.2%	70.2%	13.7%	1.2%

10	Poultry	161.6%	74.8%	60.2%	26.3%	0.2%
11	Other livestock and poultry, i.e.,	159.1%	74.7%	58.7%	28.1%	0.3%
12	agricultural services and other agricultural products	148.4%	79.6%	116.6%	23.3%	0.3%
13	round timber	93.2%	97.4%	21.4%	42.8%	0.9%
14	other forestry products; forestry service, planting tree	85.3%	85.8%	26.8%	60.3%	0.3%
15	fishery	76.4%	166.5%	54.7%	34.0%	1.9%
16	fish farming	169.4%	77.1%	71.0%	21.6%	2.9%
17	Coke all type	104.2%	105.8%	94.3%	26.7%	1.4%
18	crude oil	66.0%	77.0%	13.7%	89.7%	11.4%
19	natural gas	69.2%	121.8%	20.7%	57.2%	0.0%
20	Stone, sand, gravel, clay	84.9%	106.2%	82.2%	49.4%	0.2%
21	other none-metallic minerals	87.3%	93.0%	134.2%	56.1%	0.4%
22	supporting service for exploiting mine and ore	137.7%	78.9%	75.6%	14.7%	0.0%
23	Processed, preserved meat and by-products	203.4%	74.3%	71.1%	8.3%	0.3%
24	Processed preserved fishery and by-products	171.3%	78.2%	91.6%	7.8%	1.2%
25	Processed preserved fishery Vegetables and fruit	151.6%	84.8%	75.5%	14.4%	0.5%
26	vegetable and animals oils and fats	110.2%	127.6%	29.8%	2.9%	0.2%
27	milk and by-milk	119.1%	88.5%	73.0%	23.6%	0.4%
28	Rice	153.5%	73.3%	55.3%	1.6%	0.3%
29	Flour (all kinds)	148.0%	80.5%	54.5%	1.5%	0.2%
30	Sugar	126.5%	85.4%	82.3%	22.4%	0.1%
31	cocoa, chocolate and candy, cake products from flour	143.0%	91.1%	99.3%	11.0%	0.1%
32	processed coffee	101.3%	80.2%	51.2%	54.1%	0.1%
33	Other remaining food(macaroni, my yarn and same products; processed food: spices, sauce, vinegar, ferment beer)	142.1%	90.4%	97.8%	12.3%	0.5%
34	animal feed	163.6%	82.8%	66.8%	1.1%	0.4%
35	Alcohol	112.9%	95.8%	74.3%	22.9%	0.0%
36	Beer	115.1%	96.9%	77.1%	20.1%	0.7%
37	Non-alcohol water and soft drinks	113.2%	95.9%	74.7%	22.6%	0.2%
38	Cigarettes	122.9%	92.1%	60.2%	9.3%	0.4%
39	Fiber (all kinds)	121.3%	107.6%	119.1%	9.6%	0.6%
40	Textile products (all kinds)	120.3%	107.0%	117.5%	10.8%	0.7%
41	costume (all kinds)	87.5%	112.3%	70.2%	19.2%	2.1%
42	leather, preliminary processed bags,saddle and other same kinds)	94.5%	117.6%	63.7%	21.9%	1.8%
43	shoes, sandal (all kinds)	86.0%	105.5%	82.5%	37.2%	1.3%
44	Processed wood and by-wood products	110.0%	90.1%	72.5%	32.1%	1.8%
45	Paper and by-paper products	113.2%	102.1%	178.0%	17.5%	0.6%
46	Products of printing activities	107.0%	98.2%	93.7%	26.6%	0.1%
47	Coke coal and other by-product cokes	80.9%	103.9%	22.0%	43.7%	0.1%
48	Gasoline, lubricants	76.6%	201.0%	15.2%	8.4%	0.4%
49	Other products extracting from oil gas	79.5%	206.5%	50.0%	4.5%	0.2%
50	Basic organic chemicals	98.2%	143.4%	182.4%	9.1%	0.3%

51	Fertilizer and nitrogen compound	99.3%	145.5%	206.7%	7.1%	0.4%
52	Plastic and primary synthetic rubber	93.4%	133.8%	170.1%	18.5%	0.2%
53	Other chemical products; man-made fibers	103.0%	120.1%	94.7%	12.6%	2.0%
54	medicine, chemical prophylaxis and pharmacy	98.4%	106.5%	67.9%	24.8%	0.1%
55	by-product rubber	73.5%	100.3%	12.8%	51.7%	0.5%
56	by-product plastic	81.1%	116.5%	33.9%	37.7%	0.6%
57	Glass and by-product glass	77.7%	125.5%	93.5%	37.5%	0.3%
58	cements	115.2%	93.9%	89.5%	30.4%	0.4%
59	Other non-metallic mineral products	107.4%	88.0%	59.4%	32.2%	0.6%
60	Iron,steel	92.1%	148.0%	60.3%	9.6%	1.0%
61	Other metal products	87.3%	137.9%	42.1%	16.9%	2.6%
62	electronic device, computer and peripheral	132.7%	102.4%	51.5%	4.2%	0.1%
63	Machinery & equipment used for broadcasting, television and information activities.	105.5%	102.5%	36.3%	33.5%	0.0%
64	electrical household appliance	168.4%	96.7%	52.6%	9.2%	0.1%
65	other electronic products and optical products	75.7%	101.5%	52.5%	54.9%	0.1%
66	motor, electric generator, power transformers	77.0%	89.5%	18.2%	64.3%	0.1%
67	cell and battery	79.0%	90.1%	20.3%	60.0%	0.0%
68	electric conductor	78.7%	86.8%	18.2%	59.6%	0.2%
69	electric light equipment	100.9%	111.7%	65.0%	20.2%	0.1%
70	consumer electronic equipment	137.6%	96.8%	72.8%	8.3%	0.0%
71	Other electric equipment	112.0%	106.5%	111.7%	13.1%	0.1%
72	general-purpose machinery	85.5%	108.7%	99.4%	36.7%	0.1%
73	special-purpose machinery	98.0%	130.2%	78.0%	14.4%	0.1%
74	cars (all kinds)	88.5%	136.2%	54.7%	11.7%	1.0%
75	Car engines with tractor (except automotive)	86.4%	131.1%	51.1%	17.5%	0.4%
76	Ships and boats	95.1%	129.1%	56.2%	18.2%	0.3%
77	motor vehicles, motor bikes	89.8%	121.6%	56.5%	22.6%	0.6%
78	other transport means	91.4%	124.5%	60.0%	17.7%	0.0%
79	Bed, cabinet, tables, chairs	102.3%	86.2%	61.6%	44.4%	1.5%
80	Jewelry, false jewelry and related details; musical instrument; fit tools , sports, toys, games	76.8%	111.8%	48.4%	44.4%	0.1%
81	medical equipment, dental, Orthopedics and rehabilitation	72.3%	101.2%	65.3%	51.8%	0.0%
82	Other processed industrial products, repair service and equipment and machinery maintenance	79.1%	96.9%	32.8%	60.7%	0.7%
83	Electric transmission services	88.5%	79.5%	2785.2%	59.8%	3.4%
84	Gas, fuel distribution by pipeline	84.4%	80.7%	346.5%	64.1%	0.1%
85	steam distribution , hot water, air conditioner and ice producing	91.2%	77.6%	730.9%	59.1%	0.1%
86	Exploitation, processing and water supply	83.5%	82.0%	436.4%	64.3%	0.2%
87	Management and waste water handle, waste	82.3%	88.1%	82.8%	63.5%	0.1%
88	Construction (all kinds)	104.8%	95.7%	36.6%	37.1%	0.1%
89	railway and road construction , useful construction , other technical construction	105.2%	113.1%	50.9%	22.6%	0.1%
90	special-purpose construction	114.0%	99.2%	60.2%	24.2%	0.1%

91	Sell, car repairing and other car engine repairing, sell, maintenance and repairing car, motorbikes, accessories and auxiliary parts of motorbike and car	81.8%	88.9%	73.3%	55.3%	0.7%
92	Wholesale (except automobile, Moto, motorbike and other car engines), retail (except automobile, Moto, motorbike and other car engines)	79.7%	88.7%	36.2%	59.3%	17.7%
93	railway passenger transport	81.7%	121.3%	46.3%	42.2%	0.0%
94	railway good transport	79.9%	116.7%	42.3%	47.2%	0.0%
95	bus transport; other road passenger transport	74.6%	164.6%	18.5%	33.9%	0.6%
96	good transport by road; pipeline transport	74.3%	162.1%	18.0%	35.7%	0.7%
97	passenger waterway transport service	76.0%	154.2%	19.5%	36.4%	0.1%
98	good waterway transport services	76.5%	157.3%	20.2%	34.1%	0.7%
99	passenger airline service	100.4%	137.7%	37.9%	13.6%	0.1%
100	cargo airline services	100.4%	137.7%	37.9%	13.6%	0.0%
101	parking services and supporting services for transportation	79.8%	87.3%	54.9%	61.8%	1.8%
102	Postal and delivery	109.9%	82.1%	185.0%	36.2%	0.5%
103	residential service	87.3%	76.3%	371.1%	58.7%	1.8%
104	Food Service	104.3%	73.7%	53.9%	64.1%	1.1%
105	Publishing services	110.9%	89.0%	74.8%	33.0%	0.1%
106	Film, television, recording and music publishing	106.9%	77.9%	116.9%	40.7%	0.0%
107	Radio, television	93.0%	74.3%	102.0%	53.2%	0.1%
108	Telecommunication services	97.5%	77.2%	35.4%	57.3%	0.0%
109	programming computer service, consulting services and other information services	98.3%	75.7%	159.2%	54.9%	0.1%
110	Financial services (except insurance and social insurance)	76.3%	83.2%	6.6%	51.8%	0.9%
111	non-life insurance and re-insurance	87.5%	83.8%	67.3%	61.6%	0.2%
112	Life insurance, social insurance	113.9%	93.3%	126.3%	28.7%	0.0%
113	Other financial services	92.3%	81.4%	127.2%	59.9%	0.2%
114	real estate business service	81.9%	79.1%	198.9%	69.9%	1.2%
115	Legal services, accounting and audit	82.4%	77.1%	41.8%	64.4%	0.1%
116	headquarters office service; consulting services for management	84.3%	75.3%	38.0%	65.3%	0.1%
117	architectural , testing and analysis technique service	87.1%	81.1%	44.8%	61.8%	0.3%
118	Research and development	76.7%	78.7%	38.1%	76.6%	0.1%
119	advertising and market research service	92.2%	75.9%	35.0%	62.3%	0.1%
120	Other professional ,scientific and technological service	98.0%	97.0%	111.2%	38.5%	0.1%
121	Veterinary services	75.8%	98.6%	12.1%	63.4%	0.0%
122	rent machinery and equipment (no operator), personal household appliance for rent	81.1%	89.2%	52.3%	60.8%	0.1%
123	work and job service	91.7%	80.5%	90.2%	48.0%	0.0%
124	travel agency services, tour business ; supporting services of promoting and organizing tour	84.3%	99.9%	48.6%	52.3%	0.1%
125	Investigation services and security	75.0%	79.1%	76.2%	76.0%	0.0%
126	sanitation services for house and landscape	90.8%	108.2%	124.9%	42.2%	0.1%

127	Administrative services, office support and other business supporting activities	89.6%	83.2%	80.8%	58.5%	0.1%
128	service of communist Party activities, political and social organization, state management,defence and compulsory social security	89.0%	80.2%	70.9%	63.8%	0.0%
129	Education and training(except college, university and postgraduate)	87.4%	78.4%	89.6%	64.7%	0.1%
130	college, university and post-graduate service	82.1%	79.0%	67.9%	67.9%	0.2%
131	healthcare services	88.4%	97.9%	70.5%	44.2%	0.1%
132	Care services, centralized nurse and non-centralized social supporting services	76.2%	74.8%	49.6%	79.9%	0.0%
133	Creation, arts and entertainment, library services, archives, museums and other cultural services	95.8%	82.1%	110.1%	52.0%	0.0%
134	Lottery, Bet and gamble	122.3%	71.1%	52.3%	37.3%	0.0%
135	sports ; entertainment	93.4%	79.9%	198.4%	56.1%	0.1%
136	Other services of organizations and foundations	97.0%	84.9%	82.9%	52.2%	0.0%
137	repair service for computer ,other personal household appliances	89.4%	83.9%	125.8%	59.7%	0.0%
138	household service ;self-consumption products of household, service of organizations and international offices	69.2%	125.3%	16.3%	61.7%	0.2%

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Original Paper

Interregional Input-Output Analysis between the Mekong Delta Region (MDR) and the Rest of Vietnam (ROV)

Nguyen Quang Tung[1], Trinh Bui[2*], Nguyen Viet Phong[3], Nguyen Hong Nhung[4] & Nguyễn Thị Lan Anh[5]

[1] Government Office, Hanoi, Vietnam

[2] Development Research Institute, Hanoi, Vietnam

[3] General Statistics Office, Hanoi, Vietnam

[4] Development Research Institute, Hanoi, Vietnam

[5] Thai Nguyen University of Economics and Business Administration, Thai Nguyen, Vietnam

[*] Trinh Bui, Development Research Institute, Hanoi, Vietnam

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Abstract

The Mekong Delta is an important economic area, located in the southern part of Vietnam. The Mekong Delta has many potential and opportunities for development, but also new challenges in the context of global climate change, sea level rise, as well as the consequences of blocking the river and the Mekong countries also need to increase competition in international integration. In addition to these challenges, the region also has new opportunities when implementing economic restructuring in line with the policy of restructuring the economy in new conditions, including the establishment of special economic zones as PhuQuoc Resort. Besides analysis based on modern economic theory, this paper uses the input-output framework (I/O Inter-sect oral Scope Model) updated in 2016 for two areas: by the Mekong River and the Rest of Vietnam (ROV) to find inter-regional impacts and to calculate some impact assessments of climate change. The study also analyzes some other factors related to the viewpoint of sustainable regional development in new conditions, income distribution and social security.

Keywords

inter-regional, regional, input-output, value added, final demand

1. Introduction

The Mekong Delta has a lot of potential for development, especially the potential for rice, fruit and seafood. This area forms a triangular area of 3.9 million hectares and is home to nearly 18 million people (about 20% of Vietnam's population), with a rapidly increasing urbanization rate, in 2016 reaching about 25%. This is one of the most fertile plains in the world, accounting for 50% of rice production, 65% of aquaculture production and 70% of fruits of the country. Vietnam economy has grown at a rate high in the past three decades. The stability of the Vietnamese economy during this period has contributed greatly to tropical agriculture and the Mekong Delta. At the same time, the impact of floods and storms is increasingly exacerbated by the global climate, creating significant negative impacts on human life, infrastructure and economic activity. The harsh annual weather events cost thousands of billions of dong, as in 2011, which resulted in housing losses of VND 327 billion and infrastructure losses of VND5, 304 billion. At the same time, in 2011, 85 people died in extreme weather events and 138 people died in 2008 for similar reasons. Moreover, floods and storms affect 0.7% of agricultural land, with losses of about 1,020 billion VND. Although the total cost of disaster-related water damage was about VND6, 650 billion in 2011, only VND322 billion was allocated from the public budget for compensation and compensation. Remarkably, the cost of damage in 2011 is four times higher than the value added from water distribution services and accounts for 0.2% of the national GDP. In addition to the economic losses, the associated disasters Floods and typhoons are a constant threat to the lives of people in the Mekong Delta. Droughts and saltwater intrusion often occur in the Mekong Delta region of Viet Nam, as severe droughts and Stalinization occur by 2015 and subsequent years, causing serious economic losses. This situation is complicated by the impact of global climate change and the blockade of upstream of the Upper Mekong. Researchers point out that the 7 dams that China built upstream of the Mekong have led them to reduce sediment flow downstream. At present, there are about 500 landslide sites in the Mekong delta that are severely eroded by tens of kilometers along the river and coastal areas, affecting the cultivated area and the stable life of the people. All these negative impacts will require changes in farming practices and economic structural change, as has been done in some provinces in the region (reducing the number of rice crops for conversion to aquaculture, planting fruit trees, as in Vinh Long, even developing clean industries such as Bac Lieu ....). As a result, the legitimacy of the policy is to change the "old" mode of development, creating a strong and effective change in the adjustment of economic structure.

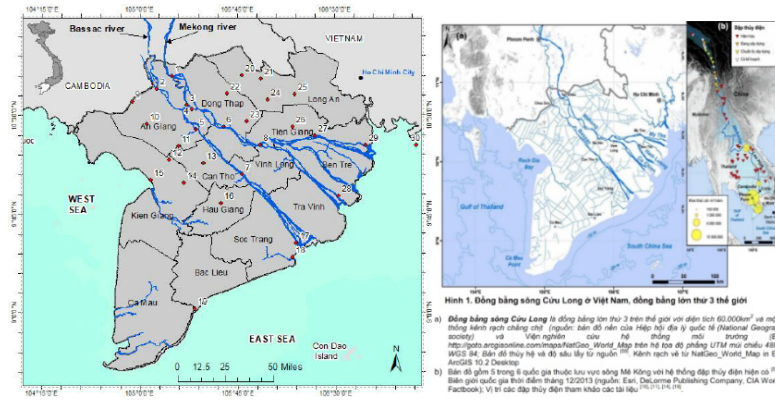

Figure 1. Mekong Delta of Vietnam

According to the Government (Note 1), the Mekong Delta region has an important strategic position in the country, both economically and socially as well as national defense and security, and is home to more than 20 million people. The erosion of river banks, canals, and coasts occurs in most areas of the Mekong Delta, especially in 2017 and early 2018, which directly threatens the safety of many residential areas. Coastal and coastal infrastructure, especially in An Giang, Dong Thap, Ca Mau, Bac Lieu and Can Tho (Note 2). There are 562 coastal areas and landslides with the total length of 786 km, of which 42 landslides are particularly dangerous with a total length of 148 km and itneeds to deal soonto ensure the safety of life and property of the people and state.

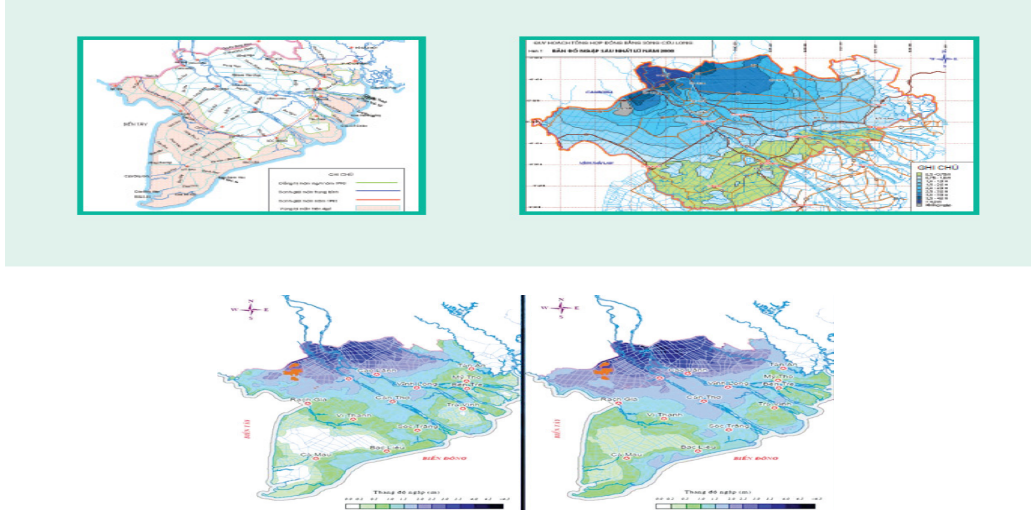

Figure 2. Mekong Delta Flooded and Saline Intrusion Map

Unreasonable exploitation of water resources in the region under multi-dimensional impacts has caused subsidence and erosion in river and coastal areas and increased pollution caused by unplanned industrialization and urbanization. Identifying mixed strategies for regional development,

transformation of the farming model is very important, improving the region's labor productivity and ensuring sustainable development. Over the past years, the Ministry of Agriculture and Rural Development and localities have concentrated drastically on the conversion of crops on rice land, especially the inefficient ones, lack of fresh water. In the winter-spring crop of 2018, over 16,000ha of paddy in the Mekong Delta have been converted to bean, maize, peanut, vegetable, orange, grapefruit, tangerine. Fruit trees that have been converted from rice paddies are very satisfactory. Typically, the orange trees yield more than VND 370 million/ha/year after deducting expenses; rambutan for profit 228 million VND/ha/year; grapefruit reaches VND 660 million/ha/year; VND 460 million/ha/year ... all far exceeded the efficiency of rice. From this basis, in 2018, MARD policy to encourage Mekong Delta farmers to convert about 118,000ha of inefficient rice land into other crops (Note 3). Vinh Long city also converted some areas to flower growing, organic farming. The agricultural sector has built 37 models of orchids in Vinh Long and Binh Minh town with 37,000 pots of seedlings, initially formed the orchid production area focuses on supplying fresh flowers. On the spots, increase the price competitive advantage with the same products from other localities. Moreover, Vinh Long is located between the Tien and Hau rivers, so most of the urban areas of the province are located next to the large waterway transport system, the distance is relatively close, on average 18 km and the city where is farthest from province center only about 45 km. The potential for agricultural development along the urban area is very large, equivalent to about 60% of the agricultural land of the province. Over the past time, the agricultural sector of Vinh Long province has focused on supporting the transfer of scientific and technical advances, helping farmers to shift production towards diversified crops and livestock on the basis of suitable conditions themselves production, level of cultivation and market demand. A series of models of agricultural production in the direction of applying high technology were initially applied effectively and replicated. The Mekong Delta is a dynamic and highly dynamic economic region where economic structural adjustment is in line with global climate change and changes in the international context. Thus, in the context of global climate change as well as the pressures of international integration is required to have more basic policies, suitable to the conditions of the Mekong Delta and also country. Figure 4 below presents the contribution and constraints of water resources to the socio-economic development of the area.

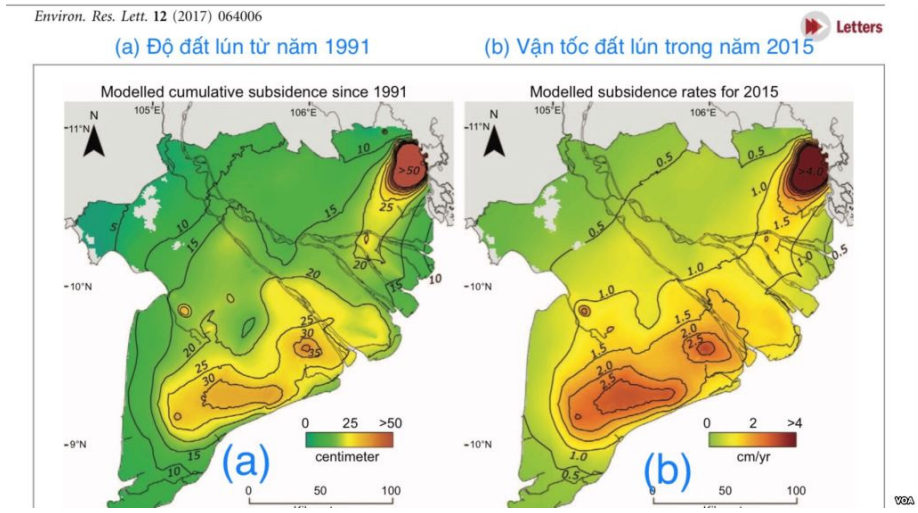

Figure 3. Map of Subsidence in Mekong Delta

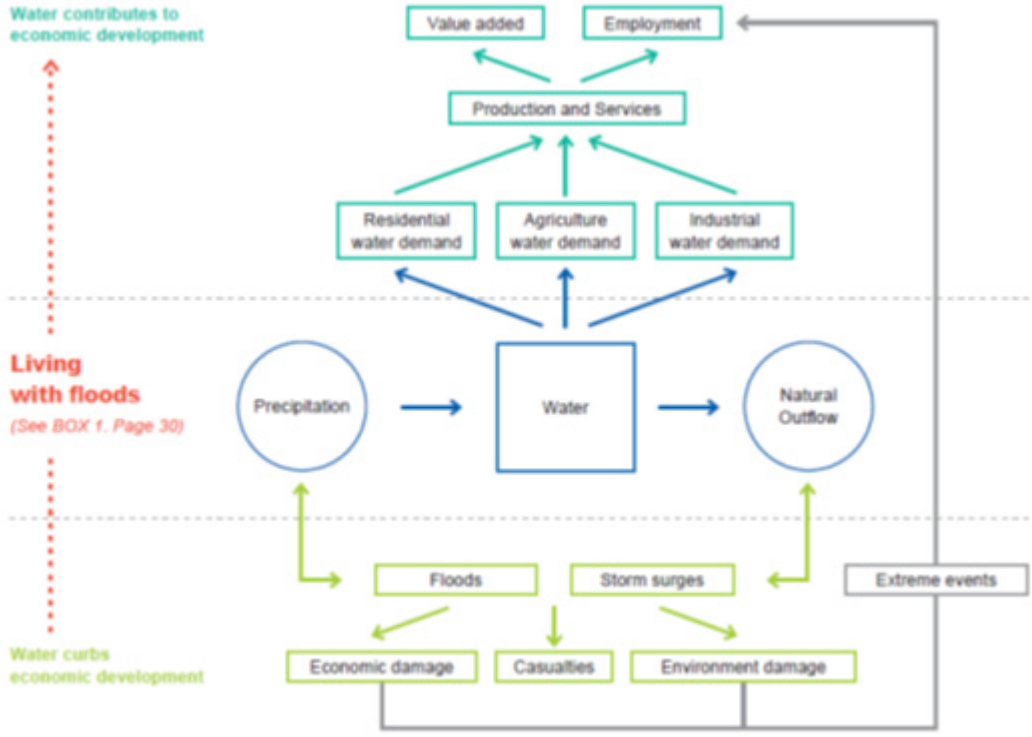

Figure 4. Water Contribution and Constraint to Socioeconomic Development in the Mekong Delta Region

Everyone knows that over the past years, the Party and State leaders have analyzed the ineffective economic situation. Therefore, they have proposed policies to restructure the economy and renovate the growth model. However, the implementation of these policies is not high, including the recent Resolutions before and after the XII Congress of the Party. The program of action has been built not yet

attached to the modern market economy institution and integration transition. In shaping the long-term development of the region, adopting an integrated approach to land and water resource management requires comprehensive analysis and understanding of the systematic relationship between water resources and key elements of socio-economic reality in the Mekong Delta. The Figure below provides a demonstration of the major contributions and challenges posed by water to economic growth and social welfare in the region. In addition to the analysis by macroeconomic instruments, this section also examines in detail the impact of the new development policy of the Mekong Delta, including tourism and special development policies. The research team used the Inter-sectoral Scale model to carry out more specific assessments. This study attempts to use the inter-regional input-output model to study the relationship between the Mekong Delta (including PhuQuoc) and the Rest of Vietnam (ROV). The article not only assesses the damage caused by natural disasters to the Mekong Delta but also affects to other parts of the country. At the same time, this study also takes advantage of previous results to clarify the situation of climate change and the production model that has an adverse impact on the environment and sustainable development. Some issues on income disparities of Resident Groups are also mentioned initially to clarify the need to create high-yield jobs in new conditions.

Leontief's input-output system has been developed into Isard's (1951) inter-regional input-output model; the idea of the inter-regional I-O model has been recognized by Richardson (1972) and Miyazawa (1976) and is considered as an important tool in regional economic research. The inter-regional IO model not only describes inter-sectoral relationships, but also describes interregional relationships through regional trade flows of the region with other regions and regional trade flows with foreigners. The inter-regional model was developed by Chenery-Moses (also known as Chenery-Moses model) and Miller-Blair (1985). Regional economics is based on the application of inter-regional input-output models that were established in the late 1960s and early 1970s. Since then it has been perfected and developed by many famous economists such as Miyazawa, M. Miller (1986); Sonis and Hewing (1998). Inter-regional inputs and outputs have been used by many countries in analyzing regional economic structures, especially in Japan, using this model to assess the impact of the massive Hanshin earthquake in 1995, Japan (Note 4).

This study is based on the inter-regional input-output table between the Mekong Dental and the rest of Vietnam in 2016 with 28 sectors (Appendix 1).

The Vietnam National input-output table in 2016 was updated base on the Vietnam input-output table in 2012 and Vietnam enterprise survey in 2016. The intra-input-output of Mekong Delta region in 2016 was updated base on intra-input-output table of Mekong Delta region of Vietnam in 2012 and data on gross output and intermediate input vectors was estimated base on Vietnam enterprise survey in 2016. The interregional input-output table was updated base Vietnam national input-output and intra-input-output tables in 2016 by SLQ method, Bui (2016).

2. Methodology

To analyze the inter-regional feedback effects and the degree to which change originating in one region has capacity to influence activity levels in another region, Bui, Kim, and Francisco T Secretario (2000) applied an interregional I-O model on a case study of HoChiMinh City and the rest of Vietnam. Harries et al. (1998) separated the Lincoln County into the Caliente area and the rest of Lincoln County. Following procedures outlined by Robinson (1997), Holland (1991), and Robinson and Lark (1993), Harries et al. (1998) used an inter-regional model to give local decision makers an idea of potential socio-economic and fiscal impacts from changes in local economic activity.

The inter-region input-output model is used to analyze economic impacts, describing on products flows between regions that allow estimation of the non-specific in a single input-output model.

Leontief's standard relationship is in the form as follow:

$$A.X + Y = X \quad (1)$$

Where: A is a direct input coefficient matrix, X is vector of output, Y is a vector of final demand. In the interregional input-ouput analysis the matrix A was divided as:

$$A = \begin{bmatrix} A_{cc} & A_{cr} \\ A_{rc} & A_{rr} \end{bmatrix}$$

$$X = \begin{bmatrix} X_c \\ X_r \end{bmatrix}$$

$$\text{And } Y = \begin{bmatrix} Y_{cc} & Y_{cr} \\ Y_{rc} & Y_{rr} \end{bmatrix}$$

Where: A_{ck} is sub-matrix that present region k used products of region c for intermediate input; X_c is vector gross output of region c and X_k is vector gross output of region k; Yck present final demand of region k use products of region c

Call B = (I-A)-1

So we have X =B.Y

And

$$B = \begin{bmatrix} B_{cc} & B_{cr} \\ B_{rc} & B_{rr} \end{bmatrix}$$

In this case x is a matrix of output that induced by each region final demand, X is defined as follow:

$$X = \begin{bmatrix} B_{cc}.Ycc + Bcr.Yrc & B_{cr}.Yrr + Bcc.Ycr \\ B_{rc}.Ycc + Brr.Yrc & B_{rr}Yrr + Brc.Ycr \end{bmatrix}$$

Follow Miyazawa (1976) the matrix B can be divided as:

$B_{cc} = (I - A_{cc} - A_{cr}.(I - A_{cc})^{-1}.A_{rc})$

$B_{rr} = (I - A_{rr} - Arc.\ (I - A_{rr})^{-1}.A_{cr})$

$B_{cr} = B_{cc}.A_{cr}(I-A_{rr})^{-1}$

$B_{rc} = B_{rr}.A_{rc}(I - A_{cc})^{-1}$

In other words:

Bcc includes multipliers effects $(I-Acc)^{-1}$ and interregional feedback effects: Bcc + Brc - $(I-Acc)^{-1}$ B_{rc} represent for Spillover effects from region C to region R.

In the case of research on a sector group in a region related to other sectors in the region and other region, the matrix A can be divided as follow:

$$A = \begin{bmatrix} A^{ii}{}_{cc} & A^{ij}{}_{cc} & A_{cr} \\ A^{ji}{}_{cc} & A^{jj}{}_{cc} & A_{cr} \\ A^{ij}{}_{rc} & A^{ij}{}_{rc} & A_{rr} \end{bmatrix}$$

And

$$X = \begin{bmatrix} X^{i}{}_{c} \\ X^{j}{}_{c} \\ X_{r} \end{bmatrix}$$

$$Y = \begin{bmatrix} Y^{i}{}_{cc} & Y^{i}{}_{cr} \\ Y^{j}{}_{cc} & Y^{j}{}_{cr} \\ Y_{rc} & Y_{rr} \end{bmatrix}$$

From equation (1) we have:

$$X^i c = (I - A^{ii}_{CC})^{-1}.(A^{ii}_{cr}.\ X^j_c + A_{cr}.X_r + Y^i_{cc} + Y^i_{cr}) \quad (2)$$

$$X^j_c = (I - A^{ij}_{cc})^{-1}.(A^{ji}_{cc}.\ X^i_c + A_{cr}.X_r + Y^j_{cr} + Y^j_{cr}) \quad (3)$$

$$Xr = ((I-A^{ii}_{rr})^{-1}.(A^{NR}_{hk}.X^R_c + A_{rr}.X^R + Y_{rc} + Y_{rr}) \quad (4)$$

So, demand of i sectors group in a region is not only depend on final demand of those sector group but also depend on production demand of other sectors in the same region and others.

Put: $v^c_i = V^c_i/X^c_i$

With: V^c_i is a vector value added of sector i, C region; X^c_i is a vector of output, C region

Rewrite follow matrix form, we have:

$$V = v.B.Y \quad (5)$$

Where:

$v= (v^c, v^r)$

$$v.B = (V_c.B_{cc}+V_r.B_{rc}, V_r.B_{rr} +V_cB_{cr}) \quad (6)$$

Final demand of C region includes products that is produced by itself and the product is produced by region r; C region used products by itself will be induced to value added of C region: Vc.Bcc; and C region used products of R region will be induced to value added of R region: Vr.Brc. Similar to the final demand of the R region.

And:

V = v.BY = [Vc.(Bcc.Ycc + Bcr.Yrc), + Vr.(Brc + Brr.Yrc); Vc.(Bcc.Ycr + Bcr.Yrr) + Vr.(Brc.Yrc + Brr.Yrr)]

3. Some Findings

Appendixes 2, 3 show total output requirements of Mekong Delta River (MDR) region is higher than Rest of Vietnam (ROV), this means the outputs induced by MDR's final uses more than outputs induced by ROV's final used. In which, interregional feedback and spillover effects of MDR region is much higher than ROV region. This means that the product in the MDR transaction channel to the ROV region appears to be raw products. Especially, in MDR region, the fishery sector has interregional feedback effect very high, this means input requirement on fishery of ROV region is very big, Meanwhile, all most other sector of MDR region have low interregional feedback effects counts. For the ROV, 15 sectors in the 28 sectors surveyed in the model has a higher intraregional feedback effects index than the overall average of this region, these sectors are agriculture; fishery; manufacture of food products; manufacture of textiles, clothing, footwear & leather goods; manufacture of furniture & other goods, repair & installation; construction; accommodation & food service activities; real estate activities; mining and quarrying; manufacture of petroleum, chemical, rubber and plastic products, manufacture of metal products, machinery and equipment; electricity; water supply; professional, scientific and technical activities, administrative and support service activities. These sectors has level

high on interregional feedback effects compare with other sectors in ROV region, but, these interregional feedback effects until are small with MDR region.

Appendix 4 shows a unit final demand of MDR region create value added more than a unit final demand of ROV region (0.7 compare with 0.61); value added induced by intra-region's final demand and interregional final demand the products produced by MDR higher than these of ROV region. Appendixes 4, 5 also show agriculture and almost services sectors have level induced impact to value added higher than average.

Figure 5 shows final demand of MDR induced to output and value added better than final demand of ROV at all factors in final demand. Especially fixed gross capital formation and export of ROV induced to value added very low.

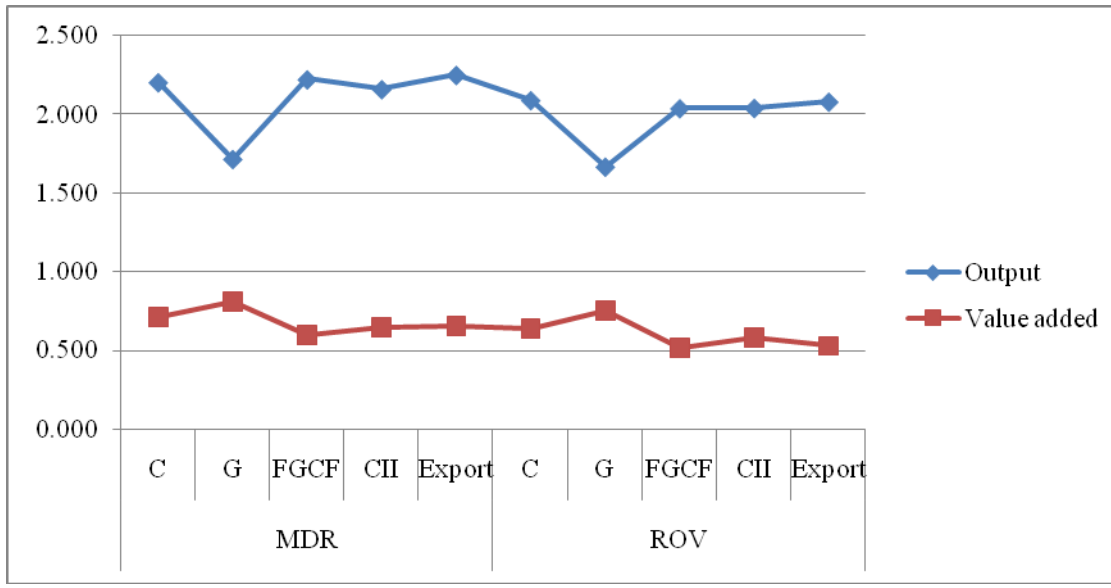

Figure 5. Output, Value Added Induced by Factors of Final Demand

C: Final consumption; G: Government consumption expenditure; FGCF: Fixed gross capital formation, CII: Change in inventory.

Source: Author's Calculation.

The MDR region often encounters droughts and Stalinization, this research tries a attempt to apply inter-regional input-output analysis to estimate intra-regional and inter-regional impacts as natural disasters directly affect agricultural output (5%) in Appendix 6.

4. Conclusions

Although Vietnam has many policies that have proven to have a positive impact on the economy, there are areas where policy seems to have gone wrong. This study shows that an important sector such as agriculture has not received an appropriate policy to develop its potential compatibility.

The study also finds that the inter-regional feedback and spillover effects indexes of Mekong delta river is higher than the rest of Vietnam region, this means production and final uses of Mekong delta river region have has good impacts to the rest of Vietnam. But in the opposite direction, the rest of Vietnam region does not have good spread to the Mekong delta river region, so MDR region seemed "lonely" in inter-regional cohesion.

Acknowledgment

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Notes

Note 1. http://baochinhphu.vn/Tin-noi-bat/Thu-tuong-chi-dao-tap-trung-khac-phuc-sat-lo-vung-DBSCL/336809.vgp

Note 2. http://vietnamnet.vn/vn/thoi-su/sat-lo-o-can-tho-nha-do-am-xuong-song-dan-thao-chay-tan-loan-452254.html

Note 3. http://www.baohaugiang.com.vn/kinh-te/dong-bang-song-cuu-long-hieu-qua-tu-chuyen-doi-cay-trong-68173.html

Note 4. Everyone knows that the measurement of demand and output, income and employment has finally been studied by economists. One of the useful studies was developed by J.M. Keynes on income and currency (1936). Then, the national input-output model was developed by W. Leontief (1936, 1941) at the national level. The Leontief system was extended to study regional economics by Isard (1951),

also known as the Isard model, and the ideas of the inter-regional IO model developed by Miyazawa (1976) and Richardson (1972), and is considered as an essential tool in regional scientific research. The inter-regional input-output model not only shows the interdisciplinary relationship, but also the relationship between regions based on trade flows between this and other regions. The later inter-regional model was developed by Chenery-Moses (also known as Chenery/Moses-1955 model). Input-output models are also used to estimate losses and losses due to unexpected events, such as earthquakes, floods, and other major natural disasters. Okuyama et al. (2002) applied a series of interdisciplinary models to assess the impact of the large Hanshin earthquake in such a way as to permit the transfer into the I-O framework. Other recent studies used inter-regional I-O models include Allan et al. (2004), Zhang (2007), Patrick and Wang (2007), and Rey (1999).

Appendixes

Appendix 1

1	AGRICULTURE
2	FORESTRY
3	FISHING
4	MANUFACTURE OF FOOD PRODUCTS
5	MANUFACTURE OF TEXTILES, CLOTHING, FOOTWEAR & LEATHER GOODS
6	MANUFACTURE OF FURNITURE & OTHER GOODS; REPAIR & INSTALLATION
7	CONSTRUCTION
8	WHOLESALE & RETAIL TRADE; REPAIR OF MOTOR VEHICLES & MOTORCYCLES
9	TRANSPORTATION & STORAGE
10	ACCOMMODATION & FOOD SERVICE ACTIVITIES
11	REAL ESTATE ACTIVITIES
12	MINING & QUARRYING
13	MANUFACTURE OF BEVERAGES & TOBACCO
14	MANUFACTURE OF WOOD, PAPER & RELATED PRODUCTS; PRINTING
15	MANUFACTURE OF PETROLEUM, CHEMICAL, RUBBER & PLASTIC PRODUCTS
16	MANUFACTURE OF NON-METALLIC MINERAL PRODUCTS
17	MANUFACTURE OF METAL PRODUCTS, MACHINERY & EQUIPMENT
18	ELECTRICITY
19	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT & REMEDIATION ACTIVITIES
20	INFORMATION & COMMUNICATIONS
21	FINANCIAL & INSURANCE ACTIVITIES
22	PROFESSIONAL, SCIENTIFIC & TECHNICAL ACTIVITIES
23	ADMINISTRATIVE & SUPPORT SERVICE ACTIVITIES

24	PUBLIC ADMINISTRATION & DEFENCE; COMPULSORY SOCIAL SECURITY
25	EDUCATION
26	HUMAN HEALTH & SOCIAL WORK ACTIVITIES
27	ARTS, ENTERTAINMENT & RECREATION
28	OTHER SERVICE ACTIVITIES

Appendix 2

Multipliers of Mekong Region

Sector	Output requirements	Multiplier effects	Interregional feed back effects	Spillover Effects	In Which: Average of Output requirements	Average of Multiplier effects	Average of Interregional feed back effects	Average of Spillover Effects
1	2.288	2.018	0.0082	**0.262**	1.0813	1.1141	0.1402	**1.0627**
2	1.806	1.420	0.0055	0.381	0.8537	0.7838	0.0942	1.5469
3	4.000	2.286	1.4184	0.296	1.8904	1.2620	24.3269	1.2003
4	1.923	1.648	0.0110	0.264	0.9090	0.9102	0.1893	1.0707
5	3.165	2.747	0.0128	0.405	1.4957	1.5169	0.2201	1.6419
6	2.235	1.959	0.0093	0.267	1.0564	1.0815	0.1592	1.0841
7	1.981	1.815	0.0059	0.160	0.9361	1.0020	0.1010	0.6494
8	2.560	2.058	0.0075	0.494	1.2096	1.1366	0.1284	2.0020
9	2.328	2.013	0.0094	0.305	1.1001	1.1117	0.1606	1.2367
10	2.297	2.012	0.0093	0.276	1.0858	1.1112	0.1600	1.1184
11	2.146	1.728	0.0201	0.398	1.0143	0.9541	0.3450	1.6152
12	2.291	1.863	0.0103	0.418	1.0827	1.0286	0.1760	1.6949
13	1.593	1.425	0.0066	0.161	0.7529	0.7870	0.1138	0.6531
14	1.821	1.639	0.0061	0.176	0.8607	0.9050	0.1039	0.7139
15	2.283	1.945	0.0137	0.325	1.0791	1.0738	0.2341	1.3177
16	1.788	1.639	0.0049	0.144	0.8449	0.9051	0.0846	0.5825
17	2.092	1.861	0.0067	0.224	0.9886	1.0278	0.1156	0.9079
18	2.378	2.101	0.0084	0.268	1.1238	1.1601	0.1445	1.0881
19	2.159	1.884	0.0118	0.263	1.0202	1.0404	0.2029	1.0653
20	1.806	1.675	0.0032	0.128	0.8534	0.9248	0.0550	0.5178
21	1.609	1.507	0.0035	0.099	0.7605	0.8321	0.0601	0.3997
22	1.923	1.731	0.0076	0.185	0.9090	0.9558	0.1295	0.7499

23	1.899	1.699	0.0064	0.193	0.8973	0.9382	0.1099	0.7827
24	1.648	1.508	0.0047	0.135	0.7788	0.8327	0.0802	0.5481
25	1.555	1.441	0.0038	0.110	0.7351	0.7957	0.0650	0.4480
26	1.943	1.726	0.0063	0.211	0.9182	0.9528	0.1087	0.8553
27	1.874	1.705	0.0039	0.165	0.8856	0.9417	0.0667	0.6673
28	1.855	1.656	0.0073	0.192	0.8769	0.9143	0.1247	0.7796
Average	**2.116**	**1.811**	**0.058**	**0.247**				

Appendix 3

Multipliers of Rest of Vietnam

Sector	**Rest of Vietnam (ROV)**							
		In Which:				In Which:		
	Output requirements	Multiplier effects	Interregional feedback effects	Spillover Effects	Average of Output requirements	Average of Multiplier effects	Average of Interregional feedback effects	Average of Spillover Effects
1	2.174	2.104	0.009	**0.060**	1.1287	1.1298	1.0462	1.1124
2	1.443	1.425	0.003	0.015	0.7492	0.7650	0.3167	0.2741
3	2.490	2.385	0.014	0.092	1.2929	1.2802	1.5315	1.7034
4	1.739	1.676	0.010	0.053	0.9029	0.8995	1.1847	0.9799
5	2.927	2.810	0.015	0.102	1.5199	1.5085	1.7122	1.8934
6	2.101	2.033	0.010	0.058	1.0911	1.0914	1.1106	1.0814
7	1.962	1.866	0.010	0.087	1.0191	1.0015	1.0823	1.6229
8	2.133	2.095	0.006	0.033	1.1079	1.1248	0.6367	0.6078
9	2.120	2.062	0.008	0.049	1.1007	1.1072	0.9117	0.9130
10	2.122	2.054	0.009	0.058	1.1018	1.1028	1.0730	1.0785
11	1.811	1.696	0.020	0.095	0.9407	0.9104	2.3011	1.7743
12	1.945	1.884	0.010	0.052	1.0101	1.0112	1.1124	0.9610
13	1.499	1.457	0.007	0.035	0.7784	0.7820	0.8007	0.6542
14	1.740	1.687	0.008	0.044	0.9035	0.9057	0.9532	0.8246
15	2.081	1.984	0.015	0.082	1.0807	1.0649	1.7245	1.5277
16	1.749	1.703	0.007	0.039	0.9081	0.9144	0.7519	0.7209
17	1.981	1.912	0.010	0.060	1.0290	1.0263	1.1001	1.1151
18	2.275	2.189	0.011	0.075	1.1814	1.1749	1.2829	1.3965
19	2.008	1.934	0.012	0.061	1.0425	1.0384	1.3878	1.1353
20	1.772	1.741	0.004	0.027	0.9202	0.9349	0.4557	0.4942

21	1.632	1.598	0.005	0.029	0.8476	0.8580	0.5710	0.5360
22	1.849	1.792	0.009	0.048	0.9600	0.9619	1.0103	0.8913
23	1.817	1.749	0.010	0.057	0.9434	0.9390	1.1604	1.0669
24	1.614	1.567	0.007	0.040	0.8380	0.8413	0.7751	0.7386
25	1.531	1.496	0.005	0.030	0.7948	0.8030	0.6007	0.5492
26	1.835	1.783	0.007	0.044	0.9530	0.9574	0.8413	0.8241
27	1.805	1.769	0.005	0.031	0.9372	0.9496	0.5652	0.5735
28	1.766	1.706		0.051	0.9172	0.9159	0.0000	0.9498
Average	**1.926**	**1.863**	**0.009**	**0.054**				

Appendix 4

Value Added Multipliers of Mekong Region and Rest of Vietnam

Sector	Value added induced by a unit increase of Mekong region final demand			Value added induced by a unit increase of ROV region final demand		
	Total impacts of Mekong region final demand	Value added receipted by Mekong region	Value added receipted by ROV region	Total impacts of ROV region final demand	Value add of ROV region	Value add of Mekong region
1	0.742	0.674	0.068	0.652	0.637	0.016
2	0.813	0.660	0.153	0.611	0.607	0.004
3	0.662	0.592	0.070	0.579	0.556	0.023
4	0.672	0.605	0.066	0.579	0.566	0.013
5	0.715	0.612	0.103	0.588	0.562	0.026
6	0.737	0.668	0.069	0.646	0.630	0.015
7	0.559	0.517	0.042	0.507	0.483	0.025
8	0.677	0.489	0.188	0.451	0.442	0.009
9	0.556	0.475	0.082	0.457	0.444	0.013
10	0.714	0.637	0.078	0.611	0.594	0.017
11	0.499	0.410	0.089	0.389	0.365	0.024
12	0.646	0.505	0.141	0.471	0.458	0.014
13	0.826	0.784	0.042	0.760	0.750	0.009
14	0.760	0.715	0.045	0.691	0.679	0.012
15	0.629	0.547	0.082	0.531	0.508	0.023
16	0.818	0.778	0.040	0.756	0.745	0.011
17	0.626	0.569	0.057	0.550	0.533	0.017
18	0.728	0.660	0.068	0.640	0.621	0.019

19	0.696	0.632	0.064	0.612	0.596	0.016
20	0.858	0.813	0.045	0.789	0.780	0.009
21	0.887	0.859	0.027	0.838	0.830	0.008
22	0.777	0.729	0.047	0.710	0.697	0.013
23	0.770	0.718	0.052	0.697	0.680	0.016
24	0.839	0.803	0.036	0.786	0.775	0.011
25	0.870	0.840	0.030	0.825	0.816	0.008
26	0.621	0.569	0.052	0.548	0.536	0.012
27	0.850	0.796	0.054	0.779	0.770	0.010
28	0.743	0.693	0.050	0.672	0.658	0.014
1	**0.6997**	**0.6327**	**0.0670**	**0.6112**	**0.5972**	**0.0140**

Appendix 5

Average on Value Added Induced by a Unit Increase of Final Uses: MDR and ROV

Sector	Average of value added induced by a unit increase of final demand, MDR			Average of value added induced by a unit increase of final demand, ROV		
	Total impacts of MDR final demand	Value added receipted by Mekong region	Value added receipted by ROV region	Total impacts of ROV region final demand	Value add of ROV region	Value add of Mekong region
1	1.024	1.029	0.981	1.030	1.030	1.101
2	1.122	1.007	2.208	0.965	0.981	0.275
3	0.914	0.903	1.010	0.915	0.899	1.582
4	0.927	0.923	0.953	0.915	0.915	0.894
5	0.987	0.934	1.487	0.929	0.909	1.789
6	1.017	1.019	0.996	1.020	1.019	1.032
7	0.771	0.789	0.606	0.801	0.781	1.720
8	0.934	0.746	2.713	0.712	0.715	0.619
9	0.767	0.725	1.184	0.722	0.718	0.894
10	0.985	0.972	1.126	0.965	0.960	1.170
11	0.689	0.626	1.285	0.614	0.590	1.651
12	0.891	0.771	2.035	0.744	0.741	0.963
13	1.140	1.196	0.606	1.201	1.213	0.619
14	1.049	1.091	0.649	1.092	1.098	0.826
15	0.868	0.835	1.184	0.839	0.821	1.582

16	1.129	1.187	0.577	1.194	1.205	0.757
17	0.864	0.868	0.823	0.869	0.862	1.170
18	1.005	1.007	0.981	1.011	1.004	1.307
19	0.960	0.964	0.924	0.967	0.964	1.101
20	1.184	1.241	0.649	1.246	1.261	0.619
21	1.224	1.311	0.390	1.324	1.342	0.550
22	1.072	1.112	0.678	1.122	1.127	0.894
23	1.063	1.096	0.751	1.101	1.099	1.101
24	1.158	1.225	0.520	1.242	1.253	0.757
25	1.201	1.282	0.433	1.303	1.319	0.550
26	0.857	0.868	0.751	0.866	0.867	0.826
27	1.173	1.215	0.779	1.231	1.245	0.688
28	1.025	1.057	0.722	1.062	1.064	0.963

Appendix 6

The Change of Output of MDR and ROV When Changing on Output of Agriculture Sector of MDR Region

Sector	Change on output of MDR	Change on output of ROV region	Change on output of national
1	-5.00	-2.99	-4.80
2	0.00	-3.49	-0.01
3	0.00	-2.98	-0.02
4	-3.41	-3.32	-3.41
5	-2.93	-2.90	-2.92
6	-4.13	-3.83	-4.10
7	-1.00	-0.81	-0.91
8	-3.76	-3.40	-3.74
9	-3.34	-3.30	-3.34
10	-4.11	-3.71	-4.08
11	-3.42	-3.38	-3.41
12	-3.83	-3.65	-3.81
13	-3.58	-3.23	-3.57
14	-3.80	-3.25	-3.78
15	-3.36	-3.30	-3.36
16	-3.45	-3.33	-3.44
17	-3.53	-3.41	-3.52

18	-3.84	-3.65	-3.81
19	-3.93	-3.34	-3.91
20	-3.94	-3.45	-3.91
21	-3.93	-3.34	-3.90
22	-3.77	-3.34	-3.74
23	-4.12	-3.63	-4.09
24	-3.67	-3.28	-3.64
25	-3.51	-3.36	-3.49
26	-4.23	-3.53	-4.20
27	-3.84	-3.47	-3.80
28	-4.07	-3.32	-4.01
GVA	**-3.34**	**-3.17**	**-3.24**

Analyzing the Northern Key Economic Region of Vietnam and Rest of Vietnam Based on Interregional Input - Output Model

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Nguyen Hong Nhung[1]
Nguyen Viet Phong[2]
Nguyen Quang Thai[3]
Bui Trinh[4]

[1,3,4]*Development Research Institute, Vietnam.*
[1]*Email: hongnhung.ulsa@gmail.com Tel: 0084969066999*
[3]*Email: thai.nguyenquang@gmail.com Tel: 0084902045209*
[4]*Email: buitrinhcan@gmail.com Tel: 0084939198586*
[2]*General Statistics Office, Vietnam.*
[4]*Email: nguyenvietphong300@gmail.com Tel: 0084983053054*

ABSTRACT

This study focuses on analyzing the relationship of the Northern Key Economic Region (NKER) and the Rest of Vietnam (ROV) region on the basis of using the Interregional Input – Output table in 2012 and 2016. Some findings show the important effects of the Northern Key Economic Region of Vietnam to Rest of Vietnam region, as well as some policy suggestions on developing key economic regions of Vietnam in the coming time. This study shows that the Northern Key Economic Region is more efficient than the Rest of Vietnam and maintains this trend during 2012 (representing the 2010-2014 period) compared to the year 2016 (representing the 2015-2019 period). The Northern Key Economic Region has effectively used inputs from products in the region, reducing the consumption coefficient of products from the Rest of Vietnam and importing them. This study applied the ideas on internal and external matrix multilpiers in order to analyze the linkages on multilpier effects interregional feedback effects and spillover effects of NKER and ROV of Vietnam based on the Vietnam Input - Output tables, 2012 and 2016.

Keywords: *Input-output tables and analysis, Regional tata, Input-output models, General regional economics, Economic development, Economic methodology.*
JEL Classification: *D57; R10; C67; R19; O00; B40.*

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Highlights of this paper

- The Northern Key Economic Region changed the value added structure in gross output in a positive and better direction than the Rest of Vietnam.
- The products of Northern Key Economic Region participated in the value chain of the final product much more than the products of the rest of Vietnam.
- There is no strong connection between Northern Key Economic Region and Rest of Vietnam when intermediate costs are still mainly used locally.

1. INTRODUCTION

During the development of Vietnam, due to differences in natural, economic and social conditions, uneven development took place. Economic output per capita in urban areas is at least 2 times higher than in rural areas. In order to create favorable conditions to focus on the development of "growth poles" in Vietnam, there are four key economic zones such as Northern key economic region, Central, Southern and Mekong Delta region. This study attempts to analyze and give an overview of the linkage between the Northen key economic region of Vietnam the Rest of Vietnam. The Northern key economic region has 7 provinces and cities in total of 63 provinces and cities inVietnam such as Hanoi, HaiPhong, QuangNinh (the region's core), HaiDuong, HungYen, BacNinh and VinhPhuc. This research used the Vietnam Interregional Input – Output tables, 2012 and 2016 with 23 sectors Appendix 1.

In the development of economic – wide model, the initial addition to Leontief (1936; 1941) has been viewed social accounting matrix with Stone (1955). A parallel development was proposed and implemented by Miyazawa (1960; 1966; 1968; 1971) on demographic – economic model and explanation on internal and external in interregional input – output model. However, his contributions were not widely appreciated outside Japan, his research caught the attention by modelers in regional science until he published his research on input – output analysis and the structure of income distribution in 1976.

Miyazawa's contributions are the notions of internal and external multipliers in explanation the role of interregional trade between this region and other regions. Miyazawa's research provides a missing linkage in the typologies that have been developed outside of region economic analysis. Until now, Miyazawa's contributions havebecome more common features of regional analysis. After that, Batey and Madden (1983) developed to multi – interregional model like multi – intersectoral issues. The structure of interregional linkages has been common topics of discussion in regional analysis. The main of this problem is interregional feedback effects; they show the change of one region has the capacity to influence activity levels in another region that, in turn, will affect activity back in the region of origin. Bui *et al.* (2005) applied an interregional I-O model on a case study of HoChiMinh City and the Rest of Vietnam. Harris *et al.* (1998) separated the Lincoln County into the Caliente area and the rest of Lincoln County. Following procedures outlined by Robison (1997); Holland (1991) and Robison and Lahr (1993); Harris *et al.* (1998) used an inter-regional model to give local decision makers an idea of potential socio-economic and fiscal impacts from changes in local economic activity.

Recently, there are some researches on interregional analysis in Vietnam such as Trinh (2017) on three regions of Vietnam, Tung Nguyen, Nguyen *et al.* (2018) on Mekong Delta region and rest of Vietnam.

Data Soureces: The Vietnam interregional input-output tables, 2012 and 2016 was compiled based on intra – input – output tables and national input – output tables, these intra – input – output table was developed to interregional input – output tables by using simple location quote (SLQ) method. The SLQ approach assumes that the needs of region R for output i in each industry relative to the needs for output i in each of these industries nationally (Trinh, 2016).

2. METHODOLOGY

Miyazawa suggested an innovative way of petitioning the system of regions that resulted in the identification of what are now referred to as internal and external multipliers.

Consider a two regions input – output system, the direct input coefficient matrix A divided by sub-matrixes as follow:

$$A = \begin{bmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{bmatrix}$$

Where: A_{11}, A_{22} are direct input coefficient matrices within region 1 and region 2; A_{12} and A_{21} are direct input coefficient sub-matrices that purchased by another region and vice versa, these off-diagonal sub-matrices may be viewed as "pull" or "push" linkage with the other region (Sonis, 1980).

Put Matrix Leontief inverse $B = (I - A)^{-1}$

Matrix B is also divided to sub-matrices as follow:

$$B = \begin{bmatrix} B_{11} & B_{12} \\ B_{21} & B_{22} \end{bmatrix}$$

The method used here is a variant of well-know block form associated with the Gauss - Fourier- Jordan elimination method (Gantmacher, 1959). Miyazawa defined B11 and B22 include *external and internal matrices multipliers*. The internal matrix multiplier for region 1, 2 was defined as below:

$$B_1 = (I - A_{11})^{-1} \quad \text{(Formular 1)}$$

$$B_2 = (I - A_{22})^{-1} \quad \text{(Formular 2)}$$

In Equation 1 and 2 B_1 and B_2 are multiplier effects, these includes direct and indirect impacts on output of a unit final demand of products in intra – region. Follow defined of Miyazawa Bii = *External multiplier x Internal multiplier*.

In principle, Call C_1 and C_2 are external multipliers of region 1 and 2, we have:

$$C_1 = B_{11}.(I - A_{11})^{-1} \quad \text{(Formular 3)}$$

$$C_2 = B_{22}.(I - A_{22})^{-1} \quad \text{(Formular 4)}$$

C_1 and C_2 may be interpreted as external multipliers of first region under the influence of the input from the second region and is equal to the internal multipliers of first region premultiplied by the external multiplier for first region. B_{11} and B_{22} are external multipliers of first and second regions.

B_{21} is sub – matrix as spillover effects to second region that induced by final products of first region.

B_{12} is sub – matrix as spillover effects to first region that induced by final products of second region.

Call gross output of region 1 is X_1 and gross output of region 2 is X_2, these means the output of regions 1 and 2 were created by final demand of region 1 and region 2 as follow:

$$X=\begin{bmatrix} X_1 \\ X_2 \end{bmatrix} = B.\begin{bmatrix} Y_{11} & Y_{12} \\ Y_{21} & Y_{22} \end{bmatrix} = \begin{bmatrix} B_{11}.Y_{11}+B_{12}.Y_{21} & B_{12}.Y_{22}+B_{11}.Y_{12} \\ B_{21}.Y_{11}+B_{22}.Y_{21} & B_{22}Y_{22}+B_{21}.Y_{12} \end{bmatrix} \quad \text{(Formular 5)}$$

Or:

$$X=\begin{bmatrix} X_1 \\ X_2 \end{bmatrix} = \begin{bmatrix} X_{11} & X_{12} \\ X_{21} & X_{22} \end{bmatrix} = \begin{bmatrix} B_{11}.Y_{11}+B_{12}.Y_{21} & B_{12}.Y_{22}+B_{11}.Y_{12} \\ B_{21}.Y_{11}+B_{22}.Y_{21} & B_{22}Y_{22}+B_{21}.Y_{12} \end{bmatrix} \quad \text{(Formular 6)}$$

In Equation 6 shows X_{11} is output of region 1 that created by final demand of region 1 (including products of region 1 and product of region 2, when region 1 used product of region 2 will induce to production of region 2, in processing production of region 2 used products of region 1 as intermediate input), X_{21} is output of region 2 that created when region 1 used products of region 2 and spillover effects to region 2 when used products of region 1.The same for X_{22} and X_{12}.

In order to considerate the relation between region 1 and region 2, we have:

$$X_1 = (I - A_{11})^{-1}.A_{12}.X2 \quad \text{(Formular 7)}$$

$$X_2 = (I - A_{22})^{-1}.A21.X1 \quad \text{(Formular 8)}$$

The interregional input – output framework was extended to demographic – economic model for consumption columns and row incomes:

$$T=\begin{bmatrix} A & C \\ V & 0 \end{bmatrix} \quad \text{(Formular 9)}$$

Where: A is block matrix of direct input coefficients, V is matrix of income (or values added) ratios and C is corresponding matrix of consumption ratios by type of household. Applying M is Miyazawa's ideas yields:C.

$$(I-T)^{-1} =. \begin{bmatrix} \Delta & \Delta C \\ V\Delta & I+V\Delta C \end{bmatrix} \quad \text{(Formular10)}$$

Where: $\Delta = (I - A - -CV)-1$ is an enlarge Leontief inverse matrix, ΔC is a matrix production induced by consumption, $V\Delta$ is matrix of income earned from production and $(I + V\Delta C)$ is production income requirement for final expenditure.

3. EMPIRICAL RESULTS

Assume that the interregional input-output table in 2012 represents the period 2010 - 2014 and the interregional input-output table in 2016 represents the period 2015 - 2020.

The ratio of intermediate costs in the production value of the Northern Key Economic Region (NKER) has not changed much (in the period of 2010 - 2014 is 69.2% and the period of 2015 - 2020 is 69.5%). This rate is higher

than the average of Vietnam in the period of 2010 - 2014 (64.2%), but lower than the period of 2015-2020 (72.0%). This shows that the Northern Key Economic Region had a input structural change in order to make on value added more effectively.

Interestingly, the Northern Key Economic Region has a higher rate of domestic product use more than the Rest of Vietnam, (46.4% compared to 29.7%) in the period of 2010-2014 and this region also used domestically produced products for intermediate cost quite high (61.6% in the period of 2010 - 2014 and 62.7% in the period of 2015-2020) compared to the Rest of the Vietnam (36.3% for the 2010-2014 and 46.2% for the 2015-2020), this leads to imports for production of NKER's much lower than the Rest of Vietnam (7,6% compared with 25.7% in the period of 2010-2014 and 6.8% compared to 24.6% in the period of 2015-2020) Table 1.

Table-1. Coefficient of intermediate input, value added in gross input of northern key economic region (NKER) and Rest of Vietnam (ROV).

Unit: %

		NKER	ROV	Vietnam
I. 2010- 2014				
Intermediate input	NKER	46.4	6.6	18.8
	ROV	15.2	29.7	25.2
	ROW	7.6	25.7	20.1
Total intermediate input		69.2	62.0	64.2
Gross value added		30.8	38.0	35.8
Gross input		100.0	100.0	100.0
II. 2015-2020				
Intermediate input	NKER	48.1	4.7	15.5
	ROV	14.6	43.5	36.3
	ROW	6.8	24.6	20.2
Total intermediate input		69.5	72.8	72.0
Gross value added		30.5	27.2	28.0
Gross input		100.0	100.0	100.0

Source: Author's calculations from the inter-regional IO tables, 2012 and 2016.

Table 2 shows that the contribution of total intermediate input of Northern Key Economic Region in 2015-2020 was 23,9% in the whole country, lower than that of 2010-2014 is 33,0%, but effective contribution to value added increased (26,4% in 2010-2014; 27,0% in 2015-2020). The contribution to the intermediate cost ratio of ROV has increased in these 2 periods (in 2010-2014 was 67,0%; in 2015-2020 was 76,1%), but the contribution to the value added was not corresponding changes (73,6% in 2010-2014; 73,0% in 2015-2020). At the same time, gross output structure of 7 provinces in the total gross output also decreased by 6,1 percentage points (30,8% in 2010-2014 and 24,8% in 2015-2020). This shows that the production efficiency of the Northern KeyEconomic Region is better than the Rest of Vietnam.

In terms of the structure of domestic intermediate input in the two periods (2010 - 2014, 2015 - 2020),two regions showed the structure of using local products and using products of other regions in two regions of Vietnam have changed a little bit, this rate in the Northern Key Economic Region increased by 1.4% (from 75.4% to 76.7%). This implies that the Northern Key Economic Region has not yet had a strong connection to the Rest of Vietnam and intermediate costs are still mainly used locally. In the opposite site, the rate of intermedate costs of ROV used by ROV and the use of products of the Northern Key Economic Region is quite big. In the period of 2010 - 2014, ROV usedthemself's products is 81.7%, but in the period of 2015 - 2020, this rate increased to 90.2%.The rate of ROV's intermediate costs used by NKER in the period of 2010 - 2014 was 18.3%, and decreased down to 9.8% in the period of 2015-2020. Both of the above results showed that the connection between the two regions is worse with time Table 3.

Table-2. Structure change of northern key economic region and ROV in Vietnam economy.

Unit: %

		Vietnam	NKER	ROV
I. 2010-2014				
Intermediate costs	NKER	100	75.5	24.5
	ROV	100	18.4	81.6
	ROW	100	11.6	88.4
Total Intermediate costs		100	33	67
GVA		100	26.4	73.6
Gross output		100	30.7	69.3
II. 2015-2020				
Intermediate costs	NKER	100	77.1	22.9
	ROV	100	10	90
	ROW	100	8.3	91.7
Total Intermediate costs		100	23.9	76.1
GVA		100	27	73
Gross output		100	24.8	75.2

Source: Author's calculations from the table of inter-regional IO 2012 and 2016.

Table-3. Structure of intermediate costs, final demand of the northern key economic region NKER and ROV in 2 periods.

Unit %

	Intermediate input			Final demand			GO
	Total	NKER	ROV	Total	NKER	ROV	
I. 2010 - 2014							
NKER	42.7	75.4	18.3	21.5	91.7	4.0	30.8
ROV	57.3	24.6	81.7	78.5	8.3	96.0	69.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
II. 2015 - 2020							
NKER	29.9	76.7	9.8	19.3	92.4	2.4	24.8
ROV	70.1	23.3	90.2	80.7	7.6	97.6	75.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Change							
NKER	-12.9	1.4	-8.5	-2.2	0.8	-1.6	-6.1
ROV	12.9	-1.4	8.5	2.2	-0.8	1.6	6.1

Source: Author's calculations from the table of inter-regional IO 2012 and 2016.

Table 4 showed the total effects of each region was decomposed to multipliers effects, interregional feedback effects and spillover effects. This may further clarify the intra-regional linkages and inter-regional linkages Appendix 2.

Analyzing 3 aggregate sectors ((1) Agriculture, Forestry and Fishery; (2) Mining, Manufacturing and Construction; and (3) Services) of Northern Key Economic Region in the two periods of 2010 - 2014 and 2015 - 2020, this showed the final demand of the Northern Key Economic Region induce impact to the production of the Rest of Vietnam better than the final demand of ROV spreading to the Northern Key Economic Region in all 3 sectors.

Table 5 showed the spread to the value added induced by one unit of the final demand: Comparison of the induced impacts of the final productsto the value added indicates that impacts of the Northern Key Economic Region is much higher than the Rest of Vietnam region in all 3 sectors. Specifically, in the period of 2015 - 2020, the spread to value added by the final demand unit of NKER of 0,757 times (Of which: Agriculture, Forestry and Fishery is 0,769; Manufacturing and Construction is 0,686; Service is 0,815). While the effect spreads to the value added by one unit of final demand of ROV of 0,591 times (Of which: Agriculture, Forestry and Fishery is 0,605; Manufacturing and Construction is 0,481: Service is 0,689).

Table-4. Impacts of NKER and ROV by 3 sectors.

Unit: Times

		Output requiremenents	In Which:		
			Multiplier effects	Interregional feed back effects	Spillover Effects
	I. 2010-2014				
	NKER				
1	Agriculture, Forestry, Fisheries	2.368	1.949	0.051	0.368
2	Manufacturing and Construction	2.518	1.950	0.071	0.498
3	Services	1.918	1.625	0.036	0.257
	ROV				
1	Agriculture, Forestry, Fisheries	1.734	1.516	0.042	0.176
2	Manufacturing and Construction	1.718	1.450	0.052	0.217
3	Services	1.435	1.309	0.023	0.102
	II. 2015-2020				
	NKER				
1	Agriculture, Forestry, Fisheries	2.441	1.951	0.043	0.446
2	Manufacturing and Construction	2.681	2.013	0.060	0.608
3	Services	2.091	1.716	0.034	0.341
	ROV				
1	Agriculture, Forestry, Fisheries	2.025	1.829	0.043	0.153
2	Manufacturing and Construction	2.047	1.803	0.054	0.189
3	Services	1.793	1.646	0.032	0.116

Source: Author's calculations from the table of inter-regional IO 2012 and 2016 (based on Formular 1 and 2 and 7 and 8).

Table-5. Influence effect on value added induced by one unit of final demand.

Unit: Times

		Value added induced by a unit final demand	Value added induced by final demand of intra-region	Value added induced by final demand of other region
I. 2010-2014				
NKER				
1	Agriculture, Forestry, Fisheries	0.762	0.639	0.123
2	Manufacturing and Construction	0.688	0.525	0.163
3	Services	0.834	0.747	0.087
ROV				
1	Agriculture, Forestry, Fisheries	0.684	0.635	0.049
2	Manufacturing and Construction	0.539	0.479	0.060
3	Services	0.781	0.751	0.030
II. 2015-2020				
NKER				
1	Agriculture, Forestry, Fisheries	0.769	0.659	0.111
2	Manufacturing and Construction	0.686	0.540	0.146
3	Services	0.815	0.732	0.083
ROV				
1	Agriculture, Forestry, Fisheries	0.605	0.562	0.042
2	Manufacturing and Construction	0.481	0.429	0.052
3	Services	0.689	0.656	0.034

Source: Author's calculations from the table of inter-regional IO 2012 and 2016 (based on Formular 10).

Interestingly, the final demand for products of the Northern Key Economic Region spread to the added value of the rest of Vietnam higher than the final demand of the rest of Vietnam spread to value added of the Northern Key Economic Region.

Table 6 showed the value added and production income induced by one unit of final demand of NKER higher than ROV at all 3 sectors These induced impacts tends to increase in the period of 2015 - 2020 compared to the period of 2010 – 2014 in both the Northern Key Economic Region and the Rest of Vietnam Region.

Table-6. Value added and production income multipliers.

Unit: Times

	2010-2014				2015-2020			
	NKER		ROV		NKER		ROV	
	Value added induced by a unit increase of final demand	Production income induced by a unit increase of final demand	Value added induced by a unit increase of final demand	Production income induced by a unit increase of final demand	Value added induced by a unit increase of final demand	Production income induced by a unit increase of final demand	Value added induced by a unit increase of final demand	Production income induced by a unit increase of final demand
Agriculture, forestry, fisheries	0.762	0.470	0.684	0.341	0.769	0.486	0.605	0.386
Industry and construction	0.688	0.363	0.539	0.226	0.686	0.388	0.481	0.271
Services	0.834	0.456	0.781	0.351	0.815	0.483	0.689	0.411

Source: Author's calculations from the table of inter-regional IO 2012 and 2016 (based on Formular 9 and 10).

Analyzing 23 sectors of the NKER Appendix 1 howed that there were many sectors which have good influence not only for the region but also for other regional production (ROV) such as: Fishing and products of processing and preserving fishing; Other food processing industry; Aquaculture; Other manufacturing and processing industries; Construction; Hotels and restaurants; Agriculture and agricultural services; Information and communication services.

This proved that the products of NKER deeply participated in the value chain of the final products effectively more than the products of the Rest of Vietnam. The NKER was more concentrated in industries such as Aaquaculture, Seafood processing, Transport, Hotel and Restaurant, Information and Communication services... It will stimulate and make the economy further growth Table 7.

Table 8 shows the spread of Gross Output to the income of NKER and ROV through 2 periods also shows:

NKER had a slight decrease in 2 periods compare with ROV for all 3 sectors. This result shows that NKER still maintains the spillover effect of Gross Output to income better than ROV.

The effect of Gross Output on NKER's income increased in Sector I (0,134 to 0,147) but decreased in Sector II (from 0,040 to 0,038) and Sector III (from 0,227 to 0,207). However, for ROV, there was a decrease in all 3 sectors (Sector I from 0,191 to 0,135; Sector II from 0,085 to 0,040 and Sector III to 0,287 to 0,190).

Table 9 shows that most of the factors of the final demand of the northern key economic region spread to the overall output more than the final demand of the rest of Vietnam. Esspecialy, the factors of the final demand of the northern key economic region have a greater spillover effects on the output of the rest of Vietnam than in the opposite direction.

Table-7. Multiplier effects, interregional feedback effects and spillover effects on the gross output of NKER.

Unit: Times

	Output requiremenents	In Which:			Average of Output requirements	In Which:		
		Multiplier effects	Interregional feed back effects	Spillover Effects		Average of Multiplier effects	Average of Interregional feed back effects	Average of Spillover Effects
Agriculture and agricultural services	2.395	1.977	0.037	0.382	1.074	1.094	0.994	0.985
Forestry	1.845	1.423	0.017	0.405	0.827	0.788	0.452	1.045
Fisheries	2.736	2.259	0.043	0.434	1.226	1.250	1.161	1.121
Mining	2.161	1.707	0.041	0.414	0.969	0.944	1.116	1.068
Fishing and products of processing and preserving fishing	3.302	2.879	0.038	0.385	1.480	1.593	1.027	0.995
Other food processing industry	3.066	2.584	0.041	0.441	1.374	1.430	1.120	1.138
Other manufacturing and processing industries	2.532	1.857	0.059	0.616	1.135	1.028	1.602	1.590
Production of electricity, gas, hot water, air conditioning, water, waste water and waste treatment	1.737	1.471	0.024	0.242	0.778	0.814	0.653	0.625
Construction	2.472	1.824	0.059	0.590	1.108	1.009	1.591	1.523
Trade	1.885	1.613	0.024	0.249	0.845	0.892	0.646	0.642
Passenger water transport	2.493	1.796	0.063	0.634	1.117	0.994	1.723	1.637
Freight Water transport	2.637	1.969	0.060	0.607	1.182	1.090	1.637	1.567
Other transportation and storage services	2.342	1.799	0.049	0.493	1.049	0.996	1.334	1.274
Postal and courier services	1.674	1.420	0.022	0.232	0.750	0.786	0.605	0.599
Hotel, restaurant	2.457	2.043	0.036	0.377	1.101	1.131	0.987	0.974
Information and communication services	2.366	1.902	0.042	0.422	1.060	1.052	1.130	1.091
Financial, Banking and insurance services	1.843	1.654	0.014	0.175	0.826	0.915	0.367	0.453
Real estate services	1.653	1.461	0.017	0.175	0.741	0.808	0.462	0.452
Other professional, scientific and technological services	1.928	1.617	0.028	0.283	0.864	0.895	0.756	0.731
Education and training services	1.632	1.423	0.019	0.191	0.732	0.787	0.509	0.492
Human Health services and social assistance	2.262	1.693	0.052	0.518	1.014	0.936	1.409	1.337
Art, entertainment and entertainment services	1.879	1.572	0.027	0.279	0.842	0.870	0.738	0.721
Other services	2.025	1.625	0.036	0.364	0.908	0.899	0.980	0.941

Source: Author's calculations from the table of inter-regional IO 2012 and 2016 (based on Formular 3 and 4 and 5).

Table-8. Production income multipliers of NKER and ROV.

Unit:%

	NKER			ROV		
	Agriculture, forestry and fisheries	**Industry and construction**	**Services**	**Agriculture, forestry and fisheries**	**Industry and construction**	**Services**
Production income induced by a unit increase of region final demand						
2010-2014 (times)	0.134	0.040	0.227	0.191	0.085	0.287
2015-2020 (times)	0.147	0.038	0.207	0.135	0.040	0.190
(2015-2020)compare with(2010-2014)(%)	9.4	-6.4	-9.1	-29.3	-53.2	-33.7

Source: Authors' calculations from the I-O table 2012 and 2016 (based on Formular 9).

Table-9. Output unduced by factor of final demand.

	NKER			ROV		
	C	I	E	C	I	E
Output induced by final demand	2.879	4.216	3.928	1.948	2.552	1.851
Output induced by final demand the products of intra-region	2.273	3.082	2.729	1.635	1.957	1.566
Output was spillover by final demand	0.606	1.134	1.198	0.313	0.594	0.285

Note: C: Final consumption, I: Gross capital formation, E: Export (based on Formular 6).

4. CONCLUSION AND DISCUSSION

The development efficiency of the Northern Key Economic Region had achieved some certain goals, was reflected in the following research results:

1. Better Change in value added: The Northern Key Economic Region changed the value added structure in gross output in a positive and better direction than the Rest of Vietnam.

2. Using more domestic products: The Northern Key Economic Region has a higher rate of using local products, making intermediate costs more than the Rest of Vietnam, and this region also uses domestically produced products to make intermediate costs quite high; and NKER has used imports to making input costs much lower than the Rest of Vietnam.

3. The efficiency production during 2 periods: Contributing to the total intermediate cost throughout Vietnam of the NKER in 2015-2020 was lower than 2010-2014, but the effective contribution to value added increased. This shows that the efficiency production of the NKER is better than the Rest of Vietnam.

4. Better change in 3 sectors during 2 periods: The overview of the development of 3 economic sectors during 2 periods (Agriculture, Forestry, Fisheries, Manufacturing and Construction; Services) showed a good influence to the economy. It is not only for the region but also for the production of the Rest of Vietnam.

5. The impact of the final product on the added value: The paper indicates that this effect of NKER is higher than the Rest of Vietnam in all 3 regions. This proves that the products of NKER participated in the value chain of the final product much more than the products of the rest of Vietnam.

Beside some positive aspects, the development of Key Economic Regions generally and Northern Key Economic Region particularly still show that there is no strong connection to the Rest of Vietnam when intermediate costs are still mainly used locally.

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Appendix-1. Sectors in interregional input – output table.

1	**Agriculture and agricultural services**
2	Forestry
3	Fisheries
4	Mining
5	Fishery and aquatic products processed and preserved
6	Other food processing industry
7	Other manufacturing and processing industries
8	Production of electricity, gas, hot water, air conditioning, water, waste water and waste treatment
9	Build
10	Trade
11	Passenger transport service
12	Waterway
13	Waterway freight service
14	Other warehousing services
15	Delivery postage
16	Hotel, restaurant
17	Information and communication services
18	Banking and insurance financial services
19	Real estate business services
20	Other professional, scientific and technological services
21	Education and training services
22	Health services and social assistance
23	Art, entertainment and entertainment services

Appendix-2. Mapping of 23 sectors into 3 sectors.

23 Sectors		**3 Sectors**	
No.	**Economic activities**	**No.**	**Economic activities**
1	Agriculture and agricultural services	1	Agriculture, forestry, fisheries
2	Forestry		
3	Fisheries		
4	Mining		
5	Fishery and aquatic products processed and preserved		
6	Other food processing industry	2	Industry and construction
7	Other manufacturing and processing industries		
8	Production of electricity, gas, hot water, air conditioning, water, waste water and waste treatment		
9	Construction		
10	Trade	3	Services
11	Passenger transport service		
12	Waterway		
13	Waterway freight service		
14	Other warehousing services		
15	Delivery postage		
16	Hotel, restaurant		
17	Information and communication services		
18	Banking and insurance financial services		
19	Real estate business services		
20	Other professional, scientific and technological services		
21	Education and training services		
22	Health services and social assistance		
23	Art, entertainment and entertainment services		

An interregional analysis between the four central provinces of Vietnam and the rest of Vietnam (ROV)

Bui Trinh

Vietnam development research institute, Association of Regional Econometrics and Environmental Studies (*AREES*))

Nguyen Quang Tung

Government Office of Vietnam

Kim Kwang Moon

Associate Professor, PhD at Kyoto University

Nguyen Viet Phong

General Statistics Office of Vietnam

Abstract

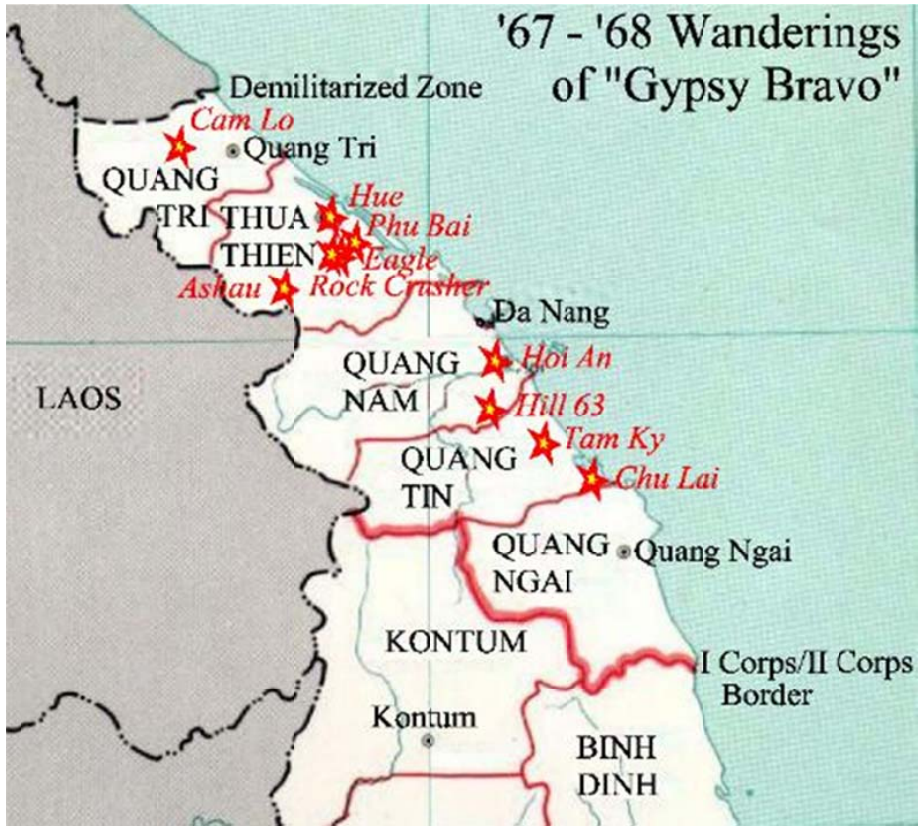
Leontief's input - output system has been developed into a inter-regional input - output model by Isard (1951); the idea of an inter-regional IO model has been documented by W. Richardson (1972) and Miyazawa K. (1976). is considered an important tool in the study of the regional economy. The inter-regional I-O model not only describes the inter-industrial relationship, but also describes interregional relationships through regional trade flows of this region and other regions and regional trade flows with foreign countries. The inter-regional model was developed by Chenery-Moses (also known as Chenery-Moses model) and Miller-Blair (1985). The science of regional economics is based on the application of the inter – regional input – output model formed in the late 60s and early 70s of the twentieth century. Since then it has been perfected and developed by many famous economists such as Miyazawa, M. Miller (1986); Sonis, Hewings (1998). The inter– regional input – output table has been used by many countries in the analysis of region economic structure, especially Japan used this model to evaluate the impact of the great Hanshin earthquake of 1995. This study uses interregional input – output frame that updated 2016 for of two regions: Central of Vietnam (Hue, Danang, Quangnam, Quangngai) of Vietnam and the rest of Vietnam (ROV) for finding interregional impacts and calculating some evaluation the impact of the storm .

Keywords: Interregional, input – output, region, output, value added, final demand

I. Introduction

Tropical storms frequently hit central Vietnam (it includes Hue, Danamg, Quangnam and Quangngai – Figure 1), typically the Xangsane storm outbreak in 2006, causing serious human and economic damage. This study attempted to use an inter-regional IO model to study the relationship between this region and the rest of Vietnam (ROV); thereby partially assessing not only disaster damage but also affecting other regions and also country

Figure 1. Four provinces Central Vietnam



Measurement of the final demandand, output, income and employment has been studied by economists. One of the useful studies was developed by J.M. Keynes on income and currency (1936). Then the National input – output model was developed by W. Leontief (1936, 1941) at the National level. The Leontief system was extended to regional research by Isard (1951), also known as the Isard model, and the ideas of the inter-regional I-O model were developed by Miyazawa (1976) and Richardson (1972), and are considered an essential tool. in scientific research on the region. The inter-regional input - output model shows not only inter-sectoral relationships but also inter-region relationships based on trade flow between this region and other regions. The inter-regional model was later developed by Chenery-Moses (also known as the Chenery / Moses-1955 model)

Inter-regional input - output models are also used to estimate the damages and losses by unscheduled events, such as earthquakes, flood, and other major natural disasters. Okuyama et al. (2002) applied a sequential inter-industry model to assess the impacts of the Great

Hanshin earthquake in such a way to enable transportation into the I-O framework. Other recent studies using the inter-regional I-O model include Allan et al. (2004), Zhang (2007), Patrick and Wang (2007), and Rey (1999)[1]

In recent contributions can be found in European countries such as Austria (Fritz et al. 2006), Finland (Piispala 2000), Italy (Benvenuti and Paniccià 2003), and Spain (Verdura 2000). In the Asian countries, the interregional input – output tables have been compiled and studied for some countries such as Japan (Ishikawa and Miyagi 2004), People's Republic of China (PRC) (Okamoto et al. 2005 and Okuda et a, 2004), Philippines (Secretario 1994 and Secretario et al. 2002), and Viet Nam (Secretario et al. 2003), Bui and Kim (2005), Bui (2017) Nguyen, V.P and Bui (2018).

In the inter-region model, Miyazawa succeeded in analyzing the Leontief inverse matrix into internal and external matrix multipliers in the input – output model, the concept of Miyazawa generalized. by Yamada and Takeo Ihara (1969), namely "the increase in input coefficients." The main purpose of this study was to show how to use inter-regional input – output framework and conventions in an effective way. Evaluate changes in spatial interactions due to regional trade. This article attempts to explain how to measure multiplier effects, inter-regional feedback effects, and spillover effects.

This study is based on the inter-regional input – output table between central Vietnam and the rest of Vietnam in 2016 with 28 sectors (Appendix 1).

The Vietnam National input – output table in 2016 was updated base on the Vietnam input – output table in 2012 and Vietnam enterprise survey in 2016 . The intra-input –output of central Vietnam in 2016 was updated base on intra - input - output table of central Vietnam in 2012 and data on gross output and intermediate input vectors was estimated base on Vietnam enterprise survey in 2016. The interregional input - output table was updated base Vietnam national input - output and intra - input - output tables in 2016 by SLQ method, T. Bui (2016).

II. General Model

Table 1. The interregional input - output model Isard type has format

			To:	Intermediate consumption			Final Demand			M	Gross output
				Region1	….	Region k	Region 1	….	Region k		
From				1 2 … j … n		1 2 … j … n	C G I E		C G I E		
I N T	R E G	1 : I		X^{11}	…. ….	X^{1k}	F^{11}	…. ….	F^{1k}	0	$X^{i.}$

[1] Research and Economic Analysis Division Department of Business, Economic Development and Tourism (2016) :The 2012 inter-county input – output study" State of Hawaii

INTERMED	1	1 : N		....			....			
	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:
	REG k	1 : I : N	X^{k1}	....	X^{kk8}	F^{k1}	....	F^{kk}	0	$X^{8.}$
	ROW	1 : I : N	X^{W1}	....	X^{Wk}	F^{W1}	....	F^{W8k}	F^{Wk}	0
		CE PT-S D OS	V^{P1}	....	V^{Pk}	0	....	0	0	GVA .
Gross input			$X^{.1}$	....	$X^{.8}$	$F^{.1}$	....	$F^{.8}$	(M)	

CE: Compensation of employees

PT-S: Indirect tax (exclude subsidies)

D:Depreciation

OS:Operating surplus

GVA: Gross value added

C:Household consumption

G:Government

I:Gross capital formation

E:Exports

M:Imports

And:

X^{ii}	domestic intermediate consumption of region i
X^{ij}	Intermediate input of region j used products of region i
F^{ii}	:Final demand of region i
F^{ij}	: Final demand of region j used products of region i
X^{Wi}	: Import of region i for intermediate input
F^{Wi}	:Imports for final demand of region i
(M)	: Total import (negatively)
V^{Pi}	: Value added of region i
$GVA^{.}$	:Gross Value Added
$F^{.ik}$	: Final demand of region k used products of region i

III. Methodology.

To analyze the inter-regional feedback effects and the degree to which change originating in one region has capacity to influence activity levels in another region, Bui, Kim and Francisco T Secretario. (2000) applied an interregional I-O model on a case study of HoChiMinh City and the rest of Vietnam. Harries et al. (1998) separated the Lincoln County into the Caliente area and the rest of Lincoln County. Following procedures outlined by Robinson (1997), Holland (1991), and Robinson and Lark (1993), Harries et al. (1998) used an inter-regional model to give local decision makers an idea of potential socio-economic and fiscal impacts from changes in local economic activity.

The inter-region input – output model is used to analyze economic impacts, describing on products flows between regions that allow estimation of the non-specific in a singleinput - output model.

Leontief's standard relationship is in the form as folow:

$$A.X + Y = X \qquad (1)$$

Where: A is a direct input coefficient matrix, X is vector of output, Y is a vector of final demand

In the interregional input – output analysis the matrix A was divided as:

$$A = \begin{bmatrix} A_{cc} & A_{cr} \\ A_{rc} & A_{rr} \end{bmatrix}$$

$$X = \begin{bmatrix} X_c \\ X_r \end{bmatrix}$$

$$\text{Và } Y = \begin{bmatrix} Y_{cc} & Y_{cr} \\ Y_{rc} & Y_{rr} \end{bmatrix}$$

Where: A_{ck} is sub-matrix that present region k used products of region c for intermediate input; X_c is vector gross output of region c and X_k is vector gross output of region k; Yck present final demand of region k use products of region c

Call $B = (I-A)^{-1}$

So we have X =B.Y

And

$$B = \begin{bmatrix} B_{cc} & B_{cr} \\ B_{rc} & B_{rr} \end{bmatrix}$$

In this case X is a mtrix of output that induced by each region final demand , X is defined

as follows:

$$X = \begin{bmatrix} B_{cc}.Ycc + Bcr.Yrc & B_{cr}.Yrr + Bcc.Ycr \\ B_{rc}.Ycc + Brr.Yrc & B_{rr}Yrr + Brc.Ycr \end{bmatrix}$$

Follow Miyazawa (1976) the matrix B can be divided as:

$Bcc = (I – Acc – Acr.(I – Acc)^{-1}.Arc)$

$Brr = (I – Arr – Arc..(I – Arr)^{-1}.Acr)$

$B_{cr} = B_{cc}.A_{cr}(I-A_{rr})^{-1}$

$B_{rc} = B_{rr}.A_{rc}(I – A_{cc})^{-1}$

In other words:

B_{cc} includes multipliers effects: $(I\text{-}Acc)^{-1}$ and interregional feedback effects: $Bcc + B_{rc}– (I\text{-}A_{cc})^{-1}$

B_{rc} present Spillover effects from region C to region R

In the case of research on a sector group in a region related to other sectors in the region and other region, the matrix A can be divided as follow::

$$A = \begin{bmatrix} A^{ii}_{cc} & A^{ij}_{cc} & A_{cr} \\ A^{ji}_{cc} & A^{jj}_{cc} & A_{cr} \\ A^{ij}_{rc} & A^{ij}_{rc} & A_{rr} \end{bmatrix}$$

And

$$X = \begin{bmatrix} X^{i}_{c} \\ X^{j}_{c} \\ X_{r} \end{bmatrix}$$

$$Y = \begin{bmatrix} Y^{i}_{cc} & Y^{i}_{cr} \\ Y^{j}_{cc} & Y^{j}_{cr} \\ Y_{rc} & Y_{rr} \end{bmatrix}$$

From equation (1) we have:

$X^{i}c = (I- A^{ii}_{CC})^{-1}.(A^{ii}_{cr}. X^{j}_{c} + A_{cr}.X_{r} + Y^{i}_{cc} + Y^{i}_{cr})$ (2)

$X^{j}_{c} = (I- A^{jj}_{cc})^{-1}.(A^{ji}_{cc}. X^{i}_{c} + A_{cr}.X_{r} + Y^{j}_{cr} + Y^{j}_{cr})$ (3)

$Xr = ((I-A^{ii}_{rr})^{-1}.(A^{NR}_{hk}.X^{R}_{c} + A_{rr}.X^{R} + Y_{rc} + Y_{rr})$ (4)

So, demand of i sector group in a region is not only depending final demand of those sector group but also depending production demand of other sectors in same region and other region.

Put: $v^{c}_{i} = V^{c}_{i}/X^{c}_{i}$

With: V^c_i is a vector value added of sector i, C region; X^c_i is a vector of output, C region

Rewrite follow matrx form, we have:

$$V = v.B.Y \quad (5)$$

Where:

$v= (v^c, v^r)$

$$v.B = (V_c.B_{cc}+V_r.B_{rc}, V_r.B_{rr} +V_cB_{cr}) \quad (6)$$

final demand of C region includes products that is produced by itself and the product is produced by region r; C region used products by itself will be induced to value added of C region: Vc.Bcc; and C region used products of R region will induced to value added of R region: Vr.Brc. Similar is the final demand of the R region.

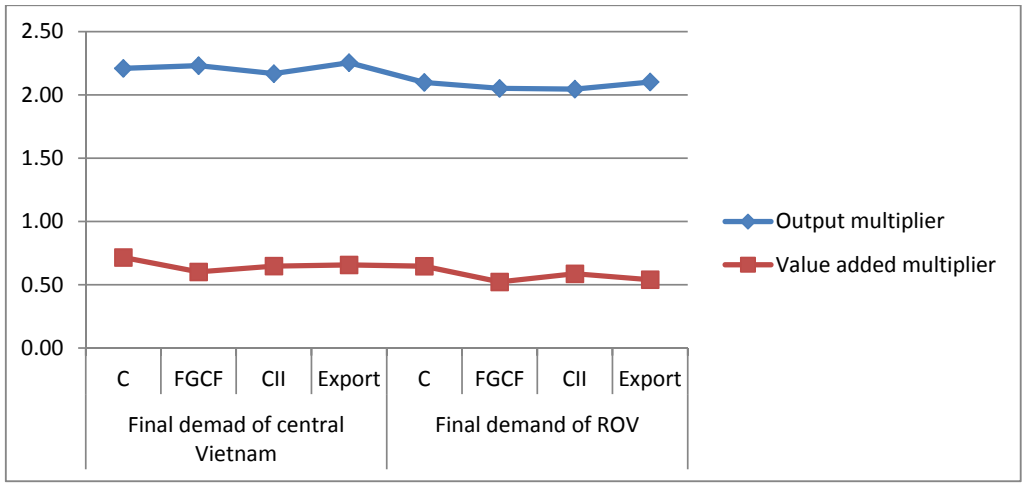
IV. Some findings

Appendixes 2 and 3 showed regarding average spillover effects for a unit final demand of central Vietnam region higher than this one of rest of Vietnam region, opposite, interregional feedback effects of ROV higher than central Vietnam region; that means production of central Vietnam stimulate production of ROV region more than production of ROV region stimulate production of central Vietnam region.Especially, sectors number 1,3,4, 5,7, 9, 10, 13 – 16, 20 of ROV has power on dispersion index higher than average on interregional feedback effects. Sectors number 1,2,3,4, 6,7, 10, 12 – 17, 20 has power of dispersion index higher than average on spillover feedback effects.

Appendix 4 showed final demand of central Vietnam region dose not only induced to high output, but also induced to high value added. Final demand of central Vietnam used products of rest of Vietnam induced to value added of rest of Vietnam higher than rest of Vietnam used products of central Viet Nam induced to value added of central Vietnam

Figure 2 showed final demand of central of Vietnam induced to output and value added better than final demand of ROV at all factors in final demand. Especially fixed gross capital formation and export of ROV induced to value added very low.

Figure 2. Output, value added induced by factors of final demand



C: Final consumption; FGCF: Fixed gross capital formation, CII: Change in inventory

Assume that central Vietnam region encountered the same typhoon as Typhoon Xangsane 2006, there are 11 directly affected sectors such as during Hurricane 2016 as follow::.

Table 3. 11 sectors direct influence by typhoon

	Sectors	Output change after typhoon
1	AGRICULTURE	-8.26
2	FORESTRY	-4.82
3	FISHING	-3.36
4	MANUFACTURE OF FOOD PRODUCTS	-1.43
5	MANUFACTURE OF TEXTILES, CLOTHING, FOOTWEAR & LEATHER GOODS	-2.60
6	MANUFACTURE OF FURNITURE & OTHER GOODS; REPAIR & INSTALLATION	-5.66
7	CONSTRUCTION	-9.54
8	WHOLESALE & RETAIL TRADE; REPAIR OF MOTOR VEHICLES & MOTORCYCLES	-3.84
9	TRANSPORTATION & STORAGE	-9.39
10	ACCOMMODATION & FOOD SERVICE ACTIVITIES	-10.96
11	REAL ESTATE ACTIVITIES	-4.93

Due to output of some sectors used as input of some other sectors, so, output of 11 sectors decreased, leading to the decrease on output of the remaining 17 sectors are 5.96% and gross value added decreased about 6.15% . The high indirectly affected industries are mining, processing of vegetables, non-metallic mineral products, machinery and equipment. Direct and indirect influences of region C presented in table 4 below:

Table 4. Influences of central Vietnam region by sectors

	Sectors	Change of output (%)
1	AGRICULTURE	-8.26
2	FORESTRY	-4.82
3	FISHING	-3.36
4	MANUFACTURE OF FOOD PRODUCTS	-1.43
5	MANUFACTURE OF TEXTILES, CLOTHING, FOOTWEAR & LEATHER GOODS	-2.60
6	MANUFACTURE OF FURNITURE & OTHER GOODS; REPAIR & INSTALLATION	-5.66
7	CONSTRUCTION	-9.54
8	WHOLESALE & RETAIL TRADE; REPAIR OF MOTOR VEHICLES & MOTORCYCLES	-3.84
9	TRANSPORTATION & STORAGE	-9.39
10	ACCOMMODATION & FOOD SERVICE ACTIVITIES	-10.96
11	REAL ESTATE ACTIVITIES	-4.93
12	MINING & QUARRYING	-0.59
13	MANUFACTURE OF BEVERAGES & TOBACCO	-3.07
14	MANUFACTURE OF WOOD, PAPER & RELATED PRODUCTS; PRINTING	-0.47
15	MANUFACTURE OF PETROLEUM, CHEMICAL, RUBBER & PLASTIC PRODUCTS	-2.60
16	MANUFACTURE OF NON-METALLIC MINERAL PRODUCTS	-2.89
17	MANUFACTURE OF METAL PRODUCTS, MACHINERY & EQUIPMENT	-1.59
18	ELECTRICITY	-0.25
19	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT & REMEDIATION ACTIVITIES	-1.36

20	INFORMATION & COMMUNICATIONS	-5.62
21	FINANCIAL & INSURANCE ACTIVITIES	-1.49
22	PROFESSIONAL, SCIENTIFIC & TECHNICAL ACTIVITIES	-3.32
23	ADMINISTRATIVE & SUPPORT SERVICE ACTIVITIES	-2.61
24	PUBLIC ADMINISTRATION & DEFENCE; COMPULSORY SOCIAL SECURITY	-4.70
25	EDUCATION	-5.62
26	HUMAN HEALTH & SOCIAL WORK ACTIVITIES	-5.93
27	ARTS, ENTERTAINMENT & RECREATION	-1.94
28	OTHER SERVICE ACTIVITIES	-3.39
	Gross output	-3.83
	Gross Value added (GVA)	-4.01
	Share of Labor	-3,64
	Share of Capital	-5,27
	Labor force	-1,79

Due to the trade relations between regions, the product of this region is the intermediate input of other regions, so all sectors of the region do not directly affect the storm also be reduced production, as in the table 5 below.

Table5. Influence spreads to the rest of Vietnam (ROV)

	Sectors	Change of output (%)
1	AGRICULTURE	-0.31
2	FORESTRY	-2.69
3	FISHING	-1.59
4	MANUFACTURE OF FOOD PRODUCTS	-1.73
5	MANUFACTURE OF TEXTILES, CLOTHING, FOOTWEAR & LEATHER GOODS	-2.89
6	MANUFACTURE OF FURNITURE & OTHER GOODS; REPAIR & INSTALLATION	-1.93
7	CONSTRUCTION	-2.28
8	WHOLESALE & RETAIL TRADE; REPAIR OF MOTOR VEHICLES & MOTORCYCLES	-2.92
9	TRANSPORTATION & STORAGE	-1.74

10	ACCOMMODATION & FOOD SERVICE ACTIVITIES	-2.06
11	REAL ESTATE ACTIVITIES	-2.58
12	MINING & QUARRYING	-2.77
13	MANUFACTURE OF BEVERAGES & TOBACCO	-0.34
14	MANUFACTURE OF WOOD, PAPER & RELATED PRODUCTS; PRINTING	-2.88
15	MANUFACTURE OF PETROLEUM, CHEMICAL, RUBBER & PLASTIC PRODUCTS	-1.98
16	MANUFACTURE OF NON-METALLIC MINERAL PRODUCTS	-0.82
17	MANUFACTURE OF METAL PRODUCTS, MACHINERY & EQUIPMENT	-3.00
18	ELECTRICITY	-1.43
19	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT & REMEDIATION ACTIVITIES	-2.31
20	INFORMATION & COMMUNICATIONS	-2.55
21	FINANCIAL & INSURANCE ACTIVITIES	-1.91
22	PROFESSIONAL, SCIENTIFIC & TECHNICAL ACTIVITIES	-1.74
23	ADMINISTRATIVE & SUPPORT SERVICE ACTIVITIES	-2.61
24	PUBLIC ADMINISTRATION & DEFENCE; COMPULSORY SOCIAL SECURITY	-2.73
25	EDUCATION	-2.77
26	HUMAN HEALTH & SOCIAL WORK ACTIVITIES	-3.55
27	ARTS, ENTERTAINMENT & RECREATION	-2.69
28	OTHER SERVICE ACTIVITIES	-3.49
	Gross output	-2.15
	Gross Value added (GVA)	-2.31
	Share of Labor	-1,76
	Share of Capital	-2,84
	Labor force	-0,31

V. Conclusions

Although the central region of Vietnam has ratios on gross output and gross value added compare with Vietnam economy are only about 2% (gross output: 1.9 and GVA: 2.1), but the final demand of this region dose not only strong stimulate to output and value added of this region but also to other regions (Appendix 5). This shows that the product flow of central Vietnam to ROV crude than the product flow of ROV to central Vietnam

Almost the elements of the ultimate demand of central Vietnam better spread to output and income, especially, final consumption of central Vietnam spills over to income higher than final consumption of ROV pretty much

The export of the ROV sector spreads very low to income.

This indicates that the level of outsourcing of ROV is higher than central Vietnam region. When central Vietnam is hit by natural disasters; it will be not only bring with it the economic decline but also of leading to the economic downturn in the country. With direct effect as shown in Table 3, GDP of the country decreased -2.35%, income of workers decreased -1.78%, capital income decreased -2.92%

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APPENDIX 1

1	AGRICULTURE
2	FORESTRY
3	FISHING
4	MANUFACTURE OF FOOD PRODUCTS
5	MANUFACTURE OF TEXTILES, CLOTHING, FOOTWEAR & LEATHER GOODS
6	MANUFACTURE OF FURNITURE & OTHER GOODS; REPAIR & INSTALLATION
7	CONSTRUCTION
8	WHOLESALE & RETAIL TRADE; REPAIR OF MOTOR VEHICLES & MOTORCYCLES
9	TRANSPORTATION & STORAGE
10	ACCOMMODATION & FOOD SERVICE ACTIVITIES
11	REAL ESTATE ACTIVITIES

12	MINING & QUARRYING
13	MANUFACTURE OF BEVERAGES & TOBACCO
14	MANUFACTURE OF WOOD, PAPER & RELATED PRODUCTS; PRINTING
15	MANUFACTURE OF PETROLEUM, CHEMICAL, RUBBER & PLASTIC PRODUCTS
16	MANUFACTURE OF NON-METALLIC MINERAL PRODUCTS
17	MANUFACTURE OF METAL PRODUCTS, MACHINERY & EQUIPMENT
18	ELECTRICITY
19	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT & REMEDIATION ACTIVITIES
20	INFORMATION & COMMUNICATIONS
21	FINANCIAL & INSURANCE ACTIVITIES
22	PROFESSIONAL, SCIENTIFIC & TECHNICAL ACTIVITIES
23	ADMINISTRATIVE & SUPPORT SERVICE ACTIVITIES
24	PUBLIC ADMINISTRATION & DEFENCE; COMPULSORY SOCIAL SECURITY
25	EDUCATION
26	HUMAN HEALTH & SOCIAL WORK ACTIVITIES
27	ARTS, ENTERTAINMENT & RECREATION
28	OTHER SERVICE ACTIVITIES

Appendix 2. Interregional multipliers of four provinces region

		4 provinces Region							
			In Which:				In Which:		
		Output requirements	Multiplier effects	Interregional feed back effects	Spillover Effects	Average of Output requirements	Average of Multiplier effects	Average of Interregional feedback effects	Average of Spillover Effects
1	AGRICULTURE	2.291	2.018	0.0010	0.272	1.1068	1.1141	1.0132	1.0555
2	FORESTRY	1.819	1.420	0.0007	0.398	0.8786	0.7838	0.6907	1.5445
3	FISHING	2.595	2.286	0.0012	0.308	1.2534	1.2620	1.1906	1.1933
4	MANUFACTURE OF FOOD PRODUCTS	3.169	2.747	0.0015	0.420	1.5310	1.5169	1.5859	1.6298

5	MANUFACTURE OF TEXTILES, CLOTHING, FOOTWEAR & LEATHER GOODS	1.982	1.815	0.0007	0.167	0.9577	1.0020	0.7323	0.6474
6	MANUFACTURE OF FURNITURE & OTHER GOODS; REPAIR & INSTALLATION	2.302	1.863	0.0013	0.438	1.1121	1.0286	1.2898	1.6979
7	CONSTRUCTION	2.289	1.945	0.0017	0.342	1.1057	1.0738	1.7158	1.3272
8	WHOLESALE & RETAIL TRADE; REPAIR OF MOTOR VEHICLES & MOTORCYCLES	1.790	1.639	0.0006	0.150	0.8648	0.9051	0.6178	0.5825
9	TRANSPORTATION & STORAGE	2.095	1.861	0.0008	0.233	1.0122	1.0278	0.8416	0.9037
10	ACCOMMODATION & FOOD SERVICE ACTIVITIES	2.381	2.101	0.0010	0.279	1.1502	1.1601	1.0444	1.0809
11	REAL ESTATE ACTIVITIES	1.611	1.507	0.0004	0.103	0.7781	0.8321	0.4393	0.4001
12	MINING & QUARRYING	1.928	1.648	0.0014	0.278	0.9312	0.9102	1.3871	1.0771
13	MANUFACTURE OF BEVERAGES & TOBACCO	2.239	1.959	0.0011	0.279	1.0816	1.0815	1.1571	1.0819
14	MANUFACTURE OF WOOD, PAPER & RELATED PRODUCTS; PRINTING	2.574	2.058	0.0009	0.515	1.2436	1.1366	0.9386	1.9966
15	MANUFACTURE OF PETROLEUM, CHEMICAL, RUBBER & PLASTIC PRODUCTS	2.332	2.013	0.0011	0.317	1.1265	1.1117	1.1692	1.2300
16	MANUFACTURE OF NON-METALLIC MINERAL PRODUCTS	2.301	2.012	0.0011	0.288	1.1118	1.1112	1.1677	1.1162
17	MANUFACTURE OF METAL PRODUCTS, MACHINERY & EQUIPMENT	2.153	1.728	0.0025	0.423	1.0403	0.9541	2.5359	1.6401
18	ELECTRICITY	1.596	1.425	0.0008	0.170	0.7709	0.7870	0.8341	0.6575
19	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT & REMEDIATION ACTIVITIES	1.824	1.639	0.0007	0.184	0.8813	0.9050	0.7596	0.7152
20	INFORMATION & COMMUNICATIONS	2.163	1.884	0.0015	0.278	1.0451	1.0404	1.4900	1.0768
21	FINANCIAL & INSURANCE ACTIVITIES	1.807	1.675	0.0004	0.132	0.8729	0.9248	0.3982	0.5109

22	PROFESSIONAL, SCIENTIFIC & TECHNICAL ACTIVITIES	1.927	1.731	0.0009	0.195	0.9308	0.9558	0.9491	0.7552
23	ADMINISTRATIVE & SUPPORT SERVICE ACTIVITIES	1.902	1.699	0.0008	0.202	0.9189	0.9382	0.8023	0.7837
24	PUBLIC ADMINISTRATION &DEFENCE; COMPULSORY SOCIAL SECURITY	1.650	1.508	0.0006	0.142	0.7973	0.8327	0.5856	0.5492
25	EDUCATION	1.557	1.441	0.0005	0.116	0.7523	0.7957	0.4744	0.4486
26	HUMAN HEALTH & SOCIAL WORK ACTIVITIES	1.946	1.726	0.0008	0.219	0.9400	0.9528	0.7913	0.8508
27	ARTS, ENTERTAINMENT & RECREATION	1.877	1.705	0.0005	0.172	0.9070	0.9417	0.4862	0.6650
28	OTHER SERVICE ACTIVITIES	1.859	1.656	0.0009	0.202	0.8979	0.9143	0.9121	0.7825
	Average	**2.070**	**1.811**	**0.001**	**0.258**				

Appendix 3. Interregional multipliers of Rest of Vietnam

		Rest of Vietnam (ROV)							
			In Which:				In Which:		
		Output requirements	Multiplier effects	Interregional feedback effects	Spillover Effects	Average ofOutput requirements	Average of Multiplier effects	Average of Interregional feedback effects	Average of Spillover Effects
1	AGRICULTURE	2.186	2.018	0.161	0.007	1.1266	1.1141	1.3569	1.1046
2	FORESTRY	1.492	1.420	0.070	0.002	0.7687	0.7838	0.5904	0.2795
3	FISHING	2.499	2.286	0.202	0.011	1.2878	1.2620	1.7024	1.6905
4	MANUFACTURE OF FOOD PRODUCTS	2.953	2.747	0.193	0.012	1.5217	1.5169	1.6261	1.8885
5	MANUFACTURE OF TEXTILES, CLOTHING, FOOTWEAR & LEATHER GOODS	1.962	1.815	0.137	0.011	1.0113	1.0020	1.1532	1.6221
6	MANUFACTURE OF FURNITURE & OTHER GOODS; REPAIR & INSTALLATION	1.985	1.863	0.116	0.006	1.0232	1.0286	0.9782	0.9685
7	CONSTRUCTION	2.099	1.945	0.144	0.010	1.0818	1.0738	1.2141	1.5430

8	WHOLESALE & RETAIL TRADE; REPAIR OF MOTOR VEHICLES & MOTORCYCLES	1.752	1.639	0.108	0.005	0.9026	0.9051	0.9055	0.7151
9	TRANSPORTATION & STORAGE	1.992	1.861	0.124	0.007	1.0268	1.0278	1.0425	1.1052
10	ACCOMMODATION & FOOD SERVICE ACTIVITIES	2.285	2.101	0.175	0.009	1.1777	1.1601	1.4742	1.3842
11	REAL ESTATE ACTIVITIES	1.627	1.507	0.117	0.003	0.8386	0.8321	0.9827	0.5306
12	MINING & QUARRYING	1.758	1.648	0.103	0.006	0.9060	0.9102	0.8691	0.9932
13	MANUFACTURE OF BEVERAGES & TOBACCO	2.115	1.959	0.150	0.007	1.0901	1.0815	1.2590	1.0813
14	MANUFACTURE OF WOOD, PAPER & RELATED PRODUCTS; PRINTING	2.187	2.058	0.124	0.004	1.1270	1.1366	1.0469	0.6085
15	MANUFACTURE OF PETROLEUM, CHEMICAL, RUBBER & PLASTIC PRODUCTS	2.144	2.013	0.124	0.006	1.1048	1.1117	1.0458	0.9156
16	MANUFACTURE OF NON-METALLIC MINERAL PRODUCTS	2.141	2.012	0.122	0.007	1.1033	1.1112	1.0221	1.0794
17	MANUFACTURE OF METAL PRODUCTS, MACHINERY & EQUIPMENT	1.844	1.728	0.104	0.012	0.9501	0.9541	0.8743	1.8134
18	ELECTRICITY	1.508	1.425	0.079	0.004	0.7773	0.7870	0.6617	0.6580
19	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT & REMEDIATION ACTIVITIES	1.747	1.639	0.103	0.005	0.9004	0.9050	0.8652	0.8204
20	INFORMATION & COMMUNICATIONS	2.021	1.884	0.129	0.007	1.0415	1.0404	1.0878	1.1518
21	FINANCIAL & INSURANCE ACTIVITIES	1.776	1.675	0.098	0.003	0.9152	0.9248	0.8229	0.4855
22	PROFESSIONAL, SCIENTIFIC & TECHNICAL ACTIVITIES	1.855	1.731	0.118	0.006	0.9557	0.9558	0.9901	0.8935
23	ADMINISTRATIVE & SUPPORT SERVICE ACTIVITIES	1.823	1.699	0.117	0.007	0.9397	0.9382	0.9871	1.0570
24	PUBLIC ADMINISTRATION & DEFENCE; COMPULSORY SOCIAL SECURITY	1.616	1.508	0.103	0.005	0.8326	0.8327	0.8639	0.7305
25	EDUCATION	1.532	1.441	0.087	0.004	0.7894	0.7957	0.7336	0.5451

26	HUMAN HEALTH & SOCIAL WORK ACTIVITIES	1.847	1.726	0.116	0.005	0.9518	0.9528	0.9762	0.8188
27	ARTS, ENTERTAINMENT &RECREATION	1.812	1.705	0.103	0.004	0.9339	0.9417	0.8679	0.5668
28	OTHER SERVICE ACTIVITIES	1.774	1.656		0.006	0.9143	0.9143	0.0000	0.9493
	Average	**1.940**	**1.811**	**0.119**	**0.006**				

Appendix 4. Value added in interregional input – output analysis

	Value added inducd by a unit increase of C region final demand(Vc.Bcc + Vr.Brc)			Value added inducd by a unit increase of R region final demand (Vr.Brr = Vc.Bcr)		
	Total impacts of C region final demand	Value added receipted by region C(Vc.Bcc)	Value added receipted by region R(Vr.Brc)	Total impacts of R region final demand	Value added receipted by region R(Vr.Brr)	Value added receipted by region C(Vc.Bcr)
1	**0.743**	0.672	0.071	**0.662**	0.660	0.002
2	**0.819**	0.658	0.161	**0.638**	0.638	0.000
3	**0.664**	0.590	0.074	**0.588**	0.585	0.003
4	**0.717**	0.609	0.108	**0.602**	0.599	0.003
5	**0.560**	0.516	0.044	**0.512**	0.509	0.003
6	**0.652**	0.503	0.149	**0.492**	0.490	0.002
7	**0.631**	0.544	0.087	**0.540**	0.538	0.003
8	**0.819**	0.777	0.042	**0.763**	0.762	0.001
9	**0.627**	0.567	0.060	**0.558**	0.556	0.002
10	**0.730**	0.658	0.072	**0.649**	0.647	0.002
11	**0.887**	0.858	0.029	**0.844**	0.843	0.001
12	**0.673**	0.603	0.071	**0.589**	0.588	0.002
13	**0.739**	0.666	0.073	**0.656**	0.654	0.002
14	**0.685**	0.487	0.198	**0.479**	0.478	0.001
15	**0.558**	0.473	0.086	**0.469**	0.467	0.002
16	**0.716**	0.635	0.082	**0.623**	0.621	0.002
17	**0.502**	0.405	0.096	**0.399**	0.396	0.003
18	**0.827**	0.783	0.044	**0.767**	0.766	0.001

19	**0.762**	0.713	0.048	**0.699**	0.697	0.001
20	**0.698**	0.629	0.069	**0.620**	0.618	0.002
21	**0.859**	0.812	0.047	**0.798**	0.797	0.001
22	**0.778**	0.728	0.051	**0.717**	0.715	0.002
23	**0.772**	0.717	0.056	**0.704**	0.702	0.002
24	**0.840**	0.802	0.039	**0.792**	0.790	0.001
25	**0.871**	0.839	0.032	**0.830**	0.829	0.001
26	**0.623**	0.568	0.055	**0.556**	0.555	0.001
27	**0.851**	0.795	0.057	**0.788**	0.787	0.001
28	**0.744**	0.691	0.053	**0.679**	0.678	0.002
Average	**0.7017**	**0.6310**	**0.0707**	**0.6211**	**0.6195**	**0.0017**

Note: C region: Central Vietnam region, R region: rest of Vietnam region

Appendix 5. Trade in domestic value added

	Final demad of central Vietnam				Final demand of ROV			
	Consumption	FGCF	CII	Export	Consumption	FGCF	CII	Export
Value added multiplier	0.72	0.60	0.65	0.66	0.65	0.52	0.59	0.54
In Which:								
Central Vietnam	0.60	0.74	0.49	0.51	0.004	0.002	0.004	0.005
ROV	0.12	0.07	0.11	0.13	0.64	0.76	0.52	0.58

Note: FGCF: Fixed gross capital formation, CII: Change in Inventory

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Supply and Use Tables

R-CDTA 8838: Updating and Constructing the Supply and Use Tables for Selected Developing Member Economies

Project Closing Forum and Regional Conference on
2008 System of National Accounts
26-28 September 2018, Chiang Mai, Thailand

An interregional analysis between the four central provinces of Vietnam and the rest of Vietnam (ROV)

Bui Trinh, Ph.D
Association of Regional Econometrics and Environmental Studies (AREES), Vietnam Development Research Institute
Kim Kwang Moon, Ph.D
Associate Professor, Kyoto University
Nguyen Quang Tung
Government Office of Vietnam
Nguyen Viet Phong
General Statistics Office of Vietnam

Outlines

- Introduction
- General Model
- Equations
- Finding

Introduction

- Central Vietnam is considered as an economic zone in the coastal area of Vietnam. Moreover, central Vietnam is also a place where natural disasters such as floods, storms, droughts, flash floods and floods occur. Studying the relationship between central Vietnam and the rest of Vietnam is considered a good thing to do
- Tropical storms frequently hit central Vietnam (it includes Hue, Danamg, Quangnam and Quangngai – Figure 1), typically the Xangsane storm outbreak in 2006, causing serious human and economic damage. This study attempted to use an inter-regional IO model to study the relationship between this region and the rest of Vietnam (ROV); thereby partially assessing not only disaster damage but also affecting other regions and also country

Introduction

Introduction

- The Leontief system was extended to regional research by Isard (1951), also known as the Isard model
- the ideas of the inter-regional I-O model were developed by Miyazawa (1976) with ideas on internal and external multipliers
- This study uses interregional input – output framework that updated 2016 for of two regions: Central of Vietnam (Hue, Danang, Quangnam, Quangngai) of Vietnam and the rest of Vietnam (ROV), 28 sector for finding interregional impacts and calculating some evaluation the impact of the storm

Introduction

- The Vietnam National input – output table in 2016 was updated base on the Vietnam input – output table in 2012 and Vietnam enterprise survey in 2016. The intra-input – output of central Vietnam in 2016 was updated base on intra - input - output table of central Vietnam in 2012 and data on gross output and intermediate input vectors was estimated base on Vietnam enterprise survey in 2016. The interregional input - output table was updated base Vietnam national input - output and intra - input - output tables in 2016 by SLQ method, T. Bui (2016).

Sector in the Vietnam interregional input-output table, COV and ROV

1	AGRICULTURE
2	FORESTRY
3	FISHING
4	MANUFACTURE OF FOOD PRODUCTS
5	MANUFACTURE OF TEXTILES, CLOTHING, FOOTWEAR & LEATHER GOODS
6	MANUFACTURE OF FURNITURE & OTHER GOODS; REPAIR & INSTALLATION
7	CONSTRUCTION
8	WHOLESALE & RETAIL TRADE; REPAIR OF MOTOR VEHICLES & MOTORCYCLES
9	TRANSPORTATION & STORAGE
10	ACCOMMODATION & FOOD SERVICE ACTIVITIES
11	REAL ESTATE ACTIVITIES
12	MINING & QUARRYING
13	MANUFACTURE OF BEVERAGES & TOBACCO
14	MANUFACTURE OF WOOD, PAPER & RELATED PRODUCTS; PRINTING
15	MANUFACTURE OF PETROLEUM, CHEMICAL, RUBBER & PLASTIC PRODUCTS
16	MANUFACTURE OF NON-METALLIC MINERAL PRODUCTS
17	MANUFACTURE OF METAL PRODUCTS, MACHINERY & EQUIPMENT
18	ELECTRICITY
19	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT & REMEDIATION ACTIVITIES
20	INFORMATION & COMMUNICATIONS
21	FINANCIAL & INSURANCE ACTIVITIES
22	PROFESSIONAL, SCIENTIFIC & TECHNICAL ACTIVITIES
23	ADMINISTRATIVE & SUPPORT SERVICE ACTIVITIES
24	PUBLIC ADMINISTRATION & DEFENCE; COMPULSORY SOCIAL SECURITY
25	EDUCATION
26	HUMAN HEALTH & SOCIAL WORK ACTIVITIES
27	ARTS, ENTERTAINMENT & RECREATION
28	OTHER SERVICE ACTIVITIES

General Model (Isard type)

From		To:	Intermediate consumption: Region1	....	Region k	Final Demand: Region 1	....	Region k	M	Gross output
			1 2 … j … n		1 2 … j … n	C G I E		C G I E		
INTERMEDIATE INPUTS	REG 1	1 : I : N	X^{11}	....	X^{1k}	F^{11}	....	F^{1k}	0	$X^{i.}$
	: : :	: : :	: : :	: : :	: : :	: : :	: : :	: : :	: : :	: : :
	REG k	1 : I : N	X^{k1}	....	X^{kk8}	F^{k1}	....	F^{kk}	0	$X^{8.}$
	ROW	1 : I : N	X^{W1}	....	X^{Wk}	F^{W1}	....	F^{W8k}	F^{Wk}	0
		CE PT-S D OS	V^{P1}	....	V^{Pk}	0	....	0	0	GVA
Gross input			$X^{.1}$	....	$X^{.8}$	$F^{.1}$	....	$F^{.8}$	(M)	

Equations

- Leontief's standard relationship is in the form as follow:

  A.X + Y = X (1)

- A= $\begin{bmatrix} A_{cc} & A_{cr} \\ A_{rc} & A_{rr} \end{bmatrix}$

- X= $\begin{bmatrix} X_c \\ X_r \end{bmatrix}$

Equations

- Y= $\begin{bmatrix} Y_{cc} & Y_{cr} \\ Y_{rc} & Y_{rr} \end{bmatrix}$

- B = $(I-A)^{-1}$

- B= $\begin{bmatrix} B_{cc} & B_{cr} \\ B_{rc} & B_{rr} \end{bmatrix}$

Equations

- X = $\begin{bmatrix} B_{cc}.Ycc + Bcr.Yrc & B_{cr}.Yrr + Bcc.Ycr \\ B_{rc}.Ycc + Brr.Yrc & B_{rr}Yrr + Brc.Ycr \end{bmatrix}$

Equations

- Bcc = (I – Acc – Acr.(I – Acc)$^{-1}$.Arc)
- Brr = (I – Arr – Arc..(I – Arr)$^{-1}$.Acr)
- $B_{cr} = B_{cc}.A_{cr}(I\text{-}A_{rr})^{-1}$
- $B_{rc} = B_{rr}.A_{rc}(I – A_{cc})^{-1}$
- With:
- B_{cc} includes multipliers effects $(I\text{-}Acc)^{-1}$ and interregional feedback effects: $Bcc + B_{rc} – (I\text{-}A_{cc})^{-1}$
- B_{rc} present Spillover effects from region C to region R

In the case of research on a sector group in a region related to other sectors in the region and other region, the matrix A can be divided as follow:

- A = $\begin{bmatrix} A^{ii}{}_{cc} & A^{ij}{}_{cc} & A_{cr} \\ A^{ji}{}_{cc} & A^{jj}{}_{cc} & A_{cr} \\ A^{ij}{}_{rc} & A^{ij}{}_{rc} & A_{rr} \end{bmatrix}$

- X = $\begin{bmatrix} X^{i}{}_{c} \\ X^{j}{}_{c} \\ X_{r} \end{bmatrix}$

- Y = $\begin{bmatrix} Y^{i}{}_{cc} & Y^{i}{}_{cr} \\ Y^{j}{}_{cc} & Y^{j}{}_{cr} \\ Y_{rc} & Y_{rr} \end{bmatrix}$

- $X^{i}c = (I - A^{ii}{}_{CC})^{-1}.(A^{ii}{}_{cr}. X^{j}{}_{c} + A_{cr}.X_{r} + Y^{i}{}_{cc} + Y^{i}{}_{cr})$
- $X^{j}{}_{c} = (I - A^{jj}{}_{cc})^{-1}.(A^{ji}{}_{cc}. X^{i}{}_{c} + A_{cr}.X_{r} + Y^{j}{}_{cr} + Y^{j}{}_{cr})$
- $Xr = ((I-A^{ii}{}_{rr})^{-1}.(A^{NR}{}_{hk}.X^{R}{}_{c} + A_{rr}.X^{R} + Y_{rc} + Y_{rr})$

Findings:

Interregional multipliers of four provinces region

		4 provinces Region							
			In Which:				In Which:		
		Output requirements	Multiplier effects	Interregional feedback effects	Spillover Effects	Average of Output requirements	Average of Multiplier effects	Average of Interregional feedback effects	Average of Spillover Effects
1	AGRICULTURE	2.291	2.018	0.0010	0.272	1.1068	1.1141	1.0132	1.0555
2	FORESTRY	1.819	1.420	0.0007	0.398	0.8786	0.7838	0.6907	1.5445
3	FISHING	2.595	2.286	0.0012	0.308	1.2534	1.2620	1.1906	1.1933
4	MANUFACTURE OF FOOD PRODUCTS	3.169	2.747	0.0015	0.420	1.5310	1.5169	1.5859	1.6298
5	MANUFACTURE OF TEXTILES, CLOTHING, FOOTWEAR & LEATHER GOODS	1.982	1.815	0.0007	0.167	0.9577	1.0020	0.7323	0.6474
6	MANUFACTURE OF FURNITURE & OTHER GOODS; REPAIR & INSTALLATION	2.302	1.863	0.0013	0.438	1.1121	1.0286	1.2898	1.6979
7	CONSTRUCTION	2.289	1.945	0.0017	0.342	1.1057	1.0738	1.7158	1.3272
8	WHOLESALE & RETAIL TRADE; REPAIR OF MOTOR VEHICLES & MOTORCYCLES	1.790	1.639	0.0006	0.150	0.8648	0.9051	0.6178	0.5825
9	TRANSPORTATION & STORAGE	2.095	1.861	0.0008	0.233	1.0122	1.0278	0.8416	0.9037
10	ACCOMMODATION & FOOD SERVICE ACTIVITIES	2.381	2.101	0.0010	0.279	1.1502	1.1601	1.0444	1.0809
11	REAL ESTATE ACTIVITIES	1.611	1.507	0.0004	0.103	0.7781	0.8321	0.4393	0.4001
12	MINING & QUARRYING	1.928	1.648	0.0014	0.278	0.9312	0.9102	1.3871	1.0771
13	MANUFACTURE OF BEVERAGES & TOBACCO	2.239	1.959	0.0011	0.279	1.0816	1.0815	1.1571	1.0819
14	MANUFACTURE OF WOOD, PAPER & RELATED PRODUCTS; PRINTING	2.574	2.058	0.0009	0.515	1.2436	1.1366	0.9386	1.9966
15	MANUFACTURE OF PETROLEUM, CHEMICAL, RUBBER & PLASTIC PRODUCTS	2.332	2.013	0.0011	0.317	1.1265	1.1117	1.1692	1.2300
16	MANUFACTURE OF NON-METALLIC MINERAL PRODUCTS	2.301	2.012	0.0011	0.288	1.1118	1.1112	1.1677	1.1162
17	MANUFACTURE OF METAL PRODUCTS, MACHINERY & EQUIPMENT	2.153	1.728	0.0025	0.423	1.0403	0.9541	2.5359	1.6401
18	ELECTRICITY	1.596	1.425	0.0008	0.170	0.7709	0.7870	0.8341	0.6575
19	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT & REMEDIATION ACTIVITIES	1.824	1.639	0.0007	0.184	0.8813	0.9050	0.7596	0.7152
20	INFORMATION & COMMUNICATIONS	2.163	1.884	0.0015	0.278	1.0451	1.0404	1.4900	1.0768
21	FINANCIAL & INSURANCE ACTIVITIES	1.807	1.675	0.0004	0.132	0.8729	0.9248	0.3982	0.5109
22	PROFESSIONAL, SCIENTIFIC & TECHNICAL ACTIVITIES	1.927	1.731	0.0009	0.195	0.9308	0.9558	0.9491	0.7552
23	ADMINISTRATIVE & SUPPORT SERVICE ACTIVITIES	1.902	1.699	0.0008	0.202	0.9189	0.9382	0.8023	0.7837
24	PUBLIC ADMINISTRATION &DEFENCE; COMPULSORY SOCIAL SECURITY	1.650	1.508	0.0006	0.142	0.7973	0.8327	0.5856	0.5492
25	EDUCATION	1.557	1.441	0.0005	0.116	0.7523	0.7957	0.4744	0.4486
26	HUMAN HEALTH & SOCIAL WORK ACTIVITIES	1.946	1.726	0.0008	0.219	0.9400	0.9528	0.7913	0.8508
27	ARTS, ENTERTAINMENT & RECREATION	1.877	1.705	0.0005	0.172	0.9070	0.9417	0.4862	0.6650
28	OTHER SERVICE ACTIVITIES	1.859	1.656	0.0009	0.202	0.8979	0.9143	0.912	0.7825
	Average	**2.070**	**1.811**	**0.001**	**0.258**				

.Interregional multipliers of Rest of Viet Nam

		Rest of Vietnam (ROV)							
			In Which:				In Which:		
		Output requirements	Multiplier effects	Interregional feedback effects	Spillover Effects	Average of Output requirements	Average of Multiplier effects	Average of Interregional feedback effects	Average of Spillover Effects
1	AGRICULTURE	2.186	2.018	0.161	0.007	1.1266	1.1141	1.3569	1.1046
2	FORESTRY	1.492	1.420	0.070	0.002	0.7687	0.7838	0.5904	0.2795
3	FISHING	2.499	2.286	0.202	0.011	1.2878	1.2620	1.7024	1.6905
4	MANUFACTURE OF FOOD PRODUCTS	2.953	2.747	0.193	0.012	1.5217	1.5169	1.6261	1.8885
5	MANUFACTURE OF TEXTILES, CLOTHING, FOOTWEAR & LEATHER GOODS	1.962	1.815	0.137	0.011	1.0113	1.0020	1.1532	1.6221
6	MANUFACTURE OF FURNITURE & OTHER GOODS; REPAIR & INSTALLATION	1.985	1.863	0.116	0.006	1.0232	1.0286	0.9782	0.9685
7	CONSTRUCTION	2.099	1.945	0.144	0.010	1.0818	1.0738	1.2141	1.5430
8	WHOLESALE & RETAIL TRADE; REPAIR OF MOTOR VEHICLES & MOTORCYCLES	1.752	1.639	0.108	0.005	0.9026	0.9051	0.9055	0.7151
9	TRANSPORTATION & STORAGE	1.992	1.861	0.124	0.007	1.0268	1.0278	1.0425	1.1052
10	ACCOMMODATION & FOOD SERVICE ACTIVITIES	2.285	2.101	0.175	0.009	1.1777	1.1601	1.4742	1.3842
11	REAL ESTATE ACTIVITIES	1.627	1.507	0.117	0.003	0.8386	0.8321	0.9827	0.5306
12	MINING & QUARRYING	1.758	1.648	0.103	0.006	0.9060	0.9102	0.8691	0.9932
13	MANUFACTURE OF BEVERAGES & TOBACCO	2.115	1.959	0.150	0.007	1.0901	1.0815	1.2590	1.0813
14	MANUFACTURE OF WOOD, PAPER & RELATED PRODUCTS; PRINTING	2.187	2.058	0.124	0.004	1.1270	1.1366	1.0469	0.6085
15	MANUFACTURE OF PETROLEUM, CHEMICAL, RUBBER & PLASTIC PRODUCTS	2.144	2.013	0.124	0.006	1.1048	1.1117	1.0458	0.9156
16	MANUFACTURE OF NON-METALLIC MINERAL PRODUCTS	2.141	2.012	0.122	0.007	1.1033	1.1112	1.0221	1.0794
17	MANUFACTURE OF METAL PRODUCTS, MACHINERY & EQUIPMENT	1.844	1.728	0.104	0.012	0.9501	0.9541	0.8743	1.8134
18	ELECTRICITY	1.508	1.425	0.079	0.004	0.7773	0.7870	0.6617	0.6580
19	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT & REMEDIATION ACTIVITIES	1.747	1.639	0.103	0.005	0.9004	0.9050	0.8652	0.8204
20	INFORMATION & COMMUNICATIONS	2.021	1.884	0.129	0.007	1.0415	1.0404	1.0878	1.1518
21	FINANCIAL & INSURANCE ACTIVITIES	1.776	1.675	0.098	0.003	0.9152	0.9248	0.8229	0.4855
22	PROFESSIONAL, SCIENTIFIC & TECHNICAL ACTIVITIES	1.855	1.731	0.118	0.006	0.9557	0.9558	0.9901	0.8935
23	ADMINISTRATIVE & SUPPORT SERVICE ACTIVITIES	1.823	1.699	0.117	0.007	0.9397	0.9382	0.9871	1.0570
24	PUBLIC ADMINISTRATION & DEFENCE; COMPULSORY SOCIAL SECURITY	1.616	1.508	0.103	0.005	0.8326	0.8327	0.8639	0.7305
25	EDUCATION	1.532	1.441	0.087	0.004	0.7894	0.7957	0.7336	0.5451
26	HUMAN HEALTH & SOCIAL WORK ACTIVITIES	1.847	1.726	0.116	0.005	0.9518	0.9528	0.9762	0.8188
27	ARTS, ENTERTAINMENT & RECREATION	1.812	1.705	0.103	0.004	0.9339	0.9417	0.8679	0.5668
28	OTHER SERVICE ACTIVITIES	1.774	1.656		0.006	0.9143	0.9143	0.0000	0.9493
	Average	**1.940**	**1.811**	**0.119**	**0.006**				

Findings

- Tables 1, 2 shows regarding average spillover effects for a unit final demand of central Vietnam region higher than this one of rest of Vietnam region, opposite, interregional feedback effects of ROV higher than central Vietnam region; that means production of central Vietnam stimulate production of ROV region more than production of ROV region stimulate production of central Vietnam region. Especially, sectors number 1, 3,4, 5,7, 9, 10, 13 – 16, 20 of ROV has power on dispersion index higher than average on interregional feedback effects. Sectors number 1,2,3,4, 6,7, 10, 12 – 17, 20 has power of dispersion index higher than average on spillover feedback effects.

Value added in interregional input – output analysis

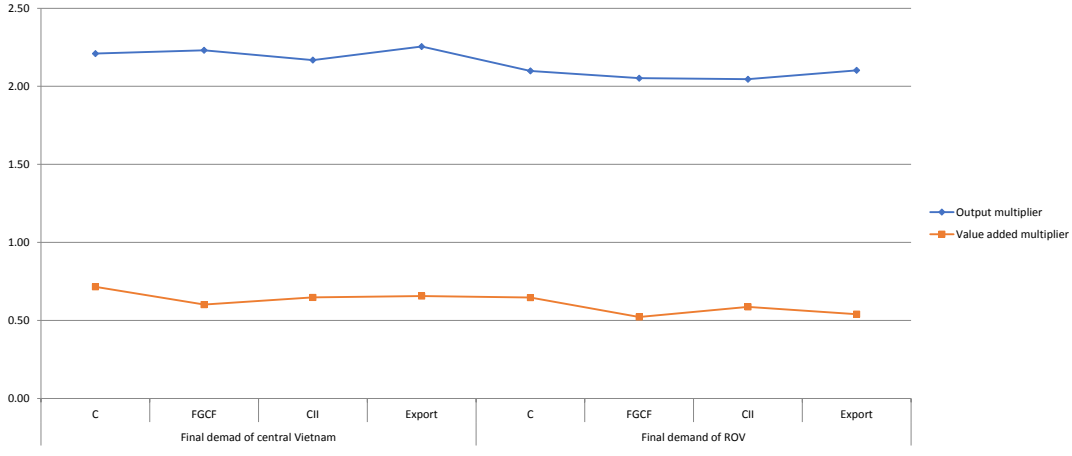
	Value added induced by a unit increase of C region final demand (Vc.Bcc + Vr.Brc)			Value added induced by a unit increase of R region final demand (Vr.Brr = Vc.Bcr)		
	Total impacts of C region final demand	Value added receipted by region C(Vc.Bcc)	Value added receipted by region R(Vr.Brc)	Total impacts of R region final demand	Value added receipted by region R(Vr.Brr)	Value added receipted by region C(Vc.Bcr)
1	**0.743**	0.672	0.071	**0.662**	0.660	0.002
2	**0.819**	0.658	0.161	**0.638**	0.638	0.000
3	**0.664**	0.590	0.074	**0.588**	0.585	0.003
4	**0.717**	0.609	0.108	**0.602**	0.599	0.003
5	**0.560**	0.516	0.044	**0.512**	0.509	0.003
6	**0.652**	0.503	0.149	**0.492**	0.490	0.002
7	**0.631**	0.544	0.087	**0.540**	0.538	0.003
8	**0.819**	0.777	0.042	**0.763**	0.762	0.001
9	**0.627**	0.567	0.060	**0.558**	0.556	0.002
10	**0.730**	0.658	0.072	**0.649**	0.647	0.002
11	**0.887**	0.858	0.029	**0.844**	0.843	0.001
12	**0.673**	0.603	0.071	**0.589**	0.588	0.002
13	**0.739**	0.666	0.073	**0.656**	0.654	0.002
14	**0.685**	0.487	0.198	**0.479**	0.478	0.001
15	**0.558**	0.473	0.086	**0.469**	0.467	0.002
16	**0.716**	0.635	0.082	**0.623**	0.621	0.002
17	**0.502**	0.405	0.096	**0.399**	0.396	0.003
18	**0.827**	0.783	0.044	**0.767**	0.766	0.001
19	**0.762**	0.713	0.048	**0.699**	0.697	0.001
20	**0.698**	0.629	0.069	**0.620**	0.618	0.002
21	**0.859**	0.812	0.047	**0.798**	0.797	0.001
22	**0.778**	0.728	0.051	**0.717**	0.715	0.002
23	**0.772**	0.717	0.056	**0.704**	0.702	0.002
24	**0.840**	0.802	0.039	**0.792**	0.790	0.001
25	**0.871**	0.839	0.032	**0.830**	0.829	0.001
26	**0.623**	0.568	0.055	**0.556**	0.555	0.001
27	**0.851**	0.795	0.057	**0.788**	0.787	0.001
28	**0.744**	0.691	0.053	**0.679**	0.678	0.001
Average	**0.7017**	**0.6310**	**0.0707**	**0.6211**	**0.6195**	**0.0017**

Findings

- Table shows final demand of central Vietnam region dose not only induced to high output, but also induced to high value added. Final demand of central Vietnam used products of rest ò Vietnam induced to value added of rest of Vietnam higher than rest of Vietnam used products of central Viet Nam induced to value added of central Vietnam

Output, value added induced by factors of final demand

C: Final consumption; FGCF: Fixed gross capital formation, CII: Change in inventory



Findings

- Figure shows final demand of central of Vietnam induced to output and value added better than final demand of ROV at all factors in final demand. Especially fixed gross capital formation and export of ROV induced to value added very low

Assume that central Vietnam region encountered the same typhoon as Typhoon Xangsane 2006, there are 11 directly affected sectors such as during Hurricane 2016 as follow

	Sectors	Hurricane production change
1	AGRICULTURE	-8.26
2	FORESTRY	-4.82
3	FISHING	-3.36
4	MANUFACTURE OF FOOD PRODUCTS	-1.43
5	MANUFACTURE OF TEXTILES, CLOTHING, FOOTWEAR & LEATHER GOODS	-2.60
6	MANUFACTURE OF FURNITURE & OTHER GOODS; REPAIR & INSTALLATION	-5.66
7	CONSTRUCTION	-9.54
8	WHOLESALE & RETAIL TRADE; REPAIR OF MOTOR VEHICLES & MOTORCYCLES	-3.84
9	TRANSPORTATION & STORAGE	-9.39
10	ACCOMMODATION & FOOD SERVICE ACTIVITIES	-10.96
11	REAL ESTATE ACTIVITIES	-4.93

Influence spreads to the rest of Vietnam (ROV)

	Sectors	Hurricane production change of ROV
1	AGRICULTURE	-0.31
2	FORESTRY	-2.69
3	FISHING	-1.59
4	MANUFACTURE OF FOOD PRODUCTS	-1.73
5	MANUFACTURE OF TEXTILES, CLOTHING, FOOTWEAR & LEATHER GOODS	-2.89
6	MANUFACTURE OF FURNITURE & OTHER GOODS; REPAIR & INSTALLATION	-1.93
7	CONSTRUCTION	-2.28
8	WHOLESALE & RETAIL TRADE; REPAIR OF MOTOR VEHICLES & MOTORCYCLES	-2.92
9	TRANSPORTATION & STORAGE	-1.74
10	ACCOMMODATION & FOOD SERVICE ACTIVITIES	-2.06
11	REAL ESTATE ACTIVITIES	-2.58
12	MINING & QUARRYING	-2.77
13	MANUFACTURE OF BEVERAGES & TOBACCO	-0.34
14	MANUFACTURE OF WOOD, PAPER & RELATED PRODUCTS; PRINTING	-2.88
15	MANUFACTURE OF PETROLEUM, CHEMICAL, RUBBER & PLASTIC PRODUCTS	-1.98
16	MANUFACTURE OF NON-METALLIC MINERAL PRODUCTS	-0.82
17	MANUFACTURE OF METAL PRODUCTS, MACHINERY & EQUIPMENT	-3.00
18	ELECTRICITY	-1.43
19	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT & REMEDIATION ACTIVITIES	-2.31
20	INFORMATION & COMMUNICATIONS	-2.55
21	FINANCIAL & INSURANCE ACTIVITIES	-1.91
22	PROFESSIONAL, SCIENTIFIC & TECHNICAL ACTIVITIES	-1.74
23	ADMINISTRATIVE & SUPPORT SERVICE ACTIVITIES	-2.61
24	PUBLIC ADMINISTRATION & DEFENCE; COMPULSORY SOCIAL SECURITY	-2.73
25	EDUCATION	-2.77
26	HUMAN HEALTH & SOCIAL WORK ACTIVITIES	-3.55
27	ARTS, ENTERTAINMENT & RECREATION	-2.69
28	OTHER SERVICE ACTIVITIES	-3.49
	Gross output	-2.15
	Gross Value added (GVA)	-2.31
	Share of Labor	-1.76
	Share of Capital	-2.84
	Labor force	-0.31

Bui Trinh
Vietnam Development Research

Email: buitrinhcan@gmail.com
Tel: +84939198586

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Rural and Urban in Vietnam Economic Structure

Nguyen Hong Nhung[1], Nguyen Quang Thai[2], Bui Trinh[3], Nguyen Viet Phong[4]

[1]MA Vietnam Development Research Institute, Vietnam

[2]Prof. Dr., Vietnam Development Research Institute, Vietnam

[3]Dr., Vietnam Development Research Institute, Vietnam

[4]MA General statistic Office, Vietnam

Correspondence: Bui Trinh, Dr., Vietnam Development Research Institute, Vietnam.

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Abstract

Vietnam is an agricultural country with a "wet rice" culture. In recent decades, in addition to the achievement of relatively high economic growth, the implementation of poverty reduction, there seems to be the trend of simple "industrialization and modernization" almost in all localities of country. Vietnam instead of using forte be cultivated and raised in tropical agriculture into workers and townsman's in an unprepared way. When Vietnamese people's strengths are not used and promoted, they have to try or be forced to use their weakness. So, the failure is almost inevitable.

This study aims to examine the change in the level of interactions between the agriculture, forestry, fisheries and rural sectors with other sectors in the economy and urban areas based on structure of the input - output table has been updated for Vietnam in 2016 by Vietnam Institute of Development Research (implemented 2018 under a Project of Vietnam Union of Science and Technique Associations VUSTA).

Keywords: urban, rural, income, consumption, induced impact

1. Introduction

When it comes to Vietnamese culture, it refers to the culture of agriculture. Every country has agriculture, but the culture of agriculture is only in some Asian countries, including Vietnam. In the soul of the Vietnamese is always a pure soul and pure. In recent decades it seems that people are trying to change this with the "industrialization and modernization" movement, trying to force the Vietnamese people instead of using the advantages of cultivation, breeding ... become workers. When Vietnamese people's strengths are not used and promoted, they have to try or be forced to use their weakness. So, the failure is almost inevitable. This study examines the change in the interactions between agriculture, forestry and fisheries with other sectors of the economy based on the structure of the 2012 and 2016 input - output tables of Vietnam

Data of the Vietnam general statistics office show that urban population growth rate has increased continuously in the period of 2010 - 2017, the population growth rate of rural areas has been negative or increase negligible in many years. The population structure of the urban area increased from 31.6% in 2010 to 35% in 2017. The speed and structure of urban and rural population structure changes relatively quickly basically due to the construction process and urbanization (urban birth rate is not as high as in rural areas), people in rural areas are became into urban people even though thinking and heart are still only agricultural people. When they become something that actually doesn't belong to them can lead to more difficulties in life, or they become "aggressive" and only a few people adapt to the "urban" life. Is this one of the causes in the suburban and new regions that have transformed from rural to urban areas with many social evils?

Table 1. Urban and rural population growth rates

Unit: %

	Urban	Rural
2010	3.64	-0.01
2011	4.54	-0.48
2012	1.98	0.66
2013	2.14	0.57
2014	4.02	-0.31
2015	3.44	-0.08
2016	2.76	0.20
2017 est.	2.78	0.15

Source: Vietnam general statistics office

Table 2. Urban-rural population structure

Unit: %

	Urban	Rural
2010	30.50	69.50
2011	31.55	68.45
2012	31.83	68.17
2013	32.17	67.83
2014	33.10	66.90
2015	33.88	66.12
2016	34.44	65.56
2017 est.	35.03	64.97

Source: Vietnam general statistics office

This research used the 2016 Vietnam input – output table. This table updated from 2012 Vietnam national input – output table and the enterprise's survey and data of Household Living Standard Survey of Vietnam General Statistics Office 2012-2016. After that, the ras method and ras method with random fixed points for balancing the gross input and gross output of the input – output table.

2. Literature Reviews

This research uses input – output analysis in Leontief system (type I) and demographic – economic modeling (type II). Since Leontief's Input-Output System (IOS) came out into (1936, 1941), it has been further developed and expanded in many ways by various researchers. Moreover, including originally inter-regional input-output table by as Isard (1951), multi-regional input-output model (MRIO) by Chenery and Moses (1954, 1955), Miller (1957) and Hirsch (1959); Social accounting system by Stone (1961),Pyatt and Rose (1977), demographic – economic model was parallel developed with social accounting matrix by Miyazawa (1976) and Madden and Batey (1983). Demographic – Economic model was been developed by Miyazawa for analyzing the structure of income distribution by endogenous consumption expenditures in the standard of Leontief system. It means the Leontief system was extended by a group of consumption expenditures in column and corresponding group of row income. HUSSAIN ALI BEKHET (2009, 2011) also used input – output approach in order to decompose of Malaysian production structure and calculating output, income, employment multipliers in Malaysian Economy, this author also used input – output system for Ranking Sectors Changes of the Malaysian economy (2010)

There are some researches on urban and rural relationship such as the research on inequality in the living standards between urban and rural sectors (Mundle, Van Akadie, 1997); Inequality in job search is also shown in the study of Phan and Coxhead (2010).. Thu Le and Booth (2014) also found that, the remittances are the most important in explaining the urban – rural expenditure gap. But this study has no clear evidence of how and why the gap between urban and rural areas increases rapidly

3. Methodology

Type I of input-output analysis is based on standard equation of Leontief system:

$$X = (I - A^d)^{-1}.Y^d \quad (1)$$

In this type, we get power of dispersion and sensitivity of dispersion for output and income from production that is induced by final demand, In this case, X is matrix of output that induced by factors of final demand, I is unit matrix, A^d is domestic direct input coefficient, Y^d is matrix of domestic final demand (these includes urban

consumption, rural consumption, Government consumption, gross capital formation and export; $(I-A^d)^{-1}$ is a Leontief inverse matrix.

In order to estimate value added induced by a unit of final demand the equation (1) can rewritten as below:

$$V = v.X = v.(I - A^d)^{-1}.Y^d$$

Where: V is matrix of value added with rows presents type of income and columns are number of sectors; v is matrix value added coefficient, with: $v_{ij} = V_{ij}/X_j$

And:

X ÷ Ydpresent impacts of factors of final demand to output

V ÷ Yd presents impacts of factors of final demand to value added

Here: ÷ shows scalar division

Type II is an expansion Leontief system and Miyazawa model. The study considers the following systems:

$$A.X + c_1.T_1 + c_2.T_2 + F = X \quad (2)$$

$$V_1.X + V'_1 = T_1 \quad (3)$$

$$V_2.X + V'_2 = T_2 \quad (4)$$

Where:

A is matrix of input coefficient;

X is a vector of output;

V_1 is a vector coefficient of urban endogenous income

V_2 is a vector coefficient of rural endogenous income

V'_1 is a vector of exogenous income of urban areas

V'_1 is a vector of exogenous income of rural areas

T1 and T2 are total income of urban areas and rural areas corresponding

C_1 is a vector coefficient of household consumption of urban area,

C_1 is a vector coefficient of household consumption of rural area,

F is rest of domestic final demand

The equation system (2), (3) and (4) can be rewritten in a matrix form as below:

$$\begin{pmatrix} A & c_1 & c_2 \\ V_1 & & \\ V_2 & & \end{pmatrix} * \begin{pmatrix} X \\ T_1 \\ T_2 \end{pmatrix} + \begin{pmatrix} F \\ V'_1 \\ V'_2 \end{pmatrix} = \begin{pmatrix} X \\ T_1 \\ T_2 \end{pmatrix} \quad (5)$$

The equation (5) goes back Standard Leontief equation with endogenous and exogenous variables of incomes and expenditures

Put:

$$B = \begin{pmatrix} A & c_1 & c_2 \\ V_1 & & \\ V_2 & & \\ & & \end{pmatrix} \tag{6}$$

From (6), we have:

$$\begin{pmatrix} X \\ T_1 \\ T_2 \\ \end{pmatrix} = (I - B)^{-1} . \begin{pmatrix} F \\ V'_1 \\ V'_2 \\ \end{pmatrix} \tag{7}$$

Where I is a unit matrix and Put: $L= (I – B)^{-1}$

$$L= (I – B)^{-1} = \begin{pmatrix} L^A & L^{C_1} & L^{c_2} \\ L^{V_1} & & \\ L^{V_2} & & K \\ & & \end{pmatrix} \tag{8}$$

L is computed based on Sonis and Hewings work (1993) where:

$L^A$is called enlarged Leontief inverse matrix. It includes multiplier effects $(I – A)^{-1}$ and induced feedback effects by L^{c1}, L^{c2} . Based on Sonis and Hewings (1993) we have:

$$L^A = (I – A – c_1V_1 – c_2V_2) \tag{9}$$

L^{V1}, L^{V2} are spillover effects caused byconsumption.

K is an enlarged matrix of Miyazawa interrelation income multipliers. This means exogenous. Since we have:

$$K = I + M (V_1, V_2). L^A. M (c_1, c_2). \tag{10}$$

It implies that final expenditure stimulates income outside of production

So, Formula (7) can be rewritten:

$$L = \begin{bmatrix} L^A & L^A.M(c,g,k) \\ M(V_1,V_2,V_3).L^A & I + M(V_1,V_2,V_3).L^A.M(c,g,k) \end{bmatrix} \tag{11}$$

4. Some Findings

After balancing the input – output table, results show that gross value added balanced from the input – output table and gross value added published before has gap 1,7%. The comparing on income structure from input - output table in 2012 and 2016 shows that the income structure of urban areas in 2016 is higher than 2012 by 0.9 and income structure of rural areas in Total value added also increased.So, income from capital decreased by 1.7%. This shows that the economy needs more capital to create a value-added unit? If this happens in a good way, the productivity will increase and the employee will be paid more.

Table 3. Share of labor and share of capital

	% contribute	% contribute
Gross value added at basic price	100	100
Share of Urban income	31.9	31
Share of Rural income	33.8	33
Share of capital	34.3	36

Source: Vietnam input – output tables, 2012, 2016

A closer look at the structure of income from production and final consumption of the economy of rural and urban areas shows that if the period 2010-2014 (2012 input - output table represents) the proportion of income from production only 94% compared to final consumption, in the period of 2014 - 2018 (the 2016 input - output table represents) this rate dropped to 92%. Note that according to the calculation of the National account in income from production, including social insurance and union funds. This suggests that income from both urban and rural production is not enough for the final consumption of households. These ratios tend to decrease, even though GDP continues to increase (GDP growth average in period of 2010 - 2017 is about 6.2%)

Table 4. Ratios between income from production and household consumption

By urban and rural areas

Unit: %

	2016	2012
Urban	93.7%	95.7%
Rural	90.5%	92.2%
Total	92.0%	94%

Table 6 shows some remarkable points:

+ The final consumption of rural areas induces to the income of urban areas more than the final consumption of urban areas induced to rural incomes (0.093 compared to 0.079).

+ It is noteworthy that government expenditure (recurrent expenditure) basically spread to the income of the urban area, this factor spread to urban income 3.09 times higher than radiating to rural income

+ Export of goods almost spread to very little income, both for urban and rural areas

+ Basic service exports spread to the income of urban areas

+ A unit of export of goods induced impacts poorly to urban areas, because agro-forestry and fishery products have not been fully outsourcing processed as products of processing industry.

Table 5. Induced impacts the factors of final demand to income of urban and rural areas

Unit: %

	Urban final consumption	*Rural final consumption*	*Government consumption*	*Gross capital formation*	*Export of goods*	*Export of services*	**Total export**
Urban	0.110	0.093	0.282	0.084	0.059	0.149	0.066
Rural	0.079	0.101	0.091	0.083	0.069	0.071	0.069

+ In general, final demand induces impact to rural incomes higher than that of urban areas (0,236 compared to 0,152)

+ Notably, the final demand on services induce impact strongly to urban areas

+ Most of the final demand of agriculture, fisheries and manufacturing on agricultural products spreading to rural incomes higher than the average level.

Table 6. Income from production induced by a unit rising of the final demand

Unit: Times

	Urban	**Rural**	Power of dispersion on income of Urban area	Power of dispersion on income of rural area
1	0.068	0.373	0.445	2.449
2	0.070	0.373	0.457	2.447
3	0.086	0.256	0.565	1.680
4	0.099	0.419	0.648	2.748
5	0.020	0.166	0.133	1.089
6	0.035	0.693	0.231	4.552
7	0.013	0.294	0.087	1.929
8	0.028	0.424	0.185	2.786

9	0.043	0.546	0.283	3.587
10	0.066	0.247	0.431	1.622
11	0.077	0.361	0.505	2.368
12	0.157	0.139	**1.032**	0.912
13	0.147	0.249	0.965	1.633
14	0.126	0.292	0.830	1.920
15	0.096	0.288	0.633	1.891
16	0.113	0.102	0.745	0.668
17	0.090	0.299	0.589	1.964
18	0.111	0.283	0.730	1.861
19	0.101	0.247	0.663	1.624
20	0.142	0.120	0.932	0.790
21	0.118	0.099	0.777	0.653
22	0.130	0.126	0.850	0.825
23	0.119	0.108	0.778	0.706
24	0.204	0.184	**1.340**	1.206
25	0.180	0.167	**1.183**	1.096
26	0.265	0.211	**1.739**	1.388
27	0.175	0.151	**1.149**	0.992
28	0.233	0.165	**1.527**	1.083
29	0.223	0.082	**1.465**	0.540
30	0.287	0.066	**1.882**	0.430
31	0.297	0.253	**1.947**	1.664
32	0.444	0.084	**2.913**	0.550
33	0.339	0.214	**2.225**	1.402
34	0.209	0.194	**1.372**	1.271
35	0.175	0.091	**1.152**	0.600
36	0.398	0.130	**2.612**	0.856
Average	0.152	0.236		

Table 7 shows final demand of rural area induced impact to income of rural area stronger than final demand of urban area induced impact to income of urban, especial, final demand the products agriculture, forestry and fishery products and manufacturing on agriculture product. Remain manufacturing and services induce impact to income of urban area higher than them of rural area.

Table 7. Income multipliers in Miyazawa model

Unit: Times

Sectors	Urban	Rural
1	0.097	0.406
2	0.099	0.406
3	0.112	0.284
4	0.135	0.459
5	0.032	0.179
6	0.076	0.742
7	0.030	0.314
8	0.054	0.455
9	0.077	0.587
10	0.088	0.272
11	0.107	0.394
12	0.188	0.169
13	0.181	0.285
14	0.160	0.328
15	0.125	0.320
16	0.135	0.124
17	0.118	0.330
18	0.142	0.317
19	0.129	0.277
20	0.169	0.147
21	0.141	0.122
22	0.155	0.152
23	0.141	0.131
24	0.244	0.224
25	0.215	0.202
26	0.315	0.261
27	0.209	0.185
28	0.275	0.207
29	0.260	0.118

30	0.332	0.109
31	0.353	0.310
32	0.513	0.150
33	0.400	0.274
34	0.250	0.235
35	0.206	0.121
36	0.463	0.193
Average	**0.19**	**0.27**

Miyazawa multipliers shows requirement on total income (income from production and income from property and transfer income) for a unit of final consumption, or in other words, a unit of final consumption excite to total income

Table 8 shows the requirement for non - productive income of urban area higher than this requirement of rural area, a unit of final consumption of urban area require 0.15 unit income from non - productive of this area, while a unit final consumption of rural area require 0,05 unit income from non - productive of rural area.

Table 9 also shows final consumption of this area is not only induce impact to income of themselves but also induce impact to income of other area

Table 8. Miyazawa Multiplier

Unit: Times

		Consumption	
		Urban	Rural
Income	Urban	1.147	0.051
	Rural	0.138	1.063
	Total	1.285	1.115

5. Conclusions

The study tries to provide a relationship between economic structure and income and consumption of urban and rural areas. It also shows the relationship between economic sectors and rural and urban sectors and the reciprocal relationship between the final consumption of each area induce impact to income of themself and income of other area. During 2012-2016, urban share of population had increasing, but the gap of income between urban and rural was changed not very large due to efficiency of modernization not very high.

Based on input – output tables type I and II in period 2012-2016, it can show: The final consumption of rural areas induces to the income of urban areas more than the final consumption of urban areas induced to rural incomes. It is noteworthy that government expenditure (recurrent expenditure) basically spread to the income of the urban area, this factor spread to urban income 3.09 times higher than radiating to rural income. A unit of export of goods induced impacts poorly to urban areas, because agro-forestry and fishery products have not been fully outsourcing processed as products of processing industry.Notably, the final demand on services induce impact strongly to urban areas. Most of the final demand of agriculture, fisheries and manufacturing on agricultural products spreading to rural incomes higher than the average level.In general, final demand induces impact to rural incomes higher than that of urban areas. Most of the final demand of agriculture, fisheries and manufacturing on agricultural products spreading to rural incomes higher than the average level.Final demand of rural area induced impact to income of rural area stronger than final demand of urban area induced impact to income of urban, especial, final demand the products agriculture, forestry and fishery products and manufacturing on agriculture products. Remain manufacturing and services induce impact to income of urban area higher than them of rural area.Final consumption of this area is not only induce impact to income of themselves but also induce impact to income of other area, it reflex relationship in economy step by step closing…

I hope that this research can help policy makers consider options when making general policies under modernization in new conditions

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Appendix: Sectors

Annual tree products	1
Perennial tree products	2
Livestock products	3
Agricultural services	4
Other agricultural products have not been classified yet	5
Forest planting and tending products	6
Timber extraction	7
Other exploited forest products; products collected from the forest	8
Forestry service	9
Aquatic products exploited	10
Aquaculture products	11
Mining products	12
Processed products preserve meat and meat products	13
Fishery and aquatic products processed and preserved	14
Processed vegetables	15
Milk and dairy products	16
Milling products and powder production	17
Feed for cattle, poultry and aquatic products	18
Products processed from wood, bamboo (including beds, cabinets, tables, chairs); from straw, plaited and plaited materials	19
Fertilizers and nitrogen compounds	20
Pesticides and other chemical products used in agriculture	21
The remaining processing and manufacturing products	22
Electricity, gas, hot water, steam and air conditioning	23
Natural water extraction	24
Construction products	25
Wholesale and retail services; repair services for cars, motorcycles, motorbikes and other motor vehicles	26
Warehouse transport services	27
Accommodation and catering services	28
Information and communication services	29
Banking and insurance financial services	30
Real estate business services	31
Other professional, scientific and technological services	32
Education and training services	33
Health services and social assistance	34
Art, entertainment and entertainment services	35
Other services	36

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Analysis of Inter-Regional Relationship between Vietnam Coastal Zones and the Rest of Vietnam

Hoang Ngoc Phong[1], Nguyen Quang Thai[2], Bui Trinh[2*], Nguyen Hong Nhung[2], Nguyen Quang Tung[3], Nguyen Thi Ai Lien[4]

[1]Academy of Policy and Development, Hanoi, Vietnam
[2]Vietnam Development Research Institute, Hanoi, Vietnam
[3]Editorial Secretariat of Government Office, Hanoi, Vietnam
[4]Investment Department, Hanoi University of Economics, Hanoi, Vietnam
Email: hoangngocphong1952@gmail.com, thais.nguyenquang@gmail.com, *buitrinhcan@gmail.com, hongnhung.ulsa@gmail.com tungnqmpi@gmail.com, lienna@neu.edu.vn

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Abstract

The paper presents the importance of Vietnam's coastal economy, including 28 of the 63 provinces and cities and analyzes six priority economic sectors according to Resolution 36/TW/2018 "About the sustainable development strategy of Vietnam's marine economy to 2030, vision to 2045". Based on the Resolution, the Interdisciplinary Balance sheet with 2 areas—coastal and the rest of Vietnam—is used (separate use of products in each region and imports) to analyze the spillover effects and sensitivity to income and related issues. Many new findings show that the efficiency of coastal economic zones already plays an important role in the Vietnamese economy and needs to be further exploited. This article is the result of the research conducted in the framework of the independent topic KC09.26/16-20 "Scientific foundations and breakthrough solutions for sustainable coastal economic development in focal economic regions in Vietnam" chaired by Dr. Hoang Ngoc Phong.

Keywords

Coastal Economy, Cross-Sectoral Balance

1. Introduction

Vietnam has an area of 332,212 km^2 with a coastline of 3260 km, which means that on every 10 km^2 of mainland has 1 km of coastline, 6 times higher than the global average. These are making Vietnam one of the 10 countries with the highest

coast length to territory index. The coastal region includes 28 of the 63 provinces and cities of Vietnam (**Figure 1**), home to 1/2 of the country's population, and the gross regional domestic product (GRDP) on the coastal zones accounts for more than 50% of the GDP of the Vietnam economy. The coastal zones is also directly connected with 4 focal economic regions throughout the country (the northern focal economic region, the focal economic region of the central region, the Southern focal economic region and the focal economic region of the Mekong River delta), where the economy is the most developed. It is estimated that these four focal economic regions account for 45% of the population and 3/4 of the nation's GDP (including some inland provinces such as Hanoi, BacNinh, Dong Nai, Binh Duong, but excluding some of the provinces in the North Central provinces).

The emerging marine economy is increasingly important, especially since the 1982 UN Convention on the Law of the Sea. **Table 1** shows the Coastal Governance Index 2015 compiled by the EIU, Vietnam achieved a good ranking of 15th in the world with 57/100 points.

In the Vietnam marine strategy identified in 2018, there are 6 particularly important coastal economic sectors, in the following order of priority:

1) Tourism and marine services: Vietnam has great tourism development potential thanks to its long and beautiful coastline, with many famous monuments and landscapes dotting its 5 coastal tourist areas, along with many world Heritage Sites such as Ha Long Bay, Co Dinh Hue capital, My Son Holy Land,

Figure 1. Coastal area (Source: The names coastal provinces in Vietnam) [1].

Table 1. Ranking of coastal management.

Rank/20		Score/100	Rank/20		Score/100
1	New Zealand	86	10	Chile	67
2	United States	85	12	China	61
3	France	82	13	Mexico	60
4	Spain	80	14	Philippines	59
5	Norway	79	15	Indonesia	57
6	Japan	78	15	Vietnam	57
7	Canada	76	17	India	56
8	South Korea	72	18	Peru	55
9	South Africa	68	19	Nigeria	50
10	Brazil	67	20	Russia	42

Source: EIU. Coastal Governance Index [2].

and Hoi, An Ancient Town. Recently, tourism has been announced as a spearhead economic sector for the country and the coastal economic region. The Resolution No. 36-NQ/TW [3] on the marine economy clearly states, "all economic sectors participate in developing eco-tourism, scientific exploration, community tourism, high-quality sea resorts in coastal areas; build, develop, diversify products, product chains, and world-class marine tourism brands on the basis of biodiversity conservation, promote the value of natural, cultural and historical heritage specialties of regions and regions, connecting with international tourist routes" to make Vietnam a world-leading tourism destination. Researching and developing offshore island and sea tourism will open up new prospects, especially when the offshore service and transport system is in place. Facing the adverse impact of global climate change and the rising sea level, the Resolution also set the task of "strengthening the capacity of search and rescue; promoting scientific exploration activities; attaching importance to education and maritime health.... Support and create conditions for coastal people to change jobs from potentially dangerous activities, negatively impact the sea to protect and preserve, creating sustainable livelihoods, stable new jobs, and increasing people's income".

The sea economy associated with sea island tourism services is growing [4]. During the promotion of island tourism, destinations should be linked with high-class resort services, just like island and sea economic sectors with aviation, maritime industry and hospitality venues... together with the chain and strip of coastal cities. Modern market and infrastructure systems will bring greater income and boost socio-economic development, taking the country closer to attracting 15 million international visitors and tens of millions of domestic customers in 2018.

However, tourism is a general industry that uses the services of other industries and it needs to be analyzed carefully on the scales of products, transport

services, restaurants, and hotels. The results of calculations are clearly stated in part 3 of this article.

2) Maritime economy: The more the seaport system and ship fleet develops, the more developed shipbuilding industry has done, and however, the performance has not been high. There is a disconnect between port systems and the services of localities. Therefore, in the coming time, state authorities' mission needs to be to ensure the effective exploitation of seaports and shipping services. This includes planning, building and organizing the synchronous and effective exploitation of general seaports, international transit ports and specialized ports associated with support services, while completing the logistics infrastructure and road system connecting sea ports with regions and localities in the country and internationally.

With a long coastline, it is necessary to "promote the development of the maritime transport fleet with a rational structure applied modern technology, improve service quality, meet the domestic transport market's demand and deepen participation into transport supply chains, as well as step by step increase international market share. The shipbuilding and the maritime industry have a long tradition in Vietnam. However, given the new conditions, these industries are making significant changes. The country has developed industries of shipbuilding and repair, seaport services and maritime transport, as well as inter-freight transportation, with an extensive network of cargo container ports. The formation of a seaport system and links to onshore industrial developments support the development of the marine economy". The resolution sets out major orientations, but the arguments in marine development plans and localities have not been fully validated. The analysis in this article is intended to contribute further evidence to the major views on coastal and marine economic development.

3) Exploiting oil and gas and other marine mineral resources: After many years of developing the oil and gas industry in an "extensive" manner, the sea has supplied more than 300 million tons of oil and billions of cubic meters of gas, but exploration has not been maintained at a stable level and the output of this industry plummeted. With the current known reserves, it is only possible to exploit oil and gas for the next 40 years [5]. Other marine mineral industries also achieved modest results. Therefore, Resolution 36/TW (2018) emphasized "Improving the capacity of the oil and gas industry and other marine resources and minerals sectors; step by step mastering the search, exploration and exploitation to meet the targets of marine economic development in the new period. Promote search, exploration and increase oil and gas reserves; study and explore new sedimentary basins and non-traditional hydrocarbon forms".

Apart from oil and gas, other types of minerals are in abundance but have yet to be exploited to a sufficient degree, thus the Resolution emphasizes "linking the search and exploration of oil and gas with investigation, survey and assessment of potential resources, including other marine minerals, deep-sea minerals, especially minerals with large reserves, high value, have strategic significance (not a sentence). Improving the efficiency of the exploitation of marine mineral

resources should associate with deep processing; harmoniously combining exploitation and processing with environmental protection and marine biodiversity conservation".

In the exploitation of oil and gas and minerals, the operational experience of Vietsovpetro Joint Venture between Vietnam and the Russian Federation has brought a lot of experience in locating and exploiting oil and gas, contributing greatly to the state budget of Vietnam for many years. This is also an effective international oil and gas unit of the Russian Federation. Based on this experience, Vietnam has established dozens of other joint ventures with foreign partners to boost the industry, process oil and gas, and construct national energy centers, among others. However, it is necessary to filter subsequent projects to ensure effectiveness. In current condition, the US company has a new large gas project in Central coastal Vietnam. With the rich natural gas reserves, the Resolution also emphasized that "Oil and gas processing industry is developing very well, including liquefied gas processing and electricity production. With the search for new energy sources from the sea, the oil and gas industry also has been developing diversified and strongly, associated with the coastal industry". While the Resolution 36/TW (2018) lays special emphasis on mineral exploitation, there has been little progress in the area. Even basic discovery is still poor, especially in deep waters, and there is no suitable technology to effectively explore, evaluate, and exploit known reserves. The coastal zones with oil and gas lots were shown in **Figure 2**.

As a "basic construction" industry, exploitation, and processing are closely related to the exploration and detection of new reserves, which contains a lot of risks, so the important issue is ensuring continuous sustainable development of the industry. That requires proper and continuous vision and investment to achieve results.

4) Cultivating and exploiting seafood

Vietnam has long been a nation that relies on the sea. However, output is still low and natural reserves are exploited without a second thought to conservation or recovery, reducing seafood resources. Therefore, Resolution 36/TW (2018) emphasized to "Shifting from farming, exploiting seafood by traditional to industrial and high-tech applications; Reorganize the exploitation of marine products in the direction of reducing near-shore exploitation; Boosting exploitation in offshore and oceanic areas suitable to each sea area and the ability of marine ecosystems to recover in parallel with synchronously and effectively training and changing jobs for fishermen".

Due to increasingly stringent seafood exploitation regulations rooted in environmental protection, Resolution 36/TW (2018) states to "Promoting sustainable aquaculture and aquaculture activities, strengthening protection, regenerating marine resources, eradicating exploitation activities; Modernizing the management of marine fisheries; Promote production links in the form of cooperative groups, cooperatives, cooperative unions to build a number of strong

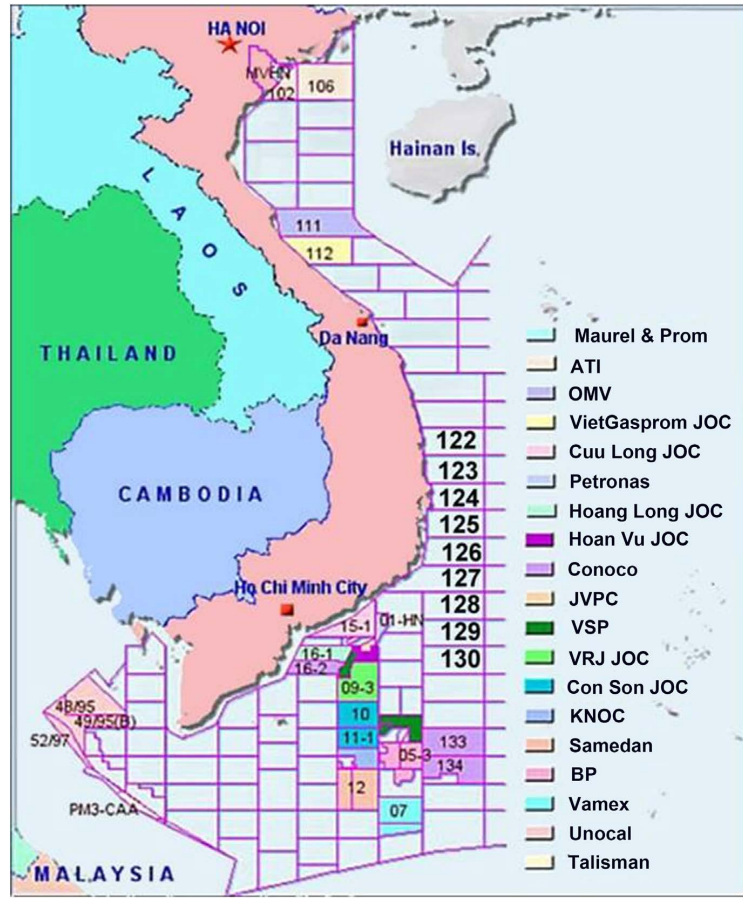

Figure 2. Coastal area with oil and gas lots. Source: PVN Petroleum-Vietnam Offshore Blocks [6].

enterprises to participate in offshore fishing and ocean exploitation cooperation".

The Resolution 36/TW (2018) also stated to "Investment in upgrading fishing ports, fishing berths, anchorage areas, well-organized fishery logistics, to step up the application of advanced science and technology in aquaculture, exploitation, preservation and processing of aquatic products, creating key products of high quality and high economic value, meeting market demands. Fishing and aquaculture, as well as the food processing industry is also very developed, but the requirement to protect natural resources is increasingly strict...".

Currently the implementation of the Resolution 36/TW (2018) on seafood has brought about certain changes, such as improved efficiency, but there is still ample space for development.

The analysis clearly shows the current advantages of coastal economic sectors, including seafood. However, Vietnam has yet to implement all the scientific and

technological advances available in the world of aquaculture, catching, and processing seafood, which restricts the sector's competitiveness on the global stage.

5) Coastal industry

This must be based on planning, considering the natural advantages of each region, prioritizing the development of environmentally friendly high-tech industries, industrial platforms, and technologies sources. Additionally, the government should work to ensure the reasonable development of the shipbuilding and repair, petrochemical, energy, manufacturing, processing, and supporting industries.

Vietnam has 28 coastal cities and provinces which are home to 17 strong economic zones with an area of over 800 thousand hectares and hundreds of industrial parks, occupying more than 80,000 ha of land. However, the IPs and EZs still operate at a low efficiency. The formation of special economic zones has not got a unified viewpoint, so particular strict law for these zones has yet to formulate.

The coastal industries should be closely linked to the construction of a coastal urban chain which is capable of promoting modern industrial and service development. The development of the marine industry should take into account the new factors of clean energy, green economy, and sustainable development, as well as focus on territorial governance.

Unfortunately, exports from these 28 coastal provinces in 2018 only accounted for 33% of the country's total exports (due to the export of high-tech industrial goods in the mainland provinces near the airports). However, analysis through the input-output table shows that the efficiency of coastal economic zones is better than those inland, especially in processing industry and using large material. This shows that there should be more changes to capitalize on the potentials and advantages of coastal areas and islands.

6) Renewable energy and new marine economic sectors

Promote construction investment, exploitation of wind power, solar power and other forms of renewable energy. To develop equipment manufacturing industry in service of the renewable energy industry, proceeding to master a number of technologies, designing, manufacturing and manufacturing equipment; prioritize investment in developing renewable energy on islands in service of production and daily life, ensuring national defense and security. Paying attention to developing a number of economic sectors based on the exploitation of marine biodiversity resources such as marine pharmaceuticals, farming and processing of seaweed, algae and sea grass... For new energy fields, there must be support policies. The initial support creates new, efficient energy industry development sectors.

Quantitative analyzes were carried out on the basis of input-output tables 2012 and 2016 of 28 coastal provinces (**Appendix 1**), including 26 sectors (**Appendix 2**) according to the national economic sector. The calculation results are shown in Section 4.

2. Analysis of Economic Relations Using I/O Tables

In 1906, Vilfredo Pareto [7] mentioned the General Concept of Economic Equilibrium. But, it was not until 1936, when the first input-output models were invented, that researchers could do this. Thanks to the input-output, we; models, people can begin to link economic figures and data to economic theory. And finally, it allows a comprehensive analysis of the economy. It was not until 1936, when the first I/O models were invented, that researchers could do this. Thanks to the I/O models, people can begin to link economic figures and data to economic theory. And finally, it allows a comprehensive analysis of the economy.

The I/O model is a quantitative analysis tool based on I/O tables. I/O tables derive from the ideas in the book "Capital" of K. Marx [8] in which he identifies a direct relationship in the technical rules between relevant factors and production elements. His idea was then developed by Wassily Leontief [9] [10], who mathematized the relation between supply and demand in the entire economy. Leontief considers every production technology to be a linear relationship between the volume of production and the cost of inputs of products and services. This relationship is represented by a system of linear functions in which the coefficients are determined by the technical normative process. With this idea, the first I/O tables built by Leontief for the United States were the I/O, 1919 and 1929 tables in 1936. In 1941, this work was published under the name "Structure of the US economy". Today, the I/O model is considered the center of the United Nations' national accounts system (SNA) published in 1968, 1993 and 2008 [11].

Leontief's national interdisciplinary balance model (1936, 1941) mentioned and analyzed relations in interdisciplinary structures. Leontief's interdisciplinary balancing system was developed by Isard [12] into an interregional input-output model. The idea of the inter-regional input-output model was developed further by H. Richardson [13] and it is considered an important tool in regional economic research. The inter-regional input-output model describes not only the relationship between sectors, but also the relationship between regions based on the flow of trade between them and the flow of transactions between regions and foreign countries. Another inter-regional model was developed by Chenery-Moses [14] [15] and Miller-Blair [16].

For example, if a new economic activity has been created that increases the final demand of the industry in Zone 1, the increased demand in Zone 1 will generate increased output in that area. This increase in Zone 1 will also require new flows of goods and services from other Zones, leading to increased production in those regions. These effects are called spillover effects. To meet the demand for new goods and services in Zone 1, economic sectors in other zones will have to expand production. This may create new demand for goods and services produced in Region 1. Therefore, output in Region 1 may rise again due to increased activity in the first place. These additional effects are called interregional feedback effects.

In Japan, the inter-regional I/O model is applied and developed strongly in the analysis and evaluation of the regional economy and environment, and is also used to analyze the impacts of the earthquake Hanshin [17]. Currently, the state of Hawaii-US compiles an inter-district I/O model every four years, which is considered an official report on the state's economic situation. The most recent I/O table of this kind was Table I/O interdisciplinary 2012 was announced in 2016 [18].

In addition, there have been some researches on interregional input output analysis for Vietnam such as Secretario, FT, Trinh, B., Hung, DM, and Kim, KM [19], Francesco T. S. [20], Bui, T., Kiyoshi, K., & Thai, NQ [21], Bui Trinh, Duong Manh Hung and Nguyen Van Huan [22], Nguyen Quang Tung *et al.* [23].

The advantages of the inter-regional input-output model compared to the National model or single-region model

First, it can be used to better assess the impacts of specific regional economic activities. Each zone's input-output models are included in the larger inter-regional input-output structure. The specific representation of each region's intermediate and final demand structure allows users to take into account the fundamental differences in production and consumption structures across regions.

Secondly, the inter-regional input-output model can provide a useful tool in assessing the linkage between income groups and consumption in the economy. National policy sometimes focuses on directing economic impacts to less developed areas. The inter-regional input-output model allows observing and quantifying the connection between income and consumption groups. The effects quantified by the model are spillover and feedback effects across regions.

Third, the inter-regional input-output model provides a more suitable framework for creating medium and long-term economic and labor forecasts for regions better than single-zone input-output models. The interregional model has eliminated the need to have an additional mechanism to allocate state predictions for individual regions.

While these are certainly advantages to the inter-regional model, there are still some disadvantages in building an inter-regional input-output table. There are a number of organizations or activities of organizations which are not easily attributed to a specific region. Another problem is that companies may have factories or offices in one area, but their main office could be located in another. If company data is reported out of the main office, the allocation of corporate profits to different regions is a problem. Compared to the national's input-output table, the inter-regional input-output table requires much more detailed data on goods and services flows between sectors and across regions. The problem is that such data, especially bilateral services and goods flows between regions and transfers between institutional sectors, are unavailable or non-existent. The lack of sufficient data to produce this inter-regional input-output model has been overcome by using different mathematical methods to estimate inter-regional flows of

goods and services.

This study examines the internal structure of the coastal zones of Vietnam and the inter-regional structure of the coastal area and the rest of Vietnam based on the inter-regional input-output table between the periphery and the rest. The scope of the research includes 26 branches (**Appendix 1**) and 28 coastal provinces (**Appendix 2**).

3. Method

3.1. Basic Diagram (Table 2)

Table 2. Diagram simulating an Isard type interregional model.

From:		To:	Intermediate consumption								Final demand								M	Gross output
			Region 1				….	Region k			Region 1				….	Region k				
			1	2	j	n		1	2	j	n	C	G	I	E		C	G	I	E		
Intermediate input	REGION	1					….									….						
		:																				
		I	X^{11}				….	X^{1k}				F^{11}				….	F^{1k}				0	X^{i}
		:																				
		N					….									….						
		:	:				:	:			:	:				:	:				:	:
		:	:				:	:			:	:				:	:				:	:
	REGION	1					….									….						
		:																				
		I	X^{k1}				….	X^{kk8}				F^{k1}				….	F^{kk}				0	X^{8}
		:																				
	K	N					….									….						
	IMPORT	1																				
		:																				
		I	X^{W1}					X^{Wk}				F^{W1}					F^{W8k}				F^{Wk}	0
		I					….									….						
		:																				
		N					….									….						
		CE																				
		PT-S	V^{P1}				….	V^{Pk}				0				….	0				0	GVA
		D																				
		OS																				
							….									….						
Gross input			$X^{0.1}$				….	$X^{0.8}$				$F^{0.1}$				….	$F^{0.8}$				(M)	

Source: Authors design based on Isard model. Type: CE: Compensation of employees; C: Household consumption; PT-S: Indirect taxes (excluding subsidies); G: Government final consumption; D: Depreciation; I: Gross capital formation; OS: Operating surplus; E: Export of goods and services; M: Import; GVA: Total value added. X^{ii}: Intermediate consumption of region 1 using the product itself; X^{ij}: Intermediate cost of region *j* using regional products *i*; F^{ii}: final demand area *i* using the product itself; F^{ij}: final demand region j using regional products *i*; X^{Wi}: Import region i for intermediate costs; F^{Wi}: Import region *i* for the last bridge region I; (M): Total import; V^{Pi}: Value added of region *i*; GVA: Total value added; $F^{.ik}$: Final demand for using regional products.

3.2. Basic Equations

To analyze inter-regional feedback effects and the extent of change originating from anregion affecting levels of activity in other regions, Bui, Kim and Francisco T. Secretario [24] applied an inter-regional I/O model on a case study of Ho Chi Minh City and the rest of Vietnam. Harries *et al.* [25] separated Lincoln County into Caliente area and the rest of Lincoln County. Following the procedures outlined by Robinson [26], Holland [27], and Robinson and Lark [28], Harries *et al.* (1998) used an inter-regional model to provide local decision makers with an idea of potential socio-economic and economic impacts from changes in regional economic activity. The first model of interregional input-output is often used to analyze economic impacts and descriptions of product lines between regions to allow an estimate of the interplay between regions.

The basic relationship Leontief takes the form of:

$$A \cdot X + Y = X \tag{1}$$

Here: A is matrix of direct cost co-efficient, X is the production value vector, Y is the final use vector. In the inter-regional model, matrix A is divided as follows:

$$\mathrm{A} = \begin{bmatrix} A_{cc} & A_{cr} \\ A_{rc} & A_{rr} \end{bmatrix},\ X = \begin{bmatrix} X_c \\ X_r \end{bmatrix},\ \text{and } Y = \begin{bmatrix} Y_{cc} & Y_{cr} \\ Y_{rc} & Y_{rr} \end{bmatrix}$$

With: $A_{ij}\left(i, j = c, r\right)$ is a sub-matrix of matrix A representing the region j using the region's product at intermediate cost; X_c is the production value vector c and X_r is the production value vector of region r; $Y_{ij}\left(i, j = c, r\right)$ is the final use of regional products i.

$$\text{Call } B = \left(I - A\right) - 1$$

We have:

$$X = B \cdot Y$$

And:

$$B = \begin{bmatrix} B_{cc} & B_{cr} \\ B_{rc} & B_{rr} \end{bmatrix}$$

In principle, in case X is the production value matrix spread by the final use of each region, X is defined as follows:

$$X = \begin{bmatrix} B_{cc} \cdot Y_{cc} + B_{cr} \cdot Y_{rc} & B_{cr} \cdot Y_{rr} + B_{cc} \cdot Y_{cr} \\ B_{rc} \cdot Y_{cc} + B_{rr} \cdot Y_{rc} & B_{rr} \cdot Y_{rr} + B_{rc} \cdot Y_{cr} \end{bmatrix}$$

According to Miyazawa (1976) matrix B can be represented:

$$B_{cc} = \left(I\ - A_{cc} - A_c r \cdot \left(I - A_{cc}\right)^{-1} \cdot A_{rc}\right) \tag{2}$$

$$B_{rr} = \left(I - A_{rr} - A_{rc} \cdot \left(I - A_{rr}\right)^{-1} \cdot A_{cr}\right) \tag{3}$$

$$B_{cr} = B_{cc} \cdot A_{cr}\left(I - A_{rr}\right)^{-1} \tag{4}$$

$$B_{rc} = B_{rr} \cdot A_{rc}\left(I\ - A_{cc}\right)^{-1} \tag{5}$$

Otherwise:

B_{cc} includes *the multiplier effects:*

$\left(I - A_{cc}\right)^{-1}$

And *interregional feedback effects* (production value of region *c* is stimulated by production of other regions using input of region *c*):

$B_{cc} - \left(I - A_{cc}\right)^{-1}$

B_{rc} is *spillover effects*, meaning that one end user unit of zone c not only stimulates production of region c but also stimulates production value of other regions (region *r*).

In the case of studying a certain industry group in a region with other industry groups in that region and other regions, the matrix *A* is made into sub-matrices as follows:

$$A = \begin{bmatrix} A_{cc}^{ii} & A_{cc}^{ij} & A_{cr} \\ A_{cc}^{ji} & A_{cc}^{jj} & A_{cr} \\ A_{rc}^{ij} & A_{rc}^{ij} & A_{rr} \end{bmatrix}$$

And

$$X = \begin{bmatrix} X_c^{ii} \\ X_c^{j} \\ X_r \end{bmatrix}, Y = \begin{bmatrix} Y_{cc}^{i} & Y_{cr}^{i} \\ Y_{cc}^{j} & Y_{cr}^{j} \\ Y_{rc} & Y_{rr} \end{bmatrix}$$

From the relationship (1) we have:

$$X_c^i = \left(I - A_{cc}^{ii}\right)^{-1} \cdot \left(A_{cr}^{ii} \cdot X_c^j + A_{cr} \cdot X_r + Y_{cc}^i + Y_{cr}^i\right) \tag{6}$$

$$X_c^j = \left(I - A_{cc}^{jj}\right)^{-1} \cdot \left(A^{ji}{}_{cc} \cdot X_c^i + A_{cr} \cdot X_r + Y_{cr}^j + Y_{cr}^j\right) \tag{7}$$

$$X_r = \left(I - A_{rr}^{ii}\right)^{-1} \cdot \left(A_{hk}^{NR} \cdot X_c^R + A_{rr} \cdot X^R + Y_{rc} + Y_{rr}\right) \tag{8}$$

This shows that the production value of the *i* sector in a region depends not only on the final use of that sector but also on the production of other sectors in the same region and production in other regions.

Put:

$$v_i^c = V_i^c \big/ X_i^c \tag{9}$$

Here:

V_i^c s an added value vector of sector *i* region *C*;

X_i^c is the production value vector *i* of region *C*.

Rewrite according to the matrix we have:

$$V = v \cdot B \cdot Y \tag{5}$$

with:

$$v = \left(v^c, v^r\right)$$

$$v \cdot B = \left(V_c \cdot B_{cc} + V_r \cdot B_{rc},\ V_r \cdot B_{rr} + V_c B_{cr}\right) \tag{10}$$

Final use of the area includes products manufactured in region c and products manufactured in region *r*; the area of ts own use of the product will spread to the

added value of region c: $V_c \cdot B_{cc}$; The region using the product area r spreads to the value of adding r area: $V_r \cdot B_{rc}$. The same is for the final use of region r.

4. Experimental Results

Table 3 and Table 4 show that the value-added ratio compared to the output of the coastal zones is higher than that of the rest of Vietnam (31% compared to 26%). This leads to the fact that the coastal zones' output makes up a lower portion of the nation's gross output than the rest of Vietnam (49% compared to 52%), but the total added value of the coastal zones higher than the value added of the rest of Vietnam (53% compared to 47%). This is because the coastal zones economy is more involved in the value chain of products than the rest of Vietnam, or in other words, the economy of the rest of Vietnam is a more comprehensive outsourcing economy than that of coastal zones.

Interestingly and more importantly, coastal zones use fewer imported products in the process of creating one product unit than the rest of Vietnam by quite a margin (7% versus 33%), but interest ROV's use of local products and use of products is quite high: the coastal area uses 48% local products to produce 100 product units, while ROV only uses 28% own products. The product utilization rate of the outer region of the coastal area is also higher than that of ROV. This suggests that the economic connectivity of the coastal area is quite strong and that the influence of the coastal area on the national economy is much higher than the rest of Vietnam.

Table 5 shows that coastal zones products are used as inputs for more sectors (intermediate consumption) than the products of the rest of Vietnam (63% versus 41%). However, ROV products are used more for final demand (consumption, accumulation and export) than the products of coastal areas (59% versus 37%). Thus, it can be seen that marginal contribution is very important in the product chain of finished products. When considering the spread index and sensitivity, Figure 3 shows that both the power and sensitivity of dispersion indexes of the coastal zones are higher than the ROV. This shows the relative importance of coastal areas to the economy of the country.

Table 3. Ratios of Intermediate input and value added per output of regions CZ and ROV.

		CZ	ROV
Intermediate input	CZ	0.481	0.137
	ROV	0.146	0.276
	ROW	0.068	0.331
Total intermediate input		**0.695**	**0.743**
Gross value added		**0.305**	**0.257**
Gross Output		1.000	1.000

Source: Calculated by authors. Unit: Times.

Table 4. Proportion of intermediate consumption, value added and output of regions in Vietnam economy.

		CZ	ROV	Vietnam
Intermediate consumption	CZ	0.768	0.232	1
	ROV	0.332	0.668	1
	Total	0.162	0.838	1
Total intermediate input		0.468	0.532	1
Gross Value added GVA		0.528	0.472	1
Gross output		0.485	0.515	1

Source: Calculated by authors. Unit: Times.

Table 5. Intermediate demand and final demand in gross output.

		Intermediate demand		Final Demand		Total Demand (Gross Output)
		CZ	ROV	CZ	ROV	
Intermediate consumption	CZ	0.481	0.145	0.338	0.035	1.000
	ROV	0.137	0.276	0.026	0.561	1.000
	ROW	0.048	0.248	0.258	0.446	1.000

Source: Calculated by authors. Note: CZ-28 province in coastal zones of Vietnam, ROV-The rest of Vietnam; ROW-Rest of the World; GVA-Gross value added.

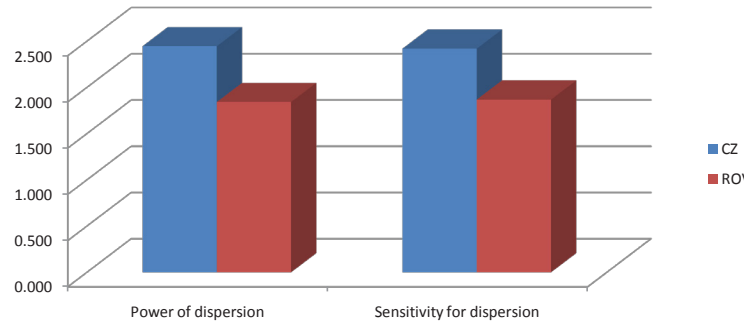

Figure 3. Power of dispersion and sensitivity for dispersion indexes of coastal zones (CZ) and ROV. Source: Calculated by authors.

A detailed analysis of the 26 sectors of the coastal zones (**Table 6**) shows that most marine-related industries have a good influence not only on their that region but also on other regional production (ROV), but the industry shows a high level of stimulation to other sectors, such as agriculture and services, forestry, fishery, crude oil exploitation, as well as other mining, food processing and manufacturing and processing industries, road transport services, warehouse services, communication services and medical services.

The most stimulating sectors to the regional economy and the general economy are seafood processing and preservation, other food processing industries, aquaculture and water and public goods transport, manufacturing and processing enterprises, passenger service...

Table 6. Multiplier effects, Interregional feedback effects and spillover effects on coastal zones production.

	Coastal							
	Output requiremenents	Average of Output requiremenents			In Which			
		Multiplier effects	Interregional feed back effects	Spillover effects		Average of Multiplier effects	Average of Interregional feed back effects	Average of Spillover Effects
1) Agriculture and agricultural services	2.364	1.978	0.0840	0.303	1.0698	1.0832	1.0097	1.005
2). Forestry	1.793	1.423	0.0369	0.333	0.8114	0.7797	0.4436	1.105
3) Aquatic products exploited	2.405	1.781	0.1412	0.483	1.0884	0.9757	1.6975	1.604
4) Aquaculture products	2.923	2.625	0.0644	0.233	**1.3225**	1.4381	0.7749	0.773
5) Crude oil exploitation	2.064	1.609	0.1023	0.353	0.9338	0.8811	1.2303	1.171
6) Natural gas or liquefied	2.062	1.981	0.0170	0.064	0.9329	1.0850	0.2041	0.212
7) Other mineral mining	2.297	1.792	0.1135	0.391	1.0395	0.9818	1.3648	1.300
8) Fishery and aquatic products processed and preserved	3.313	2.952	0.0797	0.281	1.4991	1.6169	0.9589	0.934
9) Other food processing industry	3.034	2.583	0.0959	0.355	1.3731	1.4149	1.1533	1.180
10) Other manufacturing and processing industries	2.471	1.858	0.1335	0.480	1.1181	1.0177	1.6054	1.593
11) Production of electricity, gas, hot water, air conditioning, water, waste water and waste treatment	1.717	1.481	0.0530	0.183	0.7768	0.8110	0.6377	0.608
12) Construction	2.416	1.824	0.1328	0.459	1.0933	0.9993	1.5963	1.524
13) Trade	1.863	1.613	0.0539	0.195	0.8428	0.8836	0.6484	0.649
14) Waterway passenger transport service	2.432	1.796	0.1436	0.492	1.1004	0.9839	1.7264	1.634
15) Waterway freight service	2.578	1.970	0.1365	0.472	1.1667	1.0788	1.6414	1.569
16) Other warehousing services	2.294	1.799	0.1112	0.384	1.0381	0.9856	1.3372	1.274
17) Delivery postage	1.653	1.419	0.0501	0.184	0.7480	0.7774	0.6028	0.609
18) Hotel, restaurant	2.425	2.045	0.0828	0.297	1.0972	1.1200	0.9957	0.986
19) Information and communication services	2.326	1.902	0.0942	0.330	1.0526	1.0420	1.1324	1.095
20) Banking and insurance financial services	1.830	1.653	0.0310	0.146	0.8282	0.9057	0.3729	0.484
21) Real estate business services	1.636	1.461	0.0385	0.137	0.7405	0.8004	0.4624	0.454
22) Other professional, scientific and technological services	1.900	1.616	0.0630	0.221	0.8599	0.8854	0.7576	0.733

Continued

23) Education and training services	1.612	1.422	0.0424	0.148	0.7296	0.7786	0.5096	0.492
24) Health services and social assistance	2.207	1.687	0.1175	0.402	0.9985	0.9240	1.4128	1.335
25) Art, entertainment and entertainment services	1.851	1.571	0.0615	0.219	0.8376	0.8603	0.7397	0.726
26) Other services	1.991	1.625	0.0818	0.284	0.9010	0.8901	0.9841	0.943
Total	2.210	1.826	0.083	0.301				

Source: Calculated by authors.

The comparing the impact of the final products to the added value of Table 7 shows that the effect of the coastal area is much higher than the rest of Vietnam, which strengthens the perception of regional products. Coastal participation in the value chain of the final product is much more than the products of the rest of Vietnam. If the coastal area is more focused on industries such as aquaculture, seafood processing and transportation, it will provide more stimulus to the economy to grow stronger.

Table 8 shows that the spread from the final products of the coastal zones is higher in both output and value added than the rest of Vietnam.

5. Conclusions

The coastal zones economy is closely correlated with the rest of Vietnam economy, which is the spearhead of the national economy. This paper tries an attempt to not only provide analysis from a development perspective but also quantify detailed calculation by inter-regional input-output framework, 2012 and 2016 with 26 products sectors, divided into coastal zones and rest of Vietnam.

This study quantifies the relationship of coastal areas and the rest of Vietnam in terms from final demand and production of this region to other regions.

This research also shows that most marine-related industries have a good influence not only on their that region but also on other regional production (ROV); the sectors shows a high level of stimulation to other sectors to be not only intra region but also other region, such as agriculture and services, forestry, fishery, crude oil exploitation, as well as other mining, food processing and manufacturing and processing industries, road transport services, warehouse services, communication services and medical services.

The most stimulating sectors to the regional economy and the general economy are seafood processing and preservation, as well as other food processing industries, aquaculture and water and public goods transport, manufacturing and processing enterprises, passenger service...

The limitation of this study applies only to the inter-regional input-output model for the two regions, which is the coastal area of Vietnam and the rest of Vietnam, It would be better if it was possible to establish inter-regional input-output tables

Table 7. Value added induced by a unit of the final demand.

	The value added of the coast zones is induced by a unit of final demand	The value added of ROV is induced by a unit of final demand
1	0.767	0.603
2	0.795	0.487
3	0.621	0.379
4	0.762	0.666
5	0.721	0.527
6	0.865	0.804
7	0.659	0.465
8	0.747	0.610
9	0.719	0.545
10	0.622	0.380
11	0.833	0.718
12	0.635	0.419
13	0.837	0.716
14	0.614	0.370
15	0.623	0.401
16	0.693	0.501
17	0.838	0.740
18	0.749	0.607
19	0.740	0.569
20	0.862	0.742
21	0.887	0.789
22	0.820	0.699
23	0.880	0.795
24	0.683	0.483
25	0.834	0.718
26	0.771	0.615
Average of induced impact to value added	0.7529	0.5904

Source: Calculated by authors.

Table 8. Induced impacts of final products to output and value added.

	CZ	ROV
Output	2.40	1.87
Value added	0.73	0.48

Source: Calculated by authors.

between many regions of Vietnam. It would be even better if it would link Vietnam's coastal region with other parts of Vietnam and the Mekong sub-region, which includes Cambodia, Laos, Thailand and Yunnan-China.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix 1. 26 sectors in interregional input-output framework.

No.	Name
1	Agriculture and agricultural services
2	Forestry
3	Aquatic products exploited
4	Aquaculture products
5	Crude oil exploitation
6	Natural gas or liquefied
7	Other mineral mining
8	Fishery and aquatic products processed and preserved
9	Other food processing industry
10	Other manufacturing and processing industries
11	Production of electricity, gas, hot water, air conditioning, water, waste water and waste treatment
12	Construction
13	Trade
14	Waterway passenger transport service
15	Waterway freight service
16	Other warehousing services
17	Delivery postage
18	Hotel, restaurant
19	Information and communication services
20	Banking and insurance financial services
21	Real estate business services
22	Other professional, scientific and technological services
23	Education and training services
24	Health services and social assistance
25	Art, entertainment and entertainment services
26	Other services

Source: General Statistic Office. Input output table 2012. Hanoi.

Appendix 2. 8 provinces/city in coastal zones.

1	Quảng Ninh
2	Hải Phòng City
3	Thái Bình
4	Nam Định
5	Ninh Bình
6	Thanh Hoá
7	Nghệ An
8	Hà Tĩnh
9	Quảng Bình
10	Quảng Trị
11	Thừa Thiên-Huế
12	Đà Nẵng City
13	Quảng Nam
14	Quảng Ngãi
15	Bình Định
16	Phú Yên
17	Khánh Hoà
18	NinhThuận
19	BìnhThuận
20	Bà Rịa-Vũng Tàu
21	Hồ Chí Minh City
22	Tiền Giang
23	Bến Tre
24	Trà Vinh
25	Kiên Giang
26	Sóc Trăng
27	Bạc Liêu
28	Cà Mau

Source: Resolution N 36 (2018) from Communist Party of Vietnam.

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Foreign Direct Investment (FDI) in Vietnam Economy

Bui Kieu Anh[1], Nguyen Quang Thai[2], Bui Trinh[2*]

[1]Vietnam Institute for Development Strategies, Hanoi, Vietnam
[2]Vietnam Development Research Institute, Hanoi, Vietnam
Email: *buitrinhcan@gmail.com

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Abstract

Foreign Direct Investment has positive impacts on developing economies, however without proper and effective policies in attracting and management of foreign investment, there can be negative impacts as well. This study attempts to provide a picture of foreign investment in Vietnam over the past time. The main research method used in the article is statistics analysis and Input-Output analysis method using data from Vietnam General Statistics Office, along with some contemporary policy discussion. A comprehensive statistical investigation shows that while FDI sector consistently accounts for about 20% of Vietnam GDP since 1995, this sector is becoming dominating in importing and exporting relatively to State and other non-State sectors. Besides, policies exercised by the Government are both showing signs of unfair treatment between FDI and domestic sectors and showing loopholes exploited by FDI firms (such as tax avoidance and price transfer). From the Input-Ouput analysis, we discovered that the sector which needs State investment the most—domestic sector with highest spillover effects to income and lowest to import—is begin neglected in favor of FDI sectors. Consequently, this has created a fragmented domestic economy that is assembly-based and not fully utilising its manufacturing potentials. Some recommendations drawn from the study are: increase effectiveness of policy in attracting and using foreign investments; ensure fairness in treatment between foreign and domestic firms; create incentives to boost domestic manufacturing; priorities foreign capitals which have positive spillover effects and technology transfer.

Keywords

Domestic, Enterprise, FDI, GDP, GNI, Input-Output, Investment, Export, Import

1. Introduction

Foreign direct investment (FDI) has a very important meaning both in the start-up phase of the economy, as well as in the depth of development, on the way of industrialization, modernization and development of knowledge economy. This is because foreign direct investment is a very important source of supplementary capital to the total investment capital and contributes to economic growth. Since 1978, when the Law on Foreign Investment of Vietnam [1] was passed, a large amount of foreign capital was attracted, making important contributions to economic development, stimulating exports and improving quality of human resources, technology, and an important premise for Vietnam's economic growth. On the other hand, attracting foreign direct investment is also one of the main objectives in Vietnam's socio-economic development.

Although attracting foreign direct investment is very important to mobilizing and long-term usage of capital, it is necessary to select and make policies suitable to each stage of development. In recent years, FDI enterprises in Vietnam have enjoyed many incentives from tax and land policies which, in turn, have caused many difficulties and disadvantages for domestic enterprises. This article aims to assess the status of the FDI sector's contribution as well as Vietnam expectations for FDI enterprises. Through analysis, some recommendations will be given to domestic businesses and to the state to have appropriate policies that ensure mutual benefits for all kind of business and harmonize with the country's interests.

Vietnam Investment Law [2] stipulates that: Foreign direct investment is when foreign investors bring into Vietnam capital in cash or any assets to invest, investors may be an organization or individual. There are also a number of widely recognized definitions of FDI:

Foreign direct investment (FDI) is a foreign-owned capital of assets such as factories, mineral mines and land in countries, but does not include securities. It is also possible to understand that direct investment is a long-term form of investment by an individual or company investing in another country by establishing a business-production facility, in which an individual or foreign company that will take control of this business in the country where the investment is made.

The World Trade Organization (WTO) has also made the following definition of FDI: Foreign direct investment is made when an investor from a country (called the investor country) acquires investment assets in order to invest at another country (the host country that attracts investment) along with the right to manage the property. Direct management is a sign to distinguish FDI from other financial instruments such as securities and credit. Thus, it can be seen that FDI has the following basic characteristics:

- There are elements of investment capital from abroad (may be individuals or organizations, businesses);
- Use that capital to invest abroad by setting up new assets;

- The foreign party has the right to manage the use and exploitation of such capital.

Economists have come up with explanations on why FDI exists and the phenomenon of moving capital from one country to another. This is because there is a difference in the productivity of the increase in the marginal productivity—the amount of output that a manufacturer can obtain by using an additional unit of production factor of capital between countries. Therefore, some countries are both foreign capital investor and receiver. A "capital surplus" country in a certain field often has lower marginal productivity when using it in another country, because it has reached "critical" point. A "capital deficit" country often has a higher marginal productivity, due to many untapped potentials. This situation will lead to the movement of capital from surplus to relatively scarce places, in order to maximize profits because the production costs of "excess capital" countries are often higher than those of "capital deficit" and wishing to receive capital.

Growth theories often focus on production factors, typically the notions of Ricardo, Smith, Karl Marx, which are followed by the Solow-Swan model [3] [4] as a model of exogenous growth, capital, labor, technological processes, management methods… (total factor productivity—TFP). Next Paul Romer [5] and Robert Lucas (1988) [6] put technological progress and the role of human capital as the central point of their theoretical model. It was Robert Barro [7], Barro JR, Sala-i-Martin [8] who emphasized not only the technological process, but also human capital and public policies as contributors to the increased continuous growth.

The Input-output analysis is also used in this study. There are not many studies using the I/O model to assess the impact of FDI. Some related studies such as Shri Prakas, Shalini Sharma and F. Kasid [9] in IIOA conference at San Paolo presented the approach input output model of impact of FDI on Indian economic growth, Bruno de Souza Lopes *et al.* [10] used input output approach in order to compared Foreign Direct Investment versus Domestic Investment, Trinh Bui and Pham Le Hoa [11] used also input output approach for comparing structure of Vietnam economy and China economy. Research on Vietnam Economic Structure Change based on input output system also mention Ha *et al.* [12].

This study indicates that the foreign-invested sector may increase GDP but may also reduce the economy's resources, which can make the gross national income (GNI) smaller and the flow of money going abroad is getting bigger and bigger, while people and host countries hardly get any benefits from FDI enterprises.

2. Methodology and Data Sources

This study is based on the criteria of the System of National Accounts (SNA), the path from income generation to income distribution and redistribution is ex-

pressed through macro indicators such as export, import, GDP, GNI.

Another study by Leontief [13] [14] also used input-output analysis approach in order to find the induced impacts by final demand to output, value added and import. In this research the gross capital formation was divided into state, non-state and FDI areas. Data in this research are available in website of GSO, and the input-output table was updated in 2016.

- Approach update input-output table 2016:

+ Based on structure of the input-output table, 2012 with competitive import-type and row vectors as intermediate input and gross input collected by enterprise survey. Call II (2012) and II (2016) are intermediate input vectors in 2012 and 2016; GI (2012) and GI (2016) are gross input vectors in 2012 and 2016, element of intermediate input matrix defined as follow:

$$Xij(2016) = \left(Xij(2012)/II(2012)\right) * II(2016)$$

+ Household consumption was collected by VHLSS survey.
+ Export and import based on report of Vietnam general statistics office.
+ Gross capital formation was collected by report of provinces and enterprise survey.

After that the Ras[1] [15] method was used for balancing gross input and gross output.

- Apply input-output system:

The standard Leontief (1941) was solving:

$$X = \left(I - A^d\right)^{-1} * Y^d \tag{1}$$

where: X is an output matrix that is induced by factor of domestic final demand; A^d is domestic direct intermediate coefficient matrix, Y^d is domestic final demand matrix, dimension of this matrix is number sectors in row and factors on domestic final demand (final consumption, gross capital formation of state area, gross capital formation of non-state area, gross capital formation of FDI area and export).

From (1) we have:

$$V = v * \left(I - A^d\right)^{-1} * Y^d \tag{2}$$

With: V is value added matrix and v is their coefficient matrix

And:

$$M = m * \left(I - A^d\right)^{-1} * Y^d \tag{3}$$

With: M is import vector and m is their coefficient vector

From (1), (2), (3), the induced impact of output, value added and import defined as follow:

[1]Some experts believe that the RAS method is named after the economist Richard Stone (1919-1991), who, among his other achievements, co-authored the 1968 SNA together with Abraham Aidenof. His full name was John Richard Nicholas Stone. He did not have "A" as his middle initial so there must be another explanation for RAS.

Output multipliers:

$$X \div \sum Y \tag{4}$$

Value added multipliers:

$$V \div \sum Y \tag{5}$$

Import multipliers:

$$M \div \sum Y \tag{6}$$

where: ÷ shows scalar division.

The data of these indicators are collected at the General Statistics Office (GSO) [16], an office under Vietnam Ministry of Planning and Investment. This data are from 1995 to 2017 and preliminarily calculated in 2018. Therefore, the data evaluated here are relatively long-term (in 22 years). Vietnam experienced important milestones during this period, such as: officially normalized relations with the United States in 1995; officially became a member of WTO in 2007; became a low-middle-income country in 2010.

As the data is compiled from the General Statistics Office, this ensures consistency in calculation and definition of figures. However, the data does not show particularly where FDI comes from (*i.e.* which country, which times). This is a major setback for FDI statistics in particular but also for Vietnam in general. For example, export and import data only became available recently from Ministry of Industry and Trade. In the framework of analyzing data from the General Statistics Office, the analysis in part (3) and policy recommendations in part (4) focus on clarifying the current status of FDI in Vietnam in more than 20 years (not clarifying Vietnam's trade relations).

3. Status of Foreign Direct Investment in Vietnam

Although the flow of investment from the FDI sector is expected to generate growth for Vietnam, according to the General Statistics Office (GSO) the proportion of investment capital of the State economic sector still accounts for the largest proportion and if compared 2013 to 1995, only decreased by 1.6% points (from 42% down to 40.4%). Particularly since Vietnam joined the WTO in 2007, the investment capital of the state economic sector has tended to increase, while the non-state and FDI sectors tend to decrease (**Table 1**).

Although the FDI sector's capital accounts for only about 22% of the total capital, the import-export value of this sector increasingly accounts for a significant proportion of the total import-export value (**Table 1**). From 2000 up to now, Vietnam has always had high trade deficits, highest in 2008 with a total trade deficit of over $18 billion. For a developing economy like Vietnam, trade deficit is not necessarily bad, if imported goods serve the demand for production and for domestic consumption. However, in fact, the imported goods mainly serve the FDI sector, an area where most of the machinery, equipment, materials, raw materials, etc.are used for production are mainly imported, then again

Table 1. Structure of investment by types of ownership.

Year	Structure (%)			
	Total	State	Non-state	FDI
1995	100.0	42.0	27.6	30.4
1996	100.0	49.1	24.9	26.0
1997	100.0	49.4	22.6	28.0
1998	100.0	55.5	23.7	20.8
1999	100.0	58.7	24.0	17.3
2000	100.0	59.1	22.9	18.0
2001	100.0	59.8	22.6	17.6
2002	100.0	57.3	25.3	17.4
2003	100.0	52.9	31.1	16.0
2004	100.0	48.1	37.7	14.2
2005	100.0	47.1	38.0	14.9
2006	100.0	45.7	38.1	16.2
2007	100.0	37.2	38.5	24.3
2008	100.0	33.9	35.2	30.9
2009	100.0	40.5	33.9	25.6
2010	100.0	38.1	36.1	25.8
2011	100.0	37.0	38.5	24.5
2012	100.0	40.3	38.1	21.6
2013	100.0	40.4	37.7	21.9
2014	100.0	39.9	38.4	23.3
2015	100.0	38.0	38.7	23.3
2016	100.0	37.6	39.0	23.4
2017	100.0	35.7	40.6	23.7
Prel. 2018	100.0	33.3	43.3	23.4

Source: Vietnam GSO.

are used for export. Some major exporting products of Vietnam such as electronics; computers and components; phones and components; textiles; footwear…, are heavily assemble-based in nature, have low value-added content, the efficiency of the economy is not significant. According to research on trade deficit and GDP growth rate in the period of 2000-2016, whether trade deficit is high or low, GDP still grows well in this period. In 2012, trade surplus was $284 million, GDP growth still reached 5.03%, even though it was low in the past 12 years.

The statistics also show that since the WTO accession (2007), the openness of the Vietnamese economy was huge, the export of goods in the period of 2007-2016 increased by 364%, the import of goods increased 279%. However, considering the ownership, it can be seen that the FDI sector increased much faster than the domestic sector: the export of FDI in this period increased by 454% and the import of goods of the FDI sector increased by 472%, the average export growth rate of the FDI sector in the period of 2007-2016 is about 21%

annually and the average growth of import of FDI sector is about 22% annually, while the export and import growth of the domestic sectors in this period is 11% and 7% annually respectively. The import and export structure also shows that the FDI sector is rapidly gaining market share of exports and imports. In 2005 exports of FDI sector accounted for about 57% of the total export value In 2016 the region's exports sector accounts for 72% of the total export value; similarly, the import structure of the FDI sector also increased from 35% in 2005 to 59% in 2016.

Import and export trends of the FDI sector are also increasingly "dominating", gradually occupying the market share of the domestic economic sector. The export structure of the domestic economic sector in 1995 accounted for 73% of total export turnover by the year 2000 it was 52.98%, down to 27.5% in 2017. Meanwhile, the FDI sector increased from 27% in 1995 to 47.02% in 2000 and 72.5% in 2017. Import structure also changed significantly, as the domestic economic sector "yielded" 33.2% market share to the FDI sector in the period 2000-2017 (**Figure 1** and **Figure 2**).

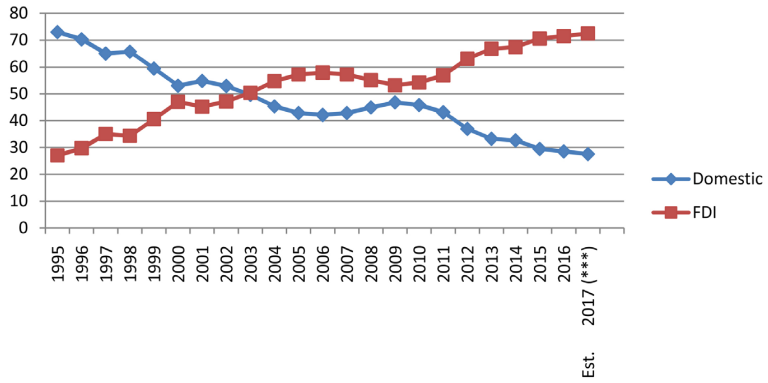

Figure 1. Structure of goods exports in the period 2000-2007 (%). Source: Authors' calculation from GSO data.

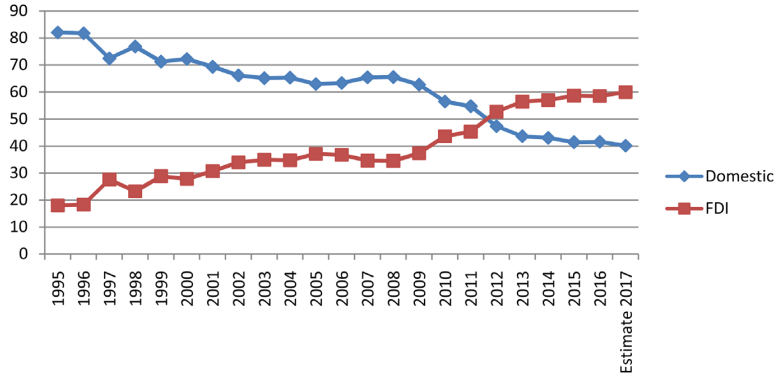

Figure 2. Structure of goods imports in the period 2000-2007 (%). Source: authors' calculation from GSO data.

In recent years, many policy makers and experts have been optimistic because Vietnam export of goods has been a trade surplus. While domestic economy sector experienced trade deficit from 1995 to 2017, foreign investment sector has always enjoyed trade surplus. In 1995 the foreign invested sector only had a trade surplus of $5 million; in 2017 the trade surplus of this region was over $25 billion. In comparison, domestic area's trade deficit in 1995 was about $2.7 billion and in 2017 was over $25 billion. Thus, we can see that the total trade surplus or trade deficit is brought by the foreign invested sector. Does this indicate that praising trade surplus actually is praising the outsider's money?

According to GSO, the export of FDI sector is very large (72.5% in 2017) but the value adding to GDP only accounts for 18% of the total export value (**Figure 3**). Even though in the FDI sector's exports which are including exports of resources (coal, oil, etc.), the ratio of intermediate costs is not high, but the proportion of value increases of this area in total GDP is only approximately 20%. In fact, the contribution of the FDI sector to GDP of 20% is not small while the private sector only contributes about 10%, the contribution of the state economic sector accounts for 32% including State-owned enterprises' contributions to state management and non-business activities (money from recurrent budget), estimated contribution of state-owned enterprises to GDP is about 20%[2]. The largest contribution to GDP is the household sector accounting for 33% of GDP, once again affirming that Vietnam's economy is not only a processing economy but also one that is very fragmented. One country cannot grow if the economy is based on manufacturing and small households. Unfortunately, this proportion has not changed noticeably since 2005 (**Table 2**).

The production of the foreign investment sector is mainly for processing and the portion of the export of this sector is only in the processing, the value added is extremely low in the export value. In essence, export from this sector is the export from the owner's country exploiting Vietnamese market's favoring conditions to other third-party countries. If goods are produced by foreign investment sectors but sold in Vietnam, they are in fact exported to Vietnam and have higher profits when they produce in their home countries and then export to Vietnam because they enjoy many advantages and cheap labor. This is partly reflected in the contribution of the FDI sector to GDP although the export value is very large but the value added of this sector in GDP is low (only about 18%). Based on estimated net foreign ownership payment data in 2018, it shows that net foreign ownership is of more than $20 billion, in which more than $10

[2]Currently, economic situation assessments are often tied to targets. GDP in Vietnam today is not only calculated but also recognized in terms of supply side, that is to add all value-added by basic prices of industries in the economy and product tax (in Value added according to the calculation method of Vietnam Statistical Office does not include product tax) on the principle of permanent residence, for example a FDI enterprise operating in the territory of Vietnam for more than one year, the entire value The increase of that enterprise is included in Vietnam's GDP, an FDI enterprise exploiting natural resources in Vietnam is also calculated according to the above principle. Thus, the growth in scale as well as the number of GDP indicators does not really reflect the picture of the economy, such as FDI enterprises specializing in resource exploitation, they will transfer profits to their country but the figures are still reflected in Vietnam's GDP.

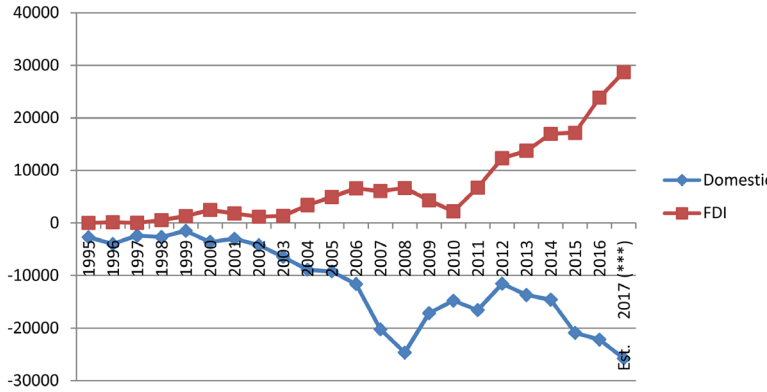

Figure 3. Net export of domestic economic sector and foreign invested sector (USD million). Source: Vietnam GSO.

Table 2. Proportion of GDP contribution of economic sectors (%).

	Total	State economic sector	Non-state economic sector	In which by types:			Foreign invested sector
				Collective	Private	Household	
2005	100	37.6	47.2	6.6	8.5	32.1	15.2
2006	100	36.7	47.2	6.3	9.0	31.9	16.1
2007	100	35.3	47.7	6.1	9.7	31.9	17.0
2008	100	35.1	47.5	5.9	10.2	31.4	17.4
2009	100	34.7	48.0	5.8	10.5	31.7	17.3
2010	100	33.5	48.8	5.3	10.7	32.8	17.7
2011	100	32.7	49.3	5.2	10.9	33.2	18.0
2012	100	32.2	48.3	5.0	10.9	32.3	19.5
2013	100	32.3	48.4	4.5	8.7	35.3	19.3
2014	100	31.9	48.2	4.5	8.7	35.0	19.9
2015	100	31.9	48.0	4.5	8.8	34.8	20.1
2016	100	32.0	47.3	4.4	9.1	33.8	20.7
2017	100	28.63	41.74	3.76	8.64	29.34	19.63

Source: Statistical yearbook of vietnam (various years) [17].
http://www.gso.gov.vn/default.aspx?tabid=388&idmid=3&ItemID=14481.

billion is for debt repayment and more than $10 billion is for a legal money transfer abroad and on average FDI sector paid about $7.5 billion in tax, in which essentially VAT is not the money of the FDI sector but the money of Vietnamese consumers contributing to the budget through the consumption of products from this sector. This is not to mention how businesses can bring products into and out of Vietnam, which are very difficult to grasp, so the real profit may have been located overseas but Vietnam cannot know and cannot tax, this part of tax payment may have been enjoyed by the FDI enterprise originating country.

According to the principle of the National Account System (SNA) resident

unit, the value added of the foreign capital sector is accounted for GDP, and then businesses in this sector can keep the profit to re-invest and also transfer money to the "mother" country (originating country).

GNI = GDP + property income − property payment

Cash outflow = property income − property payment

Thus, although the foreign capital sector adds up significantly to GDP growth, it nevertheless contributes considerably to net foreign cash outflow to be faster than GDP growth rate. The average GDP growth by current price during the period of 2007 - 2017 is 22% while the growth rate of cash outflow is 32%, thereby reducing the ratio of Gross National Income (GNI) to GDP from 97.2% in 2000 to 95.2% in 2017. Almost similarly is the final consumption of the population, when banks lend out money for consumption, it will make the final consumption of the population increase, leading to the increase in GDP at the time, but the complications accompanied are the risk of bad debt, inflation and decreased savings of the household in the next cycle. Similar argument can be made about government procurement, an increase in government procurement will lead to an increase in GDP but also budget deficit, overspending. Investing in projects such as monumental construction, gates, road digging filling also increases GDP but leads to a higher ratio of savings-to-investment and debt risks increase. This is the reason many experts believe that the higher the GDP growth, the more the country's resources are reduced when growth is based on the foreign capital sector or procurement-driven as above.

Therefore, the growth of the FDI sector can increase GDP but make the economy a shrinking resource through the targets of GNI, NDI and Saving of the economy, while those of the originating country through FDI enterprises increased. One problem is that in addition to the good management and capital source of the FDI sector, Vietnamese policies are too favoring this sector, while domestic non-state enterprises are not entitled to incentives. It is impossible to understand what people think when exempting processing enterprises from taxes (basically FDI are processing firms), if the domestic enterprises also import those goods for domestic production, they are taxed for import and VAT of imported goods but those who do processing are exempted from tax[3]. So, what other incentives to businessmen not to only process? So how can the manufacturing industry of auxiliary products be developed? In addition, FDI enterprises are entitled to corporate income tax incentives "*newly established enterprises from investment projects in the economic zone are entitled to the tax rate of* 10% *for* 15 *consecutive years from the first year that revenue is generated*" and then receives further incentives "*In addition, businesses operating in the economic zone will be exempted from corporate income tax for* 4 *years from the time the business has taxable income and* 50% *reduction in the next* 9 *years*". It is comparable to say, agricultural emphasis is needed, but agricultural production and

[3]Pursuant to Point a, Clause 1, Article 10 of Decree No. 134/2016/ND-CP of September 1, 2016 of the Government, stipulates: "Article 10. Tax exemption for goods imported for processing or export processed products".

agricultural inputs such as pesticides are "entitled" to a non-taxable policy, ie the input VAT is not deducted, while being exported by the "household" is "subject" to the tax rate of zero, *i.e.* it is both not taxable and deducted from input VAT. Why are domestic enterprises selling domestic products not entitled to preferential tax policies but only FDI enterprises enjoy? Vietnamese people have suffered from hardships for long, should they continue to suffer?

Thus with such a tax preferential policy is one of the reasons that the structure of the domestic private enterprise sector could not exceed 8% - 9% of GDP during the past 15 years,. In GDP, only the transition between the two favored areas is the state-owned enterprises and the FDI sector. If nothing changes or only changes in words, then the individual economic sector will remain dominant for many years (contributing over 30% of GDP) while the FDI sector is not managed and tightly bound. Thus, the integration of CPTPP will be the only playground of FDI enterprises and other countries.

When examining the issue in a comprehensive way based on the updated input-output model for 2016, this model shows the spillover effect of final demand elements including final consumption, investment (investment of state economic sector, non-state economic sector and FDI sector) and exports to production value (output) and income from production (added value). The calculation results indicate that although the non-state economic sector has a lowest effect to production value, it has a highest effect to income and lowest to import. The basic principle when choosing a key industry or choosing the factors of the final demand is to consider which sectors or factors of demand have a high spillover-coefficient to income and a low spillover-coefficient to import, therefore policy makers can intervene to stimulate production and control import. From 2007 up to now, the State's policies have tried to manage the demand, curb inflation and stimulate economic growth. It is nothing wrong with management of demand to stimulate production in the short term, but according to Keynes's general theory, demand management should only be momentary and should not be done for a long time. Most importantly, if intervention in demand is decided, which factors will be most beneficial to the economy? For many years, the government has stimulated economic growth through increasing public investment, while actually public investment has the lowest effect to income (investing 100 VND only spread to 27 VND of income, while 100 VND invested in non-state sector can spread to 35 VND of income—**Table 3**). Tax policies for export seem to be a mistake when export of host country is actually export of other countries in a machining economy. The priority for export not only brings low value-added but also constrains the non-state economic sector to develop and increases the trade deficit as well as the balance of payments deficit. **Table 3** was calculated which was based on Equations (4), (5) and (6) above.

4. Conclusions and Some Policy Recommendations

Vietnam has signed many multilateral and bilateral trade agreements, in an open

Table 3. Output, value added and import induced by domestic final demand (Equations (4)-(6)).

	Final consumption	Gross capital formation of State area	Gross capital formation of Non-State area	Gross capital formation of FDI area	Export
Output	1.63	1.70	1.62	1.68	1.73
Value added	0.35	0.27	0.35	0.28	0.27
Import	1.36	1.50	1.38	1.50	1.50

Sources: Authors' calculation based on vietnam input-output, 2016.

and integrated world, the flow of foreign investment directly or indirectly into Vietnam is inevitable. What do the government and the people expect from this capital inflow into Vietnam? Firstly, they expect to attract the workforce, technology transfer, but perhaps the most likely is the achievement-driven motives from the Central to Local administration levels, when capital flows into any province their GRP and national GDP increases despite the fact that Vietnamese people do not considerably benefit from this, but only some people benefit from this growth achievement.

In fact, some experts "complain" about this sector not because they are against it but they see an unjust treatment in implementing policies between different types of businesses since due to foreign investment tax incentives Vietnamese people have to bear additional tax burden. So the first thing to do is to *eliminate the achievement-driven motives and tenure culture* of the leadership levels, followed by a *real just of both policy and policy implementation*. In addition, it is not that experts who often write and talk about foreign-invested sector do not have hope in this capital flow, but rather they expect a boost in *economic structural change*, a promotion in transparency and equality so that domestic enterprises have a motivation to compete healthily with foreign-invested enterprises. To do so, it is necessary to *push back and proceed to eliminate petty corruption*, it is the petty corruption that terribly discourages the terrible domestic enterprises, they must compete by bribing, bribing to shake hands with officials.

When attracting foreign capital, "people of authority" need to firstly think about the benefits of the country, of Vietnamese people in the short, medium and long terms. Thus, it is necessary to introduce principles of *technology transfer* after a certain time. It is necessary to regulate enterprises with foreign capital on *labor use in quantity as well as in quality*. Priority should be given to attracting foreign investment flows into industries with *high spillovers to other sectors, low spillovers to imports, energy and environment*. But the important thing is that domestic businesses have to raise themselves; if a domestic enterprise refuses to stand up or cannot stand up, it is not the fault of foreign-invested enterprises. If the situation does not change, the economy will be the economy of foreign businesses. That's okay but sad! It may not be sad because working for anyone is working as a laborer, but working for the righteous people is still better.

Enterprises with foreign capital, according to a senior official of the Ministry of Industry and Trade in a recent conference on December 3 between Da Nang University of Economics and Hanoi Foreign Trade University, are more righteous than domestic businesses.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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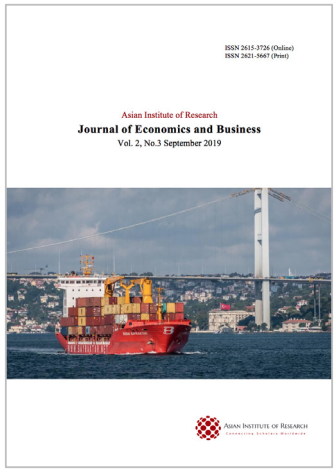

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Some Issues on Vietnam Economy

Nguyen Quang Thai[1], Bui Trinh[2], Vu Tuan Anh[3], Nguyen Hong Nhung[4]

[1] Professor, Dr. Vietnam Development Research Institute
[2] Dr. Vietnam Development Research Institute
[3] Dr. Vietnam Development Research Institute
[4] Dr. Student, MS, Vietnam Development Research Institute

Correspondence: Bùi Trinh. Email: buitrinhcan@gmail.com

Abstract
Vietnam's economy in innovation has experienced many great achievements. The distance calculated according to the ratio of economic scale, export promotion, attraction of foreign direct investment capital, job creation for young workers, accelerating urbanization. However, looking inside the economy, we can see that productivity, quality, efficiency and competitiveness are not high, because of using the old growth model, with inputs with increasing material consumption. In addition, large budget spending is caused by a bureaucratic bureaucracy, with little resources available for development investment.Taxes and fees are still unreasonable. The lack of capital mobilization of FDI has resulted in a widening gap between GDP and GNI. Human resources lack intensive training so productivity is not high. The risk of inflation is still lurking. The economy needs to continue going strong reforms

Keywords: Vietnam Economy, State Budget, FDI, Inflation

Introduction

Vietnam has a ritual culture that values form more than content, even covering content, this research tries to describe a part of Vietnam's economy through some indicators of total domestic products (GDP), GNI-gross national income, property income, about the current operational status of the enterprise through the annual enterprise survey of the General Department of Statistics, on inflation risks, on budget revenue and expenditure and some recommendations to overcome these limitations.

There are many articles about the Vietnamese economy, but most are reporting achievements, but there are also articles that are well-researched such as Pham Quang Ngoc el al (2007), Nguyen Quang Thai and Bui Trinh (2010) on analysis of the components contributing to economic growth, Nguyen and Bui (2011) on Vietnam Public Debt in the safe limitation, Hoa.P.L(2010), T. Bui el al (2012), T.Bui, Bui Quoc (2017), Bui KieuAnh el al (2019)
This research is using available data of the General Statistics Office, the Ministry of Finance, and the State Bank.

GDP and net property income

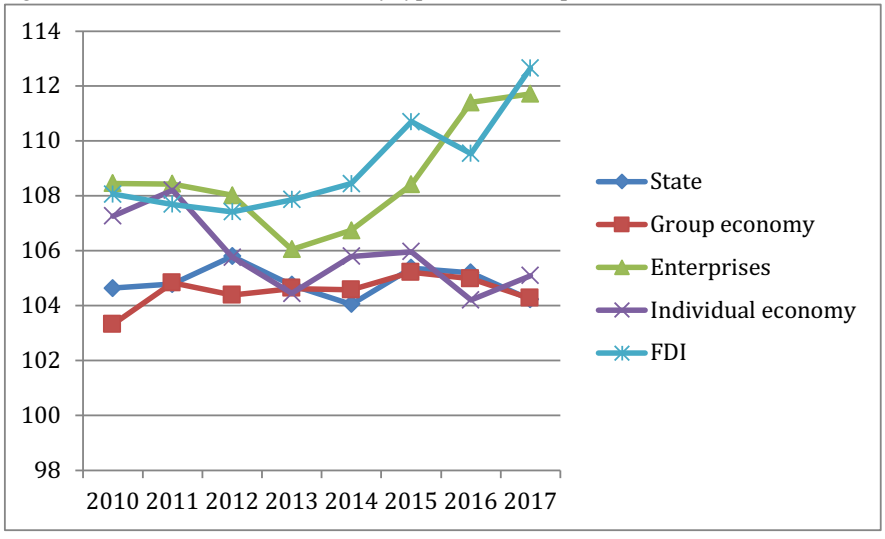
The average GDP growth of Vietnam in the period of 2010 - 2017 is about 6%, the growth rate is relatively high compared to other countries in the region. In terms of ownership structure in GDP, contribution to GDP is basically from the individual sector. In the period from 2010 to 2017, this rate decreased by 2.7%. The share of the state economy also decreased slightly from 29.34% in 2010 to 28.63% in 2017 (down about 0.7%). Meanwhile, the non-state sector has increased by less than 1%; The area of enterprises with foreign direct investment (FDI) increased by about 3%. Ownership structure shows that the Vietnamese economy is very fragmented, and there is almost no significant structural change. Small and medium-sized enterprises are still unable to grow, the share of value-added of this sector in GDP is very low (less than 10%) and almost unchanged during the 8 years (2010 - 2017). This shows that when the number of domestic enterprises increases or loses, it is only a change in quantity, while the value does not seem to change. The contribution of the foreign-invested sector increased from 15.2 in 2010 to 19.6 in 2017. The largest contribution to GDP is still the individual economic sector! However, the growths of the foreign-invested sector and the private sector (enterprises) have the most stable growth (table 1 and figure 1).

Table 1. Structure of GDP at current price by type of ownership (%)

	2010	2011	2012	2013	2014	2015	2016	Sơbộ 2017
GDP	100,00	100,00	100,00	100,00	100,00	100,00	100,00	100,00
State	29,34	29,01	29,39	29,01	28,73	28,69	28,81	28,63
Non-State	42,96	43,87	44,62	43,52	43,33	43,22	42,56	41,74
Collection	3,99	3,98	4,00	4,03	4,04	4,01	3,92	3,76
Enterprises	6,90	7,34	7,97	7,78	7,79	7,88	8,21	8,64
Household	**32,07**	**32,55**	**32,65**	**31,71**	**31,50**	**31,33**	**30,43**	**29,34**
FDI	15,15	15,66	16,04	17,36	17,89	18,07	18,59	19,63
Tax on products less subsidies.	12,55	11,46	9,95	10,11	10,05	10,02	10,04	10,00

Source: General Statistics Ofice. Gso.gov.vn

Figure 1. Growth rate of value added by type of ownership



Source: VietnamGeneral Statistics Ofice. Gso.gov.vn

According to the principle of the System of National Account (SNA) permanent resident, the value-added of the foreign capital sector is accounted for GDP, then businesses in this region can keep the profit re-invested and can also transfer money to the "mother" country. Thus, although the foreign-invested sector contributes significantly to GDP growth, it also contributes significantly to flow cash go out to foreign faster than GDP growth, average GDP growth by the current price. In during the period of 2007 - 2017 is 22%, while the growth of the net, property payment is 32%, thereby making the ratio of Gross National Income (GNI) to GDP decreased from 97.2% in 2000 to 95.2% in 2017. This is the reason that some experts believe that the more growth of GDP, the more resources of the country will be reduced when growth is based on the foreign-invested sector. The real resource of the economy is saving, savings begin to form from the GDP plus property income minus property payment (net, property income) plus pure transfer except for final consumption; If net, property income is a negative number and this negative number is increasing leading to smaller and smaller savings. Savings are the basic source of investment, if savings are always smaller than the amount needed to invest, the demand for loans will be greater (table 2). Is that the reason why GDP is so high that debt must pay more and more? So, the rise of GDP is like a serious patient who adorns his face to hide his illness? Reasonable, is Vietnam's economy in this situation?

Table 2. GNI, GDP and net, property income

	GNI (Billion Vietnamese dong)	GDP (Billion Vietnamese dong)	Net, property income (Billion Vietnamese dong)	GNI/GDP)%)
2007	1,211,806	1,246,769	-34963	97.2
2008	1,567,964	1,616,047	-48083	97.02
2009	1,731,221	1,809,149	-77928	95.69
2010	2,075,578	2,157,828	-82250	96.19
2011	2,660,076	2,779,880	-119804	95.69
2012	3,115,227	3,245,419	-130192	95.99
2013	3,430,668	3,584,262	-153594	95.71
2014	3,750,823	3,937,856	-187033	95.25
2015	3,977,609	4,192,862	-215253	94.87
2016	4,314,321	4,502,733	-188412	95.82
2017	4,764,958	5,005,975	-241017	95.19
Average growth during 2007-2017 (%)	21.60	21.97	31.76	

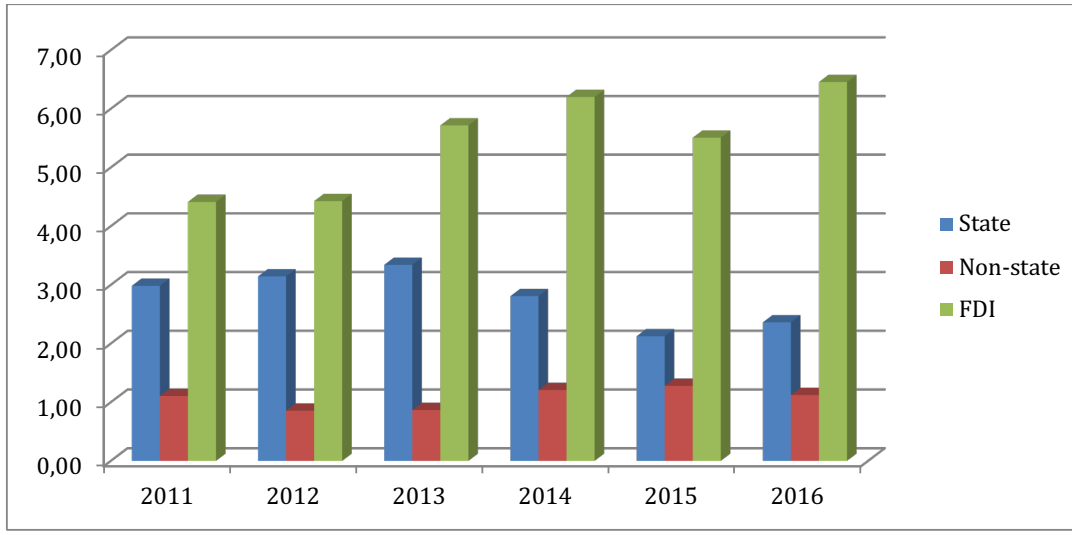
Source: Vietnam GSO. www.gso.gov.vn

Eenterprisessituarionin Vietnam

According to the enterprise survey data, the number of non-state enterprises by the end of 2016 accounted for about 97% of the total number of enterprises (including State-owned enterprises, non-state enterprises, and foreign-invested enterprises). The Government has also issued a number of policies to support small and medium enterprises such as: Information, consultancy, human resource development, the transformation from business households, a creative start-up, participation in an industry association, value chain ... These policies are what

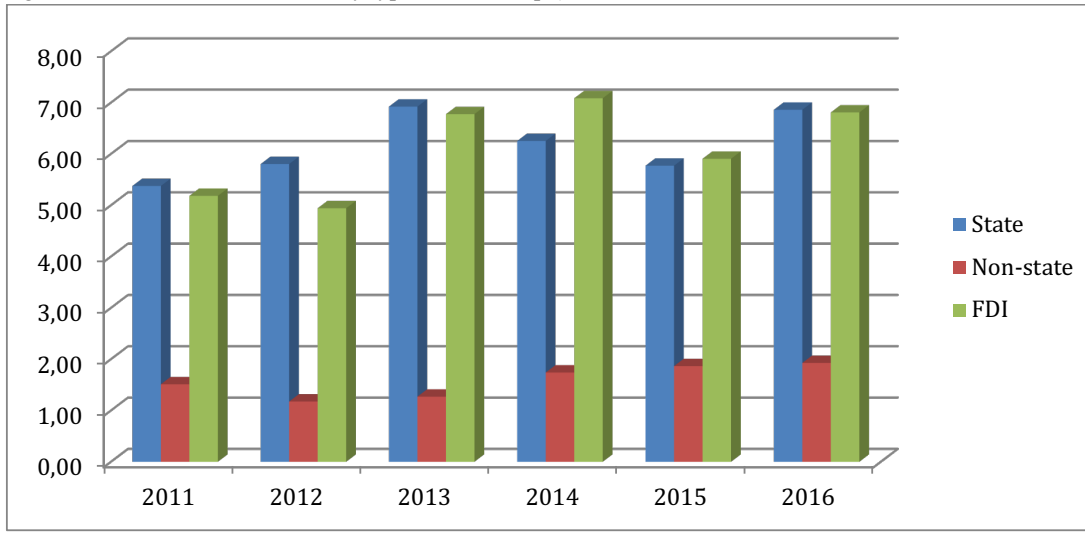
small and medium enterprises need but not enough, the most important policy that small and medium enterprises really need is policies on taxes, customs, access to capital, and land. A fair and transparent way to avoid small and medium enterprises legal risks. In many countries around the world, small and medium enterprises always play an important role and position in socio-economic development. In order for small and medium enterprises to develop, contributing positively to economic development. - National society, each country has its own development policies, in which financial mechanisms and policies are the most important factor. Comparison of small and medium-sized enterprises for state-owned enterprises and foreign-invested enterprises showed that the number of small and medium enterprises accounted for the highest proportion in the period of 2011 - 2016, State enterprises in 2016 only accounting for 0.6% and foreign-invested enterprises about 2.8%. But the small and medium-sized enterprises have very low-profit margins per capital, in 2016 this ratio of the non-state economic sector was only half of the state sector and one-sixth of the area with foreign capital investment (figure 2). The net profit-to-revenue ratio of the non-state sector is also the lowest, less than one-third of that of the State and FDI sectors (figure 3)

Figure 2. Profit margins per capital by type of ownership (%)



Source: Vietnam GSO. www.gso.gov.vn

Figure 3. Return on a net turnover by type of ownership (%0

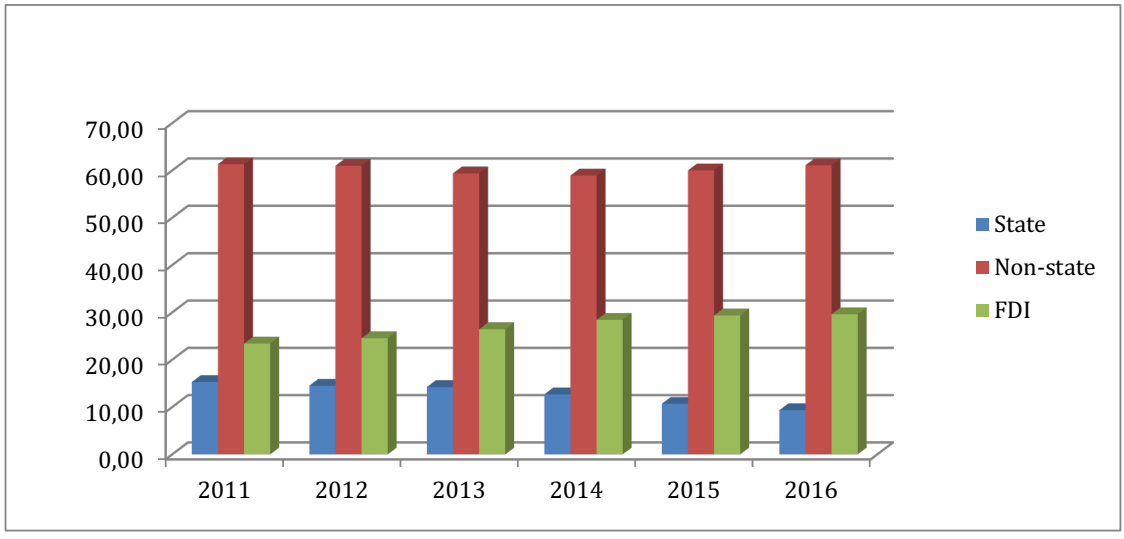


Source: Vietnam GSO. www.gso.gov.vn

Although the non-state area is the area that attracts the most workers, the labor force in this area accounts for over 60% of the total labor force, while the labor in the state sector is only about 10%, and the labor force in the Foreign investment sector is about 30% of the total labor force. The demand for labor and capital of the non-state business sector is very high, but it generates the lowest revenue and profit, but the irony is that non - state area has contributed the highest on tax. Taxes charged by non-state enterprises accounted for nearly 50% of the total tax collected from the business sector, while the State sector paid about 28% of the budget revenue in 2016 and the foreign investment sector paid only 26% of the budget revenue. The direct tax on foreign investment sector only paid to the budget 24.5% while the non-state sector paid the budget of 48%. The data show that from 2011 to 2016, the proportion of contribution to the budget of the foreign investment sector is decreasing, in 2011 the proportion of contribution to the budget of the foreign investment sector decreased from 32.5% down. 24.5% in 2016, while the budget remittance rate of the non-state sector increased from 35% in 2011 to 48% in 2016.

From this data shows the tax policy has no incentives for the non-state economic sector. All incentives are almost exclusively for State-owned enterprises and foreign investment sectors. The non-state business sector does not need slogans, support on paper, non-state business sector needs specific tax and capital support policies, People have the right to question who benefits from foreign investment areas.

Figure 4. Labor rate of ownership components



Source: Vietnam GSO. www.gso.gov.vn

Since joining WTO (2007) until now, the openness of the Vietnamese economy is very large, the export of goods in the period of 2007 - 2016 increased by 364%, the import of goods increased by 279%. However, if considering carefully the ownership can see that the FDI sector increased much faster than the domestic sector, the export of goods of the FDI sector in this period increased by 454% and the import of goods of the FDI sector increased by 472 %, the average export growth of the FDI sector in the period of 2007 - 2016 is about 21% per year and the average growth of import of the FDI sector is about 22% per year, while the export and import growth of the region The domestic sector in this period is 11% and 7% per year respectively. The import and export structure also shows that the FDI sector is rapidly taking up the export market share and also the import, in 2005 the export of the FDI sector accounted for 57% of the export value, in 2016 the region's exports this sector accounts for 72% of the total export value; Similarly, the import structure of the FDI sector also increased from 35% in 2005 to 59% in 2016.

Statistics data show that the trade deficit or trade surplus depends on the FDI sector, because the domestic economic sector is always in trade deficit and the FDI sector has always had trade surplus since 2000 up to now. from net foreign ownership payments estimated in 2018 it is possible to pay net foreign ownership of over $ 20 billion, of which more than $ 10 billion is for debt repayment and over $ 10 billion It is a legally transferred FDI

capital to foreign countries and the average FDI tax is about 7.5 billion dollars, of which VAT is not the money of the FDI sector but the money of Vietnamese consumers contribute to the budget through the use of this region's products. This is not to mention how it is difficult for enterprises to bring products into and out of Vietnam, which is very difficult to grasp. So the real profit part may have been located in foreign countries that Vietnam cannot know and cannot tax. This part of the tax may be enjoyed by the government.

Based on the principle of permanent residence, the growth of the FDI sector can increase GDP but make the economy's resources increasingly narrowed through the indicators such as GNI, NDI, and saving of the economy while these indicators of the subjective countries of FDI enterprises increased. One problem is that in addition to the well-managed FDI sector, strong capital sources of Vietnam's policies benefit this region too much, while non-state-owned enterprises are not entitled to incentives. It is impossible to understand what people think when exempting processing enterprises from taxes (which are basically outsourced to produce outsourcing), if the domestic enterprises also import those goods for domestic production, they must pay import tax. , VAT on imported goods, but those that do processing are exempted from tax. So how can the manufacturing industry of auxiliary products be developed? In addition, FDI enterprises are entitled to corporate income tax incentives "newly established enterprises from investment projects in the economic zone are entitled to a 10% tax rate for 15 consecutive years from the first year. Enterprise first has revenue "and then gets preferential treatment again" In addition, businesses operating in the economic zone will be exempted from corporate income tax for 4 years from the time of business with taxable income and 50% reduction in the next 9 years."

The tax policy of Việt Nam is the barrier that makes the value-added of the domestic private sector impossible to exceed 8% in GDP during the past 15 years, the transformation of ownership structure in GDP is only a transfer between the two favored areas is the State-owned enterprises and the FDI sector. If nothing changes or only changes in words, then the individual economic sector will remain dominant for many years (contributing over 30% of GDP) while the FDI sector is not managed and tightly bound. Thus, the join integration on of Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) will be the playground of FDI enterprises and other countries only.

About inflation risks in 2020

Another issue should be warned that credit growth and money supply growth from 2013 to 2017 are always higher than GDP growth at current prices. The ratio of M2 to GDP is getting higher and higher, according to IMF data in 2017, this rate is about 104% in 2013, increasing by 165% in 2018 and 2018 is estimated at 170% of GDP. Looking at history, we can see that this situation is similar to the period of 2011-2011 and 2011 with great inflation. Increasing money supply plus increasing the price of a series of state-controlled products such as electricity, petroleum, health, or education[1]. It should be warned that the risk of inflation may take place in 2020, or the underground and illegal economy in Vietnam is developing very strongly, is it that these activities themselves are helping Vietnam curb the increase of price?

Table 3. Some macro indicators in Vietnam

	2012	2013	2014	2015	2016	2017
Growth on money supply increase (M2) (%)	22.38	18.50	15.65	22.00	22.06	22.00
Credit growth (%)	8.91	12.51	11.80	18.24	18.25	17.26
Consumption price index (CPI) (Last year = 100)	9.21	6.60	4.09	0.63	2.66	3.53
M2/GDP (%)	96.36	103.70	114.07	130.70	149.21	165.08

[1] https://tuoitre.vn/he-qua-cua-tang-gia-dien-xang-dau-dich-vu-y-te-don-dap-20190505221413422.htm

GDP/M2 (times)	1.04	0.96	0.88	0.77	0.67	0.61
GDP Growth at current price (%)	16.75	10.44	9.87	6.48	7.39	11.18
GDP Growth at constand price (%)	5.25	5.42	5.98	6.68	6.21	6.81

Source: IMF and GSO

Structure of budget revenue and expenditure

+ *Budget revenue*

The structure of revenue collection shows that the basic source of income is from taxes and fees; this rate has been little changed from 2011 to 2017, although the structure of tax and fee changes reversed for each other, tax collection decreased from 86% in 2011 down to 72% in 2017, but fee collection increased from 5%. In 2011, up to 17.4% in 2017. The structural shift between taxes and fees is partly due to the hustle and bustle of Vietnam's integration, leading to lower import tariffs. The decree promulgating the ASEAN-China Tariff (ACFTA), 588 tariff lines will be cut from 5% in 2017 to 0%, mainly in key items such as iron and steel and iron and steel products. , electrical and electronic machinery and equipment, textile materials, garment fabrics, clothing, coffee, raw tea, food processing, partly due to excessive incentives for FDI enterprises, while the Foreign region investment has the highest growth rate of profit in the period of 2011 - 2016 (25.5%) compared to 2 domestic economic sectors, which are State-owned enterprises (21%) and non-Home sector. water (17.4%). Meanwhile, the average growth rate of total foreign investment tax is only 8.6% (compared to 21% of the non-state economic sector), especially the average growth of income tax. Foreign-invested enterprises are even lower, only 7.5% (compared to 21% of non-state economic sectors). In order to compensate for the tax revenue deficit, the Ministry of Finance collected fees such as tolls; This clause is essentially the same as indirect tax, but the budget is easily collected directly by the people

Revenues from capital also increased sharply from 7.5 in 2011 to 10% in 2017. Is the Government of Vietnam selling State assets to offset revenue?

Table 4. STRUCTURE OF STATE BUDGET REVENUES

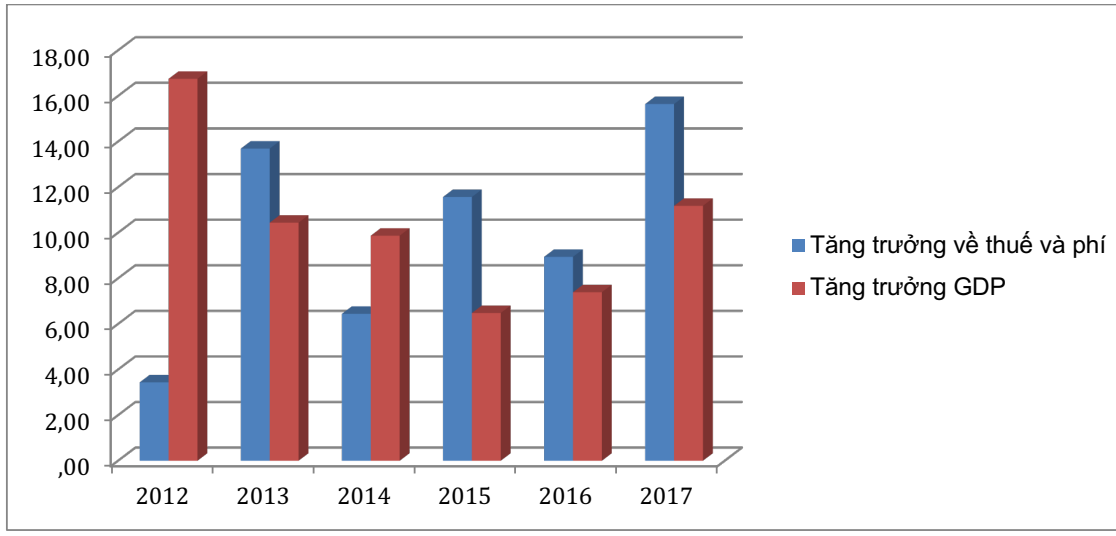
TT	Items	2017	2016	2015	2014	2013	2012	2011
-	State budget revenues and grants (I+II+III)	100%	100%	100%	100%	100%	100%	100%
I	Current revenues	89.5%	90.1%	91.7%	93.5%	93.1%	92.2%	90.8%
I.1	Taxes	72.1%	72.9%	75.8%	81.7%	82.7%	84.0%	85.7%
I.2	Fees, charges and non-tax	17.4%	17.2%	15.9%	11.7%	10.3%	8.2%	5.1%
II	Capital revenues (revenues from the sale of State-owned houses, land user right assignment)	9.9%	9.2%	7.1%	5.3%	5.6%	6.4%	7.5%
III	Grants	0.6%	0.8%	1.2%	1.3%	1.3%	1.4%	1.7%

Source: Mof.gov.vn

Figure 5 shows that only in 2012 and 2014 the growth rate of taxes and fees was lower than the GDP growth rate (at current price), the remaining years of growth rates of taxes and fees were much higher than GDP growth, especially in Three consecutive years from 2015 to 2017, the growth rate of taxes and fees compared to GDP growth is relatively large, this shows that the collection of taxes and fees exceeds the resources of the economy, if

this situation is last long. Real resources of the economy through savings indicator will be smaller in subsequent cycles.

Figure 5. Growth of tax and fees and GDP at the current price



+ *Budget expenditure*

Table 6 shows that the ratio of recurrent expenditure in total expenditure is always high, at 66% of total budget expenditure; Interest payment rate increased from 4.2% in 2011 to 7.2% in 2017. This shows that public debt is on the rise or debt with higher interest rates. The investment expenditure ratio tends to decrease.

Table 6. Structure of budget expenditure

	2011	2012	2013	2014	2015	2016	2nd est.2017
Total state budget expenditures	**100**	**100**	**100**	**100**	**100**	**100**	**100**
In Which:							
Current expenditures	**66.3**	**66.2**	**69.3**	**69.7**	**66.9**	**68.3**	**66**
Interest payment	**4.2**	**4.4**	**4.4**	**6.4**	**6.9**	**7.2**	**7**
Capital expenditures	**29.5**	**29.4**	**26.3**	**23.9**	**26.1**	**24.6**	**27**

Source:mof.gov.vn

Table 7 shows that in most years (except 2014 and 2016) the growth rate of budget expenditures and recurrent expenditures is higher than GDP growth rates (at current prices). The growth rate of interest payment is much higher than the GDP growth rate. This shows that if continued high recurrent spending and inefficient investment will make the Vietnamese economy plunge deeper into debt. This situation shows that the Vietnamese economy is very vulnerable. Flexible policies and coordination between fiscal and monetary policies are needed

Table 7. Growth of budget expenditure and GDP at the current price

Unit: Times

	2012	2013	2014	2015	2016	2nd est.2017
Total state budget expenditures	**29.3**	**12.9**	**0.8**	**13.6**	**2.2**	**14.4**
In Which:						
Current expenditures	**29.2**	**18.2**	**1.3**	**9.1**	**4.3**	**11.3**
Interest payment	**33.9**	**12.8**	**48.3**	**22.9**	**5.8**	**14.0**
Capital expenditures	**29.0**	**1.1**	**-8.5**	**24.3**	**-4.0**	**23.3**
GDP Growth	16.75	10.44	9.87	6.48	7.39	11.18

Source: mof.gov.vn

Conclusion and solution

First, do not consider GDP growth as the only indicator to assess the economy. GDP is a short-term and temporary indicator, because the corruption of inefficient investment also increases GDP at that time but may lead to macro instability, credit growth may also increase GDP but also lead to risks of bad debt and weak resources through savings targets

Second, Vietnam has participated in signing many multilateral and bilateral trade agreements, in an open and integrated world, the flow of foreign direct investment or indirectly flowing into Vietnam is inevitable. What do the government and people expect from this capital inflow into Vietnam: They expect to attract the labor force and technology transfer, but perhaps the most likely is the achievement disease from the central to Localities, when capital flows into any province that GRDP province increases and national GDP increases despite the fact that the Vietnamese people do not benefit much from this, but some people benefit from this growth achievement. Basic FDI attraction must see the added value that the Vietnamese side enjoys and does not affect the environment.

Third, Monetary policy depends on the evolution of the real economy, so it should be flexible in managing exchange rates and interest rates. Reduce the level of recurrent expenditures from the budget. One of the important questions in macroeconomics and public finance is how changes in tax policy to affect economic activity and social welfare well. Harmonizing interests between people, the State, and businesses? In theory, it is often assumed that taxes have a negative correlation with growth - higher taxes mean lower economic growth rates. This is explained by the fact that taxes create distortions to the economy, meaning that they are not neutral, as the higher tax the distortion of the economy increases.

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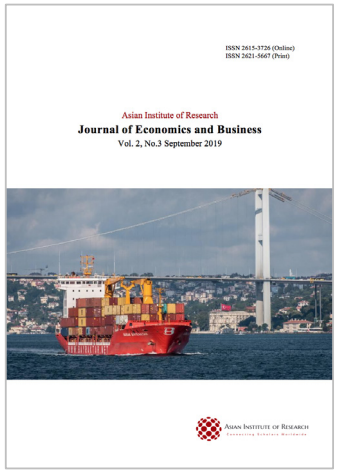
TCTK gso.gov.vn

BTC mof.gov.vn

WB www.worldbank.org



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Vietnam Economic Structure and Greenhouse Gas Emission Based on Input-Output Analysis

Thai Nguyen Quang[1], Trinh Bui[2], Tuan Anh Vu[3]

[1] Vietnam Development Research Institute, email: thai.nguyenquang@gmail.com
[2] Vietnam Development Research Institute, email: buitrinhcam@gmail.com
[3] Vietnam Development Research Institute

Correspondence: Trinh Bui. Email: buitrinhcam@gmail.com

Abstract
Over the years, Vietnam has a relatively high growth rate of gross domestic product (GDP) compared to other countries in the region, an average increase of 6.1% in the period of 2005 - 2016. However, the macro instability such as the budget deficit, public debt, the economy's debt is always high, the environment is more risky. In Vietnam, in the reports, even research articles are automatically admitted that the structure of Region II (industry and construction) and Region III (service) in GDP needs to grow and see it as an economic development in the right direction. From that, the idea of economic restructuring is to promote both Region II and Region III; The investment rate of this area is increasingly higher, if it is always very high in 2005 to 2015, it was around 43% in 2005 and nearly 50% in 2016, but the irony is that the value-added ratio compared to the value of production of this sector (region II) fell surprisingly fast; this ratio follows the structure of 2000, the structure of the input-output tables in 2007 of General Statistics Office of Vietnam) is 34.1%, in recent years (the structure of the new input-output tables) is only 21%. This means that this region is increasingly inefficient, resulting in an increasing amount of investment to compensate for that inefficiency. This research is based on Vietnam economic structure from the input-output table, 2012, that was published by Vietnam General Statistics Office, this research focused to analysis deeper on sectoral structure, inter-sectoral and effects induced impacts by final demand to output, value-added and greenhouse gas (GHG) emissions based on the approach of input-output analysis. This study hopes to help policymakers make rational decisions for sustainable development in Vietnam

Keywords: Backward, Forward, Linkage, Power of Dispersion, Sensitivity of Dispersion, Greenhouse Gas

JEL Classification: D57, R10, C67, R19, O00, B40

Highlights of this paper

- This study uses an input-output analysis method to examine the current status of inter - industrial structures in the Vietnamese economy,
- The results show that Vietnam's economy is not sustainable. The policies seem to favor the industry that emits many greenhouse gas effects

I. Introduction

Over the years, Vietnam has a relatively high growth rate of gross domestic product (GDP) compared to other countries in the region, an average increase of 6.1% in the period of 2005 - 2016. However, the macro instability such as the budget deficit, public debt, the economy's debt is always high, the environment is more risky. In Vietnam, in the reports even research articles are automatically admitted that the structure of Region II (industry and construction) and Region III (service) in GDP needs to grow and see it as an economic development in the right direction. From that, the idea of economic restructuring is to promote both Region II and Region III. The investment rate of this area is increasingly higher, if it is always very high in 2005 to 2015, it was around 43% in 2005 and nearly 50% in 2016, but the irony is that the value-added ratio compared to the value of production of this sector (region II) fell surprisingly fast; this ratio follows the structure of 2000, the structure of the input-output tables in 2007 of General Statistics Office of Vietnam) is 34.1%, in recent years (the structure of the new input-output tables) is only 21% This means that this region is increasingly inefficient, resulting in an increasing amount of investment to compensate for that inefficiency.

The notion of economic structure was proposed by W. Leontief (1941) to analyze the structural change of the US economy based on the input-output tables in 1919 and 1929. Since then, input-output analysis method has been developed by many modelers such as W. Leontief (1970), Schoonbeek, L. (1990), Ebiefung, A.A., Udo, G. (1999), Dobos, I. and Floriska, A. (2005), Yu Fan et al. (2016)W. Leontief (1970), Schoonbeek, L. (1990), Ebiefung, A.A., Udo, G. (1999), Dobos, I. and Floriska, A. (2005), Yu Fan et al. (2016). In this study, some of the main structures of the Vietnamese economy are indicated by absorption matrix, which was developed by Chenery and Watanabe (1958), Interdisciplinary structure determined through intermediary costs and consumption and the relationship between production value, incremental value, and final demand.

Today, in parallel with the System of National Accounts (SNA), the United Nations also introduces a System of Environmental-Economic Accounts, SEEA, if the traditional input-output framework is the center of the System of National Accounts, then the Hybrid input-output framework is the center of the System of Environmental-Economic Accounts.

In Vietnam, there are also some studies that apply the input-output frameworks in the analysis and measurement of economic and environmental structures through waste matrix such as T. Bui (2011), T.Bui and Q Bui (2017), Thai, N Q el all (2019).

This study used the input-output tables in 2012 and the Greenhouse Gas (GHG) matrix published by the Ministry of Natural Resources and Environment in 2014.

II. Methodology

1. Competitive and non-competitive input-output table

The competitive input-output table includes both domestically manufactured and imported products, intermediary consumption, and final demand; the non-competitive input-output table is a table which has already separated the imported products from intermediary consumption and final demand.

Leontief relation of input-output table

$$A.X + Y = X \quad (1)$$

Where X is the production value matrix, A = (a_{ij}) is the direct cost factor matrix with $a_{ij} = X_{ij}/X_j$, Y is the final demand matrix

$$Y = C + G + I + E - M \quad (2)$$

Analysis of matrix A and vector Y by using domestic and imported products, equation (1) can be rewritten:

$$A^d.X + A^m.X + C^d + C^m + G^d + G^m + I^d + I^m + E = X \quad (3)$$

Gọi $C^d + G^d + I^d + E = Y^d$

And notice that $A^m.X + C^m + G^m + I^m = M$
From equations: (1), (2) and (3), we have:
$A^d.X + Y^d = X$ (4)

And Leontief relation for non-competitive input-output model has form:
$X = (I-A^d)^{-1}.Y^d$ (5)

With $(I-A^d)^{-1}$is the Leontief inverse matrix and $Y^d$is the domestic final demand matrix, including the final products in the country, accumulated products produced in the country, and exported products. The matrix X denotes the production value that is diffused by the elements of the final demand.

Back link is defined $B_j = \sum B_{ij}$; reflects the expansion of a sector when using other sector's products as input costs. Forward link $B_i = \sum B_{ij}$, indicates the level of production depending on inputs from other sectors. Guo and Hewings (2001) explain that increased back link will create a greater demand for inputs from other sectors and increased forward link will lead to changes in the sensitivity of the output to other sectors.

From these ideas, the diffusion index and the sensitivity of each sector are determined:
Power of dispersion index: $P_j = B_j.(n / T)$ (6)
Sensitivity of dispersion index: $Si = Bi.(n / T)$ (7)
n is number of sectors in the input-output table
Where: n;a number of sectors surveyed in the table I/O; $T = \sum B_{ij}$

Let v be vector as value-added coefficient with $v_i = V_i/X_i$. Here, V_i is the added value of sector i and Xi is the production value of sector i. From (5) we have:
$V = v. (I-A^d)^{-1}.Y^d$ (8)

Similarly, e is the direct emission coefficient matrix by sector with $e_{ij} = E_{ij}/X_j$. Here, Eij is the amount of direct waste produced by sector j in the production process. From (5) we have:
$E = e. (I-A^d)^{-1}.Y^d$ (9)

From there we can estimate the vector of the factorial in terms of production value (GOm), value added (VAm), and Waste (Em) as follows:
$GOm = X \div \sum Y$ (10)
$VAm = V \div \sum Y$ (11)
$Em = E \div \sum Y$ (12)
Where: ÷ shows scalar division

III. Research results

About indexes of power of dispersion and sensitivity for dispersion

The research results about diffusion index and sensitivity from Table 2 shows that group of agriculture, forestry and fishery (sector no.1), group of food processing industry, beverages and tobacco (sector no.3), production of products from oil and gas (sector no.5) and other manufacturing industries (sector no.10) have both the sensitivity and diffusion higher than the general average of the economy quite a lot, this shows that these 4 groups not only strongly stimulate other sectors in the economy but also make the input needs of the economy quite large. Most service industries do not have good diffusion and sensitivity, especially in the scientific and technological industries have the level of diffusion and sensitivity lower than the average level, this shows that the group of the sector does not diffuse anywhere and sectors in the economy do not need it much.

Table 1. Backward linkage, forward linkage, Power of dispersion and sensitivity for dispersion of the Vietnam economy (equations 5, 6, 7)

		2012			
No.	**Economic sector**	Back Linkage (BL)	Power of dispersion index	Forward linkage (FL)	Sensitivity of dispersion index
1	Agriculture, forestry, and fishery	**1.688**	**1.104**	**2.299**	**1.504**
2	Mining	1.396	0.913	2.219	1.452
3	Food processing industry, beverages, and tobacco	**2.263**	**1.480**	**1.657**	**1.084**
4	Production of textile products, costumes, and leather goods	1.551	1.014	1.364	0.892
5	Production of products from oil and gas	**1.749**	**1.144**	**1.923**	**1.258**
6	Production of chemical products	1.558	1.019	1.461	0.955
7	Production of non-metallic mineral products	1.582	1.035	1.304	0.853
8	Manufacturing and processing metals and metal products	1.464	0.957	1.752	1.146
9	Manufacturing equipment and machinery	1.377	0.901	1.294	0.846
10	Other manufacturing industries	**1.778**	**1.163**	**2.489**	**1.628**
11	Production and distribution of electricity, gas, hot water, steam, and air conditioning	1.183	0.774	1.337	0.874
12	Water supply; waste and wastewater management and treatment	1.385	0.906	1.106	0.724
13	Construction	1.697	1.110	1.153	0.754
14	Transportation of warehouses	1.603	1.048	1.442	0.943
15	Wholesale and retail; Hotel and restaurant	1.466	0.959	1.722	1.126
16	Information and communication	1.538	1.006	1.420	0.929
17	Financial activities, banking, and insurance	1.363	0.892	1.546	1.011
18	Professional, scientific and technological activities	1.355	0.886	1.229	0.804
19	Education and training	1.184	0.775	1.029	0.673
20	Health and social assistance activities	1.655	1.082	1.008	0.659
21	Other service sectors	1.271	0.831	1.353	0.885

Source: Calculations from I/O table 2012 of Vietnam General Statistics Office

Value-added and import multipliers (equations: 3,4,8)

In many cases, the increase in demand-side stimulates the supply side but at the same time stimulates imports and does not induce so much to value-added, further research has shown that although some sectors (sector number 4) was induced impacts strongly to production but how does it induce to value-added (GDP = ∑value-added + tax on product), and how it does not induced to imports? A sector that is considered as a high importance is high sensitivity and diffusion index sectors, but it is low diffusion to imports and high diffusion to value-added. Table 3 shows that in the four sectors with high sensitivity and diffusion index, only the agriculture, forestry, and fishery sectors met this requirement. Most sectors of the manufacturing and processing industries have a high sensitivity and diffusion index but strongly stimulate the import and diffusion to the value-added is much lower than the general average. This shows that the manufacturing and processing industries in Vietnam are mainly outsourcing and the level of outsourcing is increasingly high. Interestingly, most service sectors with a low diffusion index to imports, and diffusion to added value are higher than the average, but these sectors have relatively low sensitivity and diffusion index to output. In order to improve this issue, it may give an important

solution is that if Vietnam enhances its auxiliary products to meet inputs for a group of the service sector, and service sector must also develop to meet the needs of other sectors in the economy. This will lead to increased sector linkages through increased diffusion and sensitivity, thereby creating a strong motivation for the economic development of the country. However, "policy resources," especially tax policy, are not aimed at this issue. For example, on indirect tax, there are two issues: First, indirect tax for FDI enterprises are entitled to enjoy preferences on tax policies, most FDI enterprises do the outsourcing and export, these enterprises, due to direct export, so the input of imports get tax incentives, while local enterprises are not entitled to get tax incentives if they are in domestic sales, we can see that the call on the production of auxiliary products for the past 10 years cannot become true? The import-export tax policy does not show any action, it shows the flatness among different types of businesses and secondly, when most of the production in Vietnam is outsourced, the Vietnamese people in fact use Vietnamese goods as well as use imported goods in other forms only, use the products of FDI enterprises in this case too, so the contribution of the FDI region to the budget needs to be differentiated between indirect taxes and direct taxes, because the indirect tax is paid by the Vietnamese people to the budget, FDI enterprises contribute only corporate income taxes.

Table 2. Value added and import multipliers

		2012		
No.	**Economic sector**	Diffuse to added value	Average diffuse index to the added value	Average diffuse index to import
1	Agriculture, forestry, and fishery	0.684	**1.024**	0.952
2	Mining	0.654	0.979	**1.042**
3	Food processing industry, beverages, and tobacco	0.625	0.935	**1.130**
4	Production of textile products, costumes, and leather goods	0.560	0.838	**1.327**
5	Production of products from oil and gas	0.483	0.722	**1.560**
6	Production of chemical products	0.511	0.765	**1.474**
7	Production of non-metallic mineral products	0.663	0.992	**1.016**
8	Manufacturing and processing metals and metal products	0.431	0.645	**1.716**
9	Manufacturing equipment and machinery	0.388	0.581	**1.845**
10	Other manufacturing industries	0.538	0.806	**1.392**
11	Production and distribution of electricity, gas, hot water, steam, and air conditioning	0.879	1.316	0.364
12	Water supply; waste and waste management and treatment	0.772	1.154	0.689
13	Construction	0.578	0.864	**1.274**
14	Transportation of warehouses	0.604	0.904	**1.193**
15	Wholesale and retail; Hotel and restaurant	0.798	**1.195**	0.608
16	Information and communication	0.682	**1.020**	0.959
17	Financial activities, banking, and insurance	0.869	**1.300**	0.396
18	Professional, scientific and technological activities	0.822	**1.230**	0.536
19	Education and training	0.928	**1.388**	0.218
20	Health and social assistance activities	0.680	**1.018**	0.964
21	Other service sectors	0.886	**1.325**	0.345

Source: Calculations from I/O table 2012 of study group

Impacts on the environment (equation: 9)

This study focused on greenhouse gas emissions generated during production. Table 3 shows the sector groups number 1, 2, 3, 7, 10, 12, 13 has a higher level of greenhouse gas emissions than the economy average. Especially, the No. 7 sector (Production of non-metallic mineral products) has a greenhouse gas emission of 3.5 times higher than the average level, the No. 1 sector (Agriculture, forestry, and fishery) has a greenhouse gas emission of 2.6 times higher than the average and sector 13 (construction) has emissions. 2.5 times higher than the average level

Notably, the agriculture, forestry, and fishery sectors have taken into account the uptake of greenhouse waste from the forestry sector, but the greenhouse gas emissions of this sector are still higher than the average emission of more than 2.5 times.

Final demand of services sector group induced to high value-added and greenhouse gas low at almost sectors**.**

Table 3. Greenhouse gas emissions from production

		2012	
No.	**Economic sectors**	Greenhouse emissions (GHG) are induced by added one unit in final demand	Influence level average
1	Agriculture, forestry, and fishery	0.103	**2.573**
2	Mining	0.044	**1.104**
3	Food processing industry, beverages, and tobacco	0.060	**1.497**
4	Production of textile products, costumes, and leather goods	0.017	0.427
5	Production of products from oil and gas	0.029	0.714
6	Production of chemical products	0.025	0.636
7	Production of non-metallic mineral products	0.141	**3.523**
8	Manufacturing and processing metals and metal products	0.012	0.302
9	Manufacturing equipment and machinery	0.024	0.602
10	Other manufacturing industries	0.069	**1.732**
11	Production and distribution of electricity, gas, hot water, steam, and air conditioning	0.017	0.417
12	Water supply; waste and waste management and treatment	0.080	**1.998**
13	Construction	0.099	**2.472**
14	Transportation of warehouses	0.021	0.527
15	Wholesale and retail; Hotel and restaurant	0.021	0.534
16	Information and communication	0.019	0.479
17	Financial activities, banking, and insurance	0.003	0.081
18	Professional, scientific and technological activities	0.009	0.228
19	Education and training	0.005	0.123
20	Health and social assistance activities	0.025	0.633
21	Other service sectors	0.016	0.398

Source: The author's calculation based on the table I/O 2012 and reports of the Ministry of Natural resources and Environment.

Induced impacts of factors of final demand to output, value-added, import and greenhouse gas (equation: 10, 11, 12)

Table 4 shows that exports of commodities diffuse to the lowest added value, but strongly diffuse to imports, and it is more dangerous that production for exports of commodities is the largest source of greenhouse gas emissions among the elements of the final demand, Meanwhile, service exports produced the least greenhouse gas emissions but generated the most added value

According to the report of the Ministry of Natural Resources and Environment, it is estimated that by 2010 Greenhouse gas emissions GHG will be around 247 million tons, the calculation of the study group shows that GHG will be 300 million tons by 2012, which has an average annual increase of 10% while on the average GDP increased approximately 6% from 2010-2012. It is seemed illogical to the export priority policy both in terms of tax and credit policies. It seems that resources on policy showed the wrong place one more time.

Table 4. *Induced impacts of factors of final demand to output, value-added, import and greenhouse gas*

	Final consumption	**Gross capital formation/ Accumulation**	**Exports of goods**	**Exports of services**	**Total (Million tons)**
Output	1.744	1.799	1.788	1.601	
Value added	0.72	0.58	0.56	0.76	
import	0.28	0.42	0.44	0.24	
greenhouse gas emissions (million tons)	77	65	152	6	**300**
Structure of GHG	25.70%	21.70%	50.70%	1.90%	100%

Source: The calculations based on the table I/O of the study group and data of the Ministry of Natural resources and Environment

IV. Conclusion

The result of study shows that the current economic structure and policy priorities is not towards the sustainable growth, meanwhile on the average the GDP in the period of 2005-2017 has been increased around 5.7% (GDP growth in 2017 is 6.81%) and in 2017 manufacturing and processing industries have been increased by 14.5% (according to comparative price), corresponding to 8-10% of greenhouse gas emission growth. Accordingly, by 2020 if the economic structure has not been changed and the green growth has not been invested, greenhouse gas emissions (GHG) will be 550 million tons, which is higher than that forecasted by United Nation to Vietnam (by 2020 it can be 466 million tons).

In terms of manufacturing industries, the processing industry diffuses to a low added value but high greenhouse gas emissions.

In terms of demand, exports of goods diffuse to a low added value but the highest greenhouse gas emissions among the elements of the final demand (final consumption, asset accumulation, exports of goods and services). However, all policies seem to be in favor of exports. It is a waste of policy resources.

Recommendations

It is necessary to choose the appropriate policy for sustainable development, such as:

1. There should be consistent and harmonious policies not only between institutional sectors such as State-owned enterprises, FDI enterprises, non-state owned enterprises, and household sectors but also between the enterprises in the same type of institution.

2. Agro-forestry-fisheries sector has all economic indicators such as diffusion, sensitivity to good production, and added value, but it also a major cause of greenhouse gas emissions. Policy, capital, high-quality labor resources are necessary to progress to green agriculture for this sector.
3. The result of the study are similar to Nguyen Hong Son's study on "Service in Vietnam 2020: Towards quality, efficiency and modernity"[8] as service sector diffuse well to income and less greenhouse gas emissions, but diffuse to production values and sensitivity is slightly low. If diffusion and sensitivity of this sector increase, the growth is not only high, enough quality, but also sustainable. For increase of diffusion and sensitivity, real specific priority policy is necessary for domestic auxiliary industries, particularly auxiliary production sectors for the input of the service sectors.
4. The study shows that the most important resource for sustainable and fast development is "policy resource." It is necessary to determine the specific destination, growth without environment, or sustainable growth? If GDP growth in all costs does not need macroeconomic instability such as debt, overspending, and environmental damage, this study will not make sense!
5. A flexible policy is necessary to deal with the elements of the final demand. This study shows that at the moment, the exports do not diffuse much to added value; only the imports and greenhouse gas emissions (GHG) are the biggest among the elements of the last demand.
6. Promote science, technology, and innovation under new institution, the quality of human resources needs to be improved urgently and in fact, to structure the income in total added value.

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Appendix

Sectors in research

No.	Economic sector
1	Agriculture, forestry and fisheries
2	Mining industry
3	Production of foods, beverages and cigarettes
4	Production of textile products, costumes and leather products
5	Manufacturing petroleum and gas products
6	Production of chemical products
7	Production of non-metallic mineral products
8	Manufacturing and processing metals and metal products
9	Production of equipment and machinery
10	Other manufacturing and processing industries
11	Production and distribution of electricity, gas, hot water, steam and air conditioner
12	Water supply; Waste water, sewage management and treatment activities
13	Construction
14	Logistics
15	Wholesale and retail; Hotel and restaurant
16	Information and communication
17	Financial, banking and insurance activities
18	Professional, scientific and technological activities
19	Education and training
20	Health and social support activities
21	Other service sectors

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Address: 207 Giai Phong Str, Hanoi

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