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Understanding Vietnam's economic structure using Input-Output analysis and policy implications

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ABSTRACT : This study analyzes structural transformations in Vietnam's economy from 2007 to 2023. The examination of spillover and connectivity indices among economic sectors indicates substantial changes in Vietnam's economic framework. The livestock, fisheries, and agro-processing sectors routinely have spillover indices that exceed the economy-wide average, highlighting their significant impact and essential role in enhancing overall output across industries. Nevertheless, between 2018 and 2023, the spillover benefits of these sectors diminished significantly, despite an enhancement in their backward linkages. This tendency can be ascribed to the increasing backward linkages of other sectors, which reduced the relative spillover effects of livestock, fisheries, and agro-processing businesses. An analysis of spillover indices reveals that the majority of final products in the manufacturing sector - excluding agricultural and fisheries processing - demonstrate low spillover effects on value-added but exert a strong impact on imports. This indicates that manufacturing operations are significantly reliant on processing and assembly, resulting in greater dependence on imported inputs and a reduced capacity for domestic value creation. Notably, final consumption demand has consistently demonstrated the most significant spillover effect on value-added, even though its impact on total output has not always been the highest. This highlights the critical role of final consumption in driving economic growth and value-added generation. These findings offer significant insights into structural transformations within the economy and the diverse effects of various sectors and final demand components on economic linkages and spillovers.

KEYWORDS - *analysis, IT; multiplier effects, induced effects, spillover index; sensitivity index; input-output; Vietnam's economy;*

I. Introduction

1.1. Context

This paper summarizes several preliminary findings and insights of the research team regarding the structure of Vietnam's economy, emphasizing the role of various economic sectors during the period 2007–2022. The study aims to shed further light on the economic landscape in the post WTO era through the application of the Input-Output (I-O) model.

Leontief's Input-Output (I-O) analysis serves as a fundamental tool for understanding the structure of an economy. His seminal work, The Structure of the American Economy, laid the groundwork for numerous subsequent studies. Using two Input-Output tables from 1919 and 1929, his research reflected two distinct phases of the U.S. economy, offering valuable insights into the interdependencies among industries. In this study, we employ three non-competitive I-O tables from 2007, 2012, and 2022. We assume that the 2007 I-O table represents the period 2006–2011, the 2012 I-O table corresponds to the period 2012–2017, and the 2022 I-O table reflects the period 2018–2023.

Inter industry analysis, or input-output analysis, is a methodological framework that captures the interdependencies among different sectors to provide policymakers with a comprehensive view of sectoral linkages, the relationship between final demand and supply-side dynamics, and the economy-wide effects of positive and negative economic shocks. I-O analysis maps the supply chain across all sectors of an economy, identifying industries with relative significance. This approach not only facilitates the identification of key industries but also supports economic planning and policy development.

Economic policy formulation should be based on a deep understanding of the actual conditions and potential of each sector, enabling targeted support and development. Vietnam has been implementing various policies to promote the growth of key industries while exploring the potential of emerging sectors. At the same time, outdated perspectives such as solely relying on GDP as a measure of economic prosperity should be reconsidered. Sustainable economic development requires a balance between economic growth, quality of life,

social welfare, and environmental considerations. Policies must be designed not only to achieve short-term growth but also to ensure long-term and comprehensive development.

Structural economic transformation is one of the key factors reflecting a nation's development trajectory. Since Vietnam's accession to the World Trade Organization (WTO) in 2007, the economy has undergone profound changes, necessitating in-depth analyses to better understand the evolving roles of various sectors in the context of global economic integration.

Wassily Leontief's Input-Output Analysis (I.O.) serves as an effective tool for identifying inter sectoral linkages, assessing the impacts of economic shocks, and examining the spillover effects of final demand on both output and value-added. Applying the I.O. model to analyze Vietnam's economic structure from 2007 to 2023 not only provides a comprehensive overview of sectoral contributions but also offers crucial policy recommendations to foster sustainable development. This study holds not only academic significance but also substantial practical value in shaping economic policies.

1.2. Research Objectives

This study focuses on analyzing the structural transformation of Vietnam's economy during the period 2007–2022, employing the Input-Output (I.O.) model as the primary analytical framework. The research aims to quantitatively assess the economic structure using key indicators such as the Power of Dispersion, Sensitivity of Dispersion, and Inter sectoral linkages (Forward and Backward Linkages) to determine the role and position of each sector within the economy.

The study conducts an in-depth inter sectoral impact analysis, identifying both direct and indirect spillover channels and estimating the extent to which changes in one sector influence macroeconomic indicators such as output, value-added, and employment. The objective is to clarify the real economic relationships between industries and identify those with the strongest spillover effects.

Based on these analyses, the study will propose concrete and feasible policy recommendations to enhance inter sectoral linkages, improve resource allocation efficiency, and foster a conducive environment for high-potential industries to develop. These policies aim to strengthen the overall competitiveness of the economy.

Finally, the research seeks to identify key economic sectors based on objective criteria, including high dispersion coefficients, strong inter sectoral linkages, and substantial potential contributions to economic growth. The findings will serve as a critical basis for investment prioritization and development strategies, contributing to long-term sustainable and inclusive economic growth in Vietnam.

1.3. Overview

The Input-Output System (IOS) developed by Wassily Leontief represents a ground breaking advancement in economics, particularly in the analysis of economic structures. Originating in 1936 and further refined in 1941, IOS has become a fundamental tool for understanding inter-industry relationships and their impact on the overall economy. The introduction of the Social Accounting Matrix (SAM) subsequently expanded IOS's capabilities by incorporating social and financial elements, enabling a more comprehensive view of income distribution and financial flows within society. SAM, along with the development of Multi-Regional Input-Output (MRIO) tables, has provided a robust analytical framework for studying economic interconnections not only at the national level but also on a global scale. These advancements have significantly contributed to economic policy planning and the evolution of modern economics, equipping policymakers and researchers with tools to assess and forecast economic trends with greater precision.

Research on the Input-Output (I-O) system in Vietnam has made significant progress, with several scholars making notable contributions. Bui Trinh, Duong Manh Hung, and their colleagues have published numerous studies, including the compilation of multi-regional I-O tables for Vietnam's economy, which provide a reliable database for both regional and interregional economic and environmental research. Vietnam's national I-O tables for the years 1989, 1996, and 2000 were compiled by the General Statistics Office of Vietnam. Additionally, regional I-O tables have been developed by private research groups with funding from Japanese consulting firms and various organizations. Their work has not only deepened the understanding of Vietnam's economic structure but has also served as a valuable tool for economic analysis and forecasting.

II. Methodology

The fundamental relationship in I-O analysis is expressed as follows:

$$X = (I - A)\text{-}1.Y \qquad (1)$$

where: **X** is the output vector
I is the identity matrix
A is the matrix of direct input coefficients
Y is the final demand vector.

The output vector consists of the gross output value of sector 1 (X_1), the gross output value of sector i (X_i), and the gross output value of sector n (X_n).

$$X=\begin{bmatrix} X_1 \\ X_i \\ X_n \\ \end{bmatrix} \quad (2)$$

$$Y=\begin{bmatrix} Y_1 \\ Y_i \\ Y_n \\ \end{bmatrix} \quad (3)$$

The matrix A is represented as follows:

$$A=\begin{vmatrix} A11 \dots & A1i \dots & A1n \\ \dots & \dots & \dots \\ Ai1 \dots & Aii \dots & Ain \\ \dots & \dots & \dots \\ An1 \dots & Ani \dots & Ann \end{vmatrix} \quad (4)$$

And

$$A.X=\begin{vmatrix} A11.X1 \dots & A1i.Xi \dots & A1n.Xn \\ \dots & \dots & \dots \\ Ai1.X1 \dots & Aii.Xi \dots & Ain.Xn \\ \dots & \dots & \dots \\ An1.X1 \dots & Ani.Xi \dots & Ann.Xn \end{vmatrix} \quad (5)$$

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

$$\begin{vmatrix} B11 \dots & B1i \dots & B1n \\ \dots & \dots & \dots \\ Bi1 \dots & Bii \dots & Bin \\ \dots & \dots & \dots \\ Bn1 \dots & Bni \dots & Bnn \end{vmatrix} \quad (6)$$

From equation (1), we derive:

$$\begin{vmatrix} X1 \\ \dots \\ Xi \\ \dots \\ Xn \end{vmatrix} = \begin{vmatrix} B11 & 0 & 0 \\ \dots & \dots & \dots \\ Bi1 & 0 & 0 \\ \dots & \dots & \dots \\ Bn1 & 0 & 0 \end{vmatrix} \begin{vmatrix} Y1 \\ \dots \\ Yi \\ \dots \\ Yn \end{vmatrix} + \dots + \begin{vmatrix} 0 & B1i & 0 \\ \dots & \dots & \dots \\ 0 & Bii & 0 \\ \dots & \dots & \dots \\ 0 & Bni & 0 \end{vmatrix} \begin{vmatrix} Y1 \\ \dots \\ Yi \\ \dots \\ Yn \end{vmatrix} + \dots + \begin{vmatrix} 0 & 0 & B1n \\ \dots & \dots & \dots \\ 0 & 0 & Bin \\ \dots & \dots & \dots \\ 0 & 0 & Bnn \end{vmatrix} \begin{vmatrix} Y1 \\ \dots \\ Yi \\ \dots \\ Yn \end{vmatrix} \quad (7)$$

$$\begin{vmatrix} X1 \\ \dots \\ Xi \\ \dots \\ Xn \end{vmatrix} = \begin{vmatrix} B11Y1 \\ \dots \\ Bi1Y1 \\ \dots \\ Bn1Y1 \end{vmatrix} + \dots + \begin{vmatrix} B1i.Yi \\ \dots \\ Bii.Yi \\ \dots \\ BniYi \end{vmatrix} + \dots + \begin{vmatrix} B1n.Yn \\ \dots \\ Bin.Yn \\ \dots \\ Bnn.Yn \end{vmatrix} \quad (7.1)$$

Or

$$\begin{vmatrix} X1 \\ \dots \\ Xi \\ \dots \\ Xn \end{vmatrix} = \begin{vmatrix} B11 \dots & B1i \dots & B1n \\ \dots & \dots & \dots \\ 0 & 0 & 0 \\ \dots & \dots & \dots \\ 0 & 0 & 0 \end{vmatrix} \begin{vmatrix} Y1 \\ \dots \\ Yi \\ \dots \\ Yn \end{vmatrix} + \dots + \begin{vmatrix} 0 & 0 & 0 \\ \dots & \dots & \dots \\ Bi1 & Bii & Bin \\ \dots & \dots & \dots \\ 0 & 0 & 0 \end{vmatrix} \begin{vmatrix} Y1 \\ \dots \\ Yi \\ \dots \\ Yn \end{vmatrix} + \dots + \begin{vmatrix} 0 & 0 & 0 \\ \dots & \dots & \dots \\ 0 & 0 & 0 \\ \dots & \dots & \dots \\ Bn1 & Bni. & Bnn \end{vmatrix} \begin{vmatrix} Y1 \\ \dots \\ Yi \\ \dots \\ Yn \end{vmatrix} \quad (8)$$

$$\begin{vmatrix} X1 \\ \dots \\ Xi \\ \dots \\ Xn \end{vmatrix} = \begin{vmatrix} B11Y1 + \cdots & +B1iYi + \dots & +B1n.Yn \\ \dots & \dots & \dots \\ 0 & 0 & 0 \\ \dots & \dots & \dots \\ 0 & 0 & 0 \end{vmatrix} + \dots + \begin{vmatrix} 0 & 0 & 0 \\ \dots & \dots & \dots \\ Bi1Y1 + \dots & +BiiYi + \dots & +BinYn \\ \dots & \dots & \dots \\ 0 & 0 & 0 \end{vmatrix} + \dots + \begin{vmatrix} 0 & 0 & 0 \\ \dots & \dots & \dots \\ 0 & 0 & 0 \\ \dots & \dots & \dots \\ Bn1Y1 + \dots & +Bni.Yi + \dots & +Bnn,Yn \end{vmatrix} \quad (8.1)$$

From equations (7.1) and (8.1), we obtain a clear interpretation of backward and forward linkages:

- The diagonal elements of the inverse Leontief matrix B, denoted as Bii, represent the intrinsic propagation effect, indicating how the final demand for one unit of output in sector i influences the total output of sector i itself.
- The off-diagonal elements Bij (where $i \neq j$) capture the spillover effects, signifying how the final demand for one unit of output in sector j stimulates the production of sector i.
- The backward linkage (BL_j) of sector jj is given by:

$$BL_j = \sum_i B_{ij} = B_{jj} + \sum_{i \neq j} B_{ij}$$

This implies that the final demand for product jj not only influences its own output (Bjj) but also propagates to the output of other sectors in the economy ($\sum_{i \neq j} B_{ij}$).

- The forward linkage (FL_i) of sector ii is expressed as:

$$FL_i = \sum_j B_{ij} = B_{ii} + \sum_{j \neq i} B_{ij}$$

This indicates that the output of sector ii is not only driven by its own final demand (Bii) but also by the final demand of other sectors in the economy($\sum_{j \neq i} B_{ij}$).

- By combining the forward linkage vector (FL) and the backward linkage vector (BL) into a matrix, we obtain what is referred to as the "Economic Landscape" (EL):

$$EL = FL(n \times 1).BL(1 \times n)$$

Where n represents the number of sectors in the model. This Economic Landscape Matrix provides a comprehensive visualization of the structural interdependencies within an economy, highlighting key industries that drive both upstream and downstream linkages.

Furthermore, we define:

$$v_j = \frac{V_j}{X_j} \qquad (9)$$

And: $V = \begin{bmatrix} V_1 \\ V_i \\ V_n \end{bmatrix}$ (10)

Where V_i represents the value-added of sector i.

Let $V^* = \begin{vmatrix} V1/X1 \dots & 0 \dots & 0 \\ \dots & \dots & \dots \\ 0 \dots & Vi/Xi \dots & 0 \\ \dots & \dots & \dots \\ 0 \dots & 0 \dots & Vn/Xn \end{vmatrix}$ (11)

Multiplying both sides of equation (1) V^* we obtain:

$$\begin{vmatrix} V1 \\ \dots \\ Vi \\ \dots \\ Vn \end{vmatrix} = \begin{vmatrix} V1/X1 \dots & 0 \dots & 0 \\ \dots & \dots & \dots \\ 0 \dots & Vi/Xi \dots & 0 \\ \dots & \dots & \dots \\ 0 \dots & 0 \dots & Vn/Xn \end{vmatrix} \begin{vmatrix} B11 \dots & B1i \dots & B1n \\ \dots & \dots & \dots \\ Bi1 \dots & Bii \dots & Bin \\ \dots & \dots & \dots \\ Bn1 \dots & Bni \dots & Bnn \end{vmatrix} \begin{vmatrix} Y1 \\ \dots \\ Yi \\ \dots \\ Yn \end{vmatrix} \qquad (12)$$

So from (8) and (11), we have:

$$\begin{vmatrix} V1 \\ \dots \\ Vi \\ \dots \\ Vn \end{vmatrix} = \begin{vmatrix} v1B11.Y1 + \cdots & +v1B1i.Yi + \dots & +v1B1n.Yn \\ \dots & \dots & \dots \\ viBi1Y1 + \cdots & +viBii.Yi + \cdots & +viBin.Yn \\ \dots & \dots & \dots \\ vn.Bn1Y1 + \cdots & +vi.Bni.Yi + \cdots & +vnBnn.Yn \end{vmatrix} \qquad (13)$$

Equation (13) implies that the value-added of a sector is not only generated by its own final demand but also by the final demand of other sectors (row-wise). Similarly, the final product of a sector does not only create value-added for itself but also contributes to the value-added of other sectors (column-wise).

III. Empirical Results

This study utilizes three non-competitive input-output (I.O) tables from the years 2007, 2012, and 2022, covering 28 economic sectors. The 2007 and 2012 I.O tables were officially published based on direct surveys, while the 2022 I.O table was updated using the 2012 I.O table, enterprise survey data, the Vietnam Household Living Standards Survey (VHLSS), and individual household survey data from 2022.

It is assumed that, 2007 I.O table represents the 2006–2011 period, the 2012 I.O table represents the 2012–2017 period, and the 2022 I.O table represents the 2018–2023 period.

Table 1 provides a general overview showing that final demand in later periods exhibits stronger spillover effects than in earlier periods. Specifically, in the 2007 I.O period, a one-unit increase in final demand resulted in an average output increase of 1.66 units. In contrast, the corresponding multipliers for the 2012 and 2022 I.O tables increased to 1.71 and 1.98, respectively.

The livestock, fisheries, and agro-processing industries (such as food processing, beverages, tobacco, and wood and paper product manufacturing) consistently exhibited higher-than-average spillover effects from 2007 to 2023.

Notably, the sensitivity of crop production and agro-processing industries (including fisheries) to changes in demand was higher than the overall economic average, indicating that these sectors play a crucial role in the economy's production chain.

The textile and garment sector, which initially had above-average spillover effects during 2006–2011, saw a decline below the economy-wide average in the subsequent periods (2012–2017 and 2018–2023, with multipliers <1). This could potentially indicate that the industry has increasingly become more assembly-based rather than value-adding over time.

Most service sectors demonstrated lower-than-average spillover effects from final demand to total output (<1).

The combination of sensitivity and spillover effects offers a comprehensive inter sectoral linkage analysis. Given that the 2007 I.O table represents the 2006–2011 economic structure, the 2012 I.O table represents 2011–2017, and the 2022 I.O table represents 2018–2023, Appendix 1 reveals that there has been little to no significant change in inter sectoral linkages over the past 23 years.

Table 1. Output and Input Multipliers of the Economy (times)

	2007				**2012**				**2022**			
	Output multiplier	Spillover Index	Input multiplier	Sensitivity Index	Output multiplier	Spillover Index	Input multiplier	Sensitivity Index	Output multiplier	Spillover Index	Input multiplier	Sensitivity Index
Crop Production	1.473	0.889	2.583	1.559	1.542	0.902	2.319	1.356	1.787	0.905	2.480	1.255
Livestock	2.292	**1.383**	1.322	0.798	2.375	**1.389**	1.568	0.917	2.621	**1.327**	1.657	0.839
Forestry	1.511	0.912	1.628	0.982	1.176	0.688	1.182	0.691	1.444	0.731	2.351	1.190
Fisheries	1.925	**1.162**	1.320	0.797	1.858	**1.087**	1.402	0.820	2.128	**1.077**	1.555	0.787
Mining	1.231	0.743	1.637	0.988	1.472	0.861	2.581	1.509	1.654	0.837	2.413	1.222
Agro-processing and Fisheries Processing	2.381	**1.437**	1.820	1.098	2.415	**1.412**	1.750	1.023	2.701	**1.367**	1.960	0.992
Textile and Garment Industry	1.761	**1.063**	1.664	1.004	1.602	**0.937**	1.538	0.899	1.826	**0.925**	1.798	0.910
Leather and Leather Products	1.557	0.939	1.260	0.760	1.755	1.026	1.329	0.777	1.816	0.919	1.264	0.640
Wood and Wood Products	1.805	1.089	1.699	1.026	1.645	0.962	1.754	1.026	1.847	0.935	1.774	0.898
Paper Products	1.890	1.141	1.953	1.179	2.075	1.214	2.033	1.189	2.372	1.201	2.362	1.196
Printing and Publishing Products	1.796	1.084	1.215	0.733	2.081	1.217	1.313	0.768	2.357	1.193	1.298	0.657
Non-metallic Mineral Products	1.692	1.021	1.622	0.979	1.812	1.059	1.381	0.808	2.070	1.048	1.781	0.901
Chemical Products	1.570	0.947	1.701	1.027	1.854	1.084	3.422	2.001	2.032	1.028	4.778	2.419
Rubber and Plastic	1.355	0.817	1.590	0.960	1.822	1.065	1.717	1.004	2.059	1.042	1.733	0.877

Products												
Metal Products	1.509	0.911	1.901	1.147	1.611	0.942	2.314	1.353	1.861	0.942	3.110	1.574
Machinery Products	1.525	0.920	1.035	0.625	1.420	0.831	1.073	0.627	1.583	0.801	1.194	0.604
Transport Equipment Manufacturing	1.576	0.951	1.027	0.620	1.897	1.109	1.303	0.762	2.145	1.086	1.354	0.685
Electricity and Electrical Equipment	1.694	1.023	1.760	1.062	1.509	0.882	1.421	0.831	1.759	0.890	2.067	1.046
Other Industrial Products	1.959	1.182	2.556	1.543	1.932	1.130	2.112	1.235	2.147	1.087	2.336	1.183
Electricity and Water Production and Distribution	1.460	0.881	2.051	1.238	1.304	0.763	1.645	0.962	1.513	0.766	1.792	0.907
Construction	1.676	1.011	1.512	0.912	1.768	1.034	1.269	0.742	2.039	1.032	1.409	0.713
Wholesale, Retail, and Motor Vehicle Repair	1.349	0.814	2.618	1.580	1.455	0.851	2.140	1.251	1.767	0.895	2.444	1.237
Accommodation and Food Services	1.582	0.955	1.278	0.771	1.900	1.111	1.160	0.678	2.214	1.121	1.234	0.624
Transportation Services	1.405	0.848	1.848	1.115	1.694	0.990	1.755	1.027	1.959	0.992	1.957	0.991
Telecommunications	1.660	**1.002**	1.374	0.829	1.666	**0.974**	1.527	0.893	1.903	**0.963**	1.676	0.848
Financial Services	1.580	0.954	1.547	0.934	1.502	0.878	1.988	1.163	1.812	0.917	2.160	1.093
Public Services	1.649	0.995	1.103	0.666	1.341	0.784	1.054	0.616	1.827	0.925	1.076	0.545
Other Remaining Services	1.533	0.925	1.770	1.068	1.397	0.817	1.831	1.071	2.067	1.046	2.298	1.163
Average	**1.657**	**1.00**	**1.657**	**1.00**	**1.710**	**1.00**	**1.710**	**1.00**	**1.975**	**1.00**	**1.975**	**1.000**

Source: Calculations based on non-competitive I.O tables for 2007, 2012, and 2022 with 28 sectors.

Note:

- *The output multiplier reflects the total output of the economy (including both its own output and the output of other sectors) induced by final demand.*
- *The input multiplier represents the input requirements for a one-unit increase in value added.*
- *The power of dispersion index for a sector is calculated as:*

(Output Multiplier × Number of Sector)/Total Output Multipliers of All Sector

- *The sensitivity of dispersion index is computed as:*

(Intput Multiplier × Number of Sector)/Total Input Multipliers of All Sector

- *Sectors with both indices exceeding 1 exhibit strong output spillover and high sensitivity to economic fluctuations.*

I.O analysis is not intended for performance reporting but rather for identifying sectors of relative importance to the economy. Table 2 examines how final demand propagates within a sector and across other sectors. A truly significant sector is one whose final demand strongly influences the output of the rest of the economy.

Based on the spillover index of final demand across sectors, Table 2 highlights that livestock, fisheries, and agro-processing industries exhibit significantly higher-than-average spillover effects. Although the backward linkage index for these sectors increased during 2018–2023 compared to previous periods, their spillover effects declined sharply in the same period due to a general rise in backward linkages across all sectors.

Table 2. Spillover Effects of Final Demand on Own Output (B_{ii}) and Other Sectors

	Self-Sustained Dispersion Effect						**Spillover Effect on Other Sector**					
	2007		**2012**		**2022**		**2007**		**2012**		**2022**	
	Own Output	Power of Dispersion Index	Own Output	Power of Dispersion Index	Own Output	Power of Dispersion Index	Output of Other Sectors	Spillover Index	Output of Other Sectors	Spillover Index	Output of Other Sectors	Spillover Index
Crop Production	1.27	1.09	1.19	1.01	1.22	1.00	0.20	0.42	0.35	0.66	0.57	0.76
Livestock	1.19	1.02	1.40	1.19	1.46	1.20	1.10	**2.25**	0.97	**1.82**	1.16	**1.54**
Forestry	1.29	1.10	1.04	0.89	1.28	1.05	0.22	0.45	0.13	0.25	0.17	0.22
Fisheries	1.08	0.92	1.13	0.96	1.21	0.99	0.85	**1.73**	0.72	**1.36**	0.92	**1.22**
Mining	1.04	0.89	1.14	0.97	1.13	0.93	0.19	0.39	0.33	0.62	0.52	0.69
Agro-processing and Fisheries Processing	1.34	1.15	1.25	1.06	1.32	1.08	1.04	**2.13**	1.16	2.18	1.38	**1.83**
Textile and Garment Industry	1.43	1.22	1.30	1.11	1.42	1.16	0.33	0.68	0.30	0.56	0.41	0.54
Leather and Leather Products	1.21	1.03	1.29	1.10	1.23	1.01	0.35	0.72	0.46	0.87	0.58	0.78
Wood and Wood Products	1.28	1.10	1.30	1.11	1.16	0.95	0.52	1.07	0.34	0.65	0.69	0.91
Paper Products	1.37	1.17	1.42	1.21	1.51	1.23	0.52	1.06	0.65	1.22	0.86	1.15
Printing and Publishing Products	1.09	0.94	1.14	0.97	1.11	0.91	0.70	1.44	0.94	1.77	1.25	1.66
Non-metallic Mineral Products	1.13	0.96	1.11	0.95	1.23	1.01	0.57	1.16	0.70	1.31	0.84	1.12
Chemical Products	1.09	0.93	1.25	1.06	1.39	1.13	0.48	0.98	0.61	1.14	0.65	0.86
Rubber and Plastic Products	1.13	0.96	1.18	1.00	1.18	0.96	0.23	0.47	0.64	1.20	0.88	1.17
Metal Products	1.29	1.10	1.33	1.13	1.48	1.21	0.22	0.46	0.29	0.53	0.38	0.50
Machinery Products	1.01	0.87	1.03	0.88	1.09	0.89	0.51	1.05	0.39	0.73	0.49	0.65
Transport Equipment Manufacturing	1.02	0.87	1.29	1.09	1.33	1.09	0.56	1.15	0.61	1.15	0.82	1.08
Electricity and Electrical Equipment	1.29	1.10	1.15	0.98	1.24	1.01	0.41	0.83	0.36	0.67	0.52	0.69
Other Industrial	1.14	0.97	1.04	0.88	1.04	0.85	0.82	1.68	0.89	1.67	1.11	1.47

Products												
Electricity and Water Production and Distribution	1.17	1.00	1.06	0.90	1.07	0.88	0.29	0.60	0.25	0.47	0.44	0.58
Construction	1.06	0.91	1.06	0.91	1.06	0.87	0.61	1.26	0.70	1.32	0.98	1.30
Wholesale, Retail, and Motor Vehicle Repair	1.02	0.87	1.01	0.86	1.03	0.84	0.33	0.67	0.44	0.83	0.74	0.98
Accommodation and Food Services	1.01	0.86	1.01	0.86	1.01	0.83	0.57	1.18	0.89	1.67	1.20	1.60
Transportation Services	1.11	0.95	1.12	0.95	1.14	0.93	0.29	0.60	0.57	1.08	0.82	1.09
Telecommunications	1.10	0.94	1.32	1.12	1.32	1.08	0.56	1.15	0.35	0.66	0.58	0.77
Financial Services	1.39	1.19	1.27	1.08	1.34	1.10	0.19	0.39	0.23	0.44	0.47	0.63
Public Services	1.06	0.91	1.01	0.86	1.02	0.84	0.59	1.21	0.33	0.62	0.81	1.07
Other Remaining Services	1.13	0.97	1.08	0.92	1.20	0.98	0.40	0.82	0.31	0.59	0.87	1.15
Average Spillover Level	**1.17**	**1.0**	**1.18**	**1.00**	**1.22**	**1.00**	**0.49**	**1.00**	**0.53**	**1.00**	**0.75**	**1.00**

Source: Computation based on the non-competitive I.O tables for 2007, 2012, and 2022, covering 28 sectors.

In I.O analysis, the output multiplier represents the extent to which one unit of final demand for each sector propagates through the economy's total output. However, what a nation ultimately seeks is value added (with total value added equating to GDP). In many cases, the spillover effect from final demand to output is high, while the impact on value added remains low, or vice versa.

For instance, the crop production sector exhibits a relatively lower output dispersion index compared to the economy-wide average (0.869, 0.902, and 0.905 for the three respective periods). However, its value-added dispersion index surpasses the economy-wide average (1.081, 1.214, and 1.139 for the periods 2006–2011, 2012–2017, and 2018–2023, respectively). In contrast, the livestock and fisheries sectors display an opposite trend: their output dispersion index is consistently above the economy-wide average, yet their value-added dispersion index remains below the average across all three periods.

A noteworthy observation is that most service sectors exhibit a low output dispersion index while maintaining a value-added dispersion index higher than the economy-wide average. This suggests that only final products from the crop production sector, the agro-processing and fisheries industry, and service sectors significantly contribute to the economy's value-added propagation.

On Imports:

Table 3 illustrates that final products from most manufacturing and processing industries (excluding agro-processing and fisheries) exhibit a low dispersion effect on value added but a high dispersion effect on imports. This partially reflects the heavy reliance of the manufacturing sector on processing and assembly operations. The ambition to increase the value-added share of this sector in GDP might inadvertently constrain other sectors with high value-added dispersion effects and low import dependency. This raises the question of whether policy resource allocation has been misaligned.

An analysis of economic structure through I.O tables across all periods from 2006 to 2023 reveals that final products from the crop production sector, the agro-processing and fisheries industry, and service sectors exhibit strong spillover effects on value added while maintaining a low impact on imports. These sectors should be considered key drivers of the economy and should receive concentrated resource allocation, particularly in terms of policy resources.

Table 3. Value-Added Multiplier and Import Multiplier

	Value added multiplier						Import multiplier					
	2007		2012		2022		2007		2012		2022	
	VA	Value-Added Spillover Index	VA	Value-Added Spillover Index	VA	Value-Added Spillover Index	Import	Import Spillover Index	Import	Import Spillover Index	Import	Import Spillover Index
Crop Production	0.735	1.081	0.748	1.214	0.684	1.139	0.268	0.750	0.253	0.657	0.330	0.735
Livestock	0.685	1.008	0.573	0.930	0.544	0.905	0.320	0.894	0.428	1.112	0.470	1.047
Forestry	0.712	1.048	0.598	0.971	0.634	1.056	0.291	0.814	0.402	1.045	0.369	0.823
Fisheries	0.597	0.878	0.570	0.926	0.540	0.899	0.407	1.140	0.430	1.118	0.469	1.047
Mining and Quarrying	0.852	1.253	0.655	1.064	0.581	0.967	0.153	0.427	0.345	0.897	0.433	0.965
Agro-processing and Fisheries Industry	0.634	0.932	0.658	1.068	0.606	1.008	0.375	**1.050**	0.343	0.891	0.412	0.920
Textile and Garment Industry	0.402	0.591	0.526	0.854	0.473	0.787	0.603	**1.689**	0.474	1.233	0.536	**1.195**
Leather and Footwear Industry	0.524	0.771	0.627	1.017	0.521	0.868	0.479	**1.341**	0.374	0.972	0.486	**1.084**
Wood and Wood Products	0.672	0.988	0.306	0.496	0.403	0.671	0.333	0.933	0.694	1.806	0.600	**1.339**
Paper Products	0.523	0.769	0.565	0.917	0.545	0.907	0.483	**1.351**	0.436	1.133	0.477	**1.063**
Printing and Publishing Products	0.589	0.867	0.591	0.959	0.567	0.944	0.418	**1.170**	0.410	1.067	0.468	**1.044**
Non-metallic Mineral Products	0.722	1.062	0.677	1.098	0.622	1.035	0.286	0.800	0.324	0.842	0.393	**0.876**
Chemical Products	0.429	0.631	0.521	0.845	0.463	0.771	0.579	**1.620**	0.480	1.247	0.553	**1.233**
Rubber and Plastic Products	0.603	0.887	0.491	0.797	0.466	0.775	0.400	**1.118**	0.509	1.324	0.548	**1.222**
Metal Products	0.324	0.476	0.436	0.708	0.413	0.688	0.681	**1.905**	0.564	1.468	0.597	**1.331**
Machinery Products	0.491	0.723	0.359	0.582	0.284	0.474	0.513	**1.436**	0.641	1.668	0.722	**1.610**
Transport Equipment Manufacturing	0.424	0.624	0.531	0.862	0.493	0.821	0.583	**1.630**	0.469	1.221	0.527	**1.174**
Electricity and Electrical Equipment	0.613	0.901	0.406	0.658	0.399	0.664	0.392	**1.097**	0.595	1.547	0.610	**1.360**
Other Industrial Products	0.675	0.993	0.535	0.868	0.523	0.870	0.330	0.922	0.465	1.210	0.488	**1.088**
Electricity and Water Production and Distribution	0.881	1.296	0.863	1.400	0.756	1.259	0.129	0.361	0.137	0.357	0.251	**0.561**
Construction	0.622	0.915	0.582	0.944	0.548	0.912	0.387	1.082	0.419	1.089	0.470	**1.048**

Wholesale, Retail, and Motor Vehicle Repair	0.840	1.235	0.857	1.390	0.822	1.369	0.174	0.487	0.145	0.378	0.242	0.540
Accommodation and Food Services	0.874	1.285	0.706	1.145	0.666	1.109	0.135	0.379	0.295	0.768	0.366	0.816
Transportation Services	0.590	0.868	0.598	0.970	0.565	0.940	0.419	1.172	0.403	1.049	0.460	1.026
Telecommunications	0.849	1.249	0.695	1.128	0.647	1.076	0.193	0.540	0.305	0.794	0.380	0.847
Financial Services	0.799	1.175	0.876	1.422	0.843	1.403	0.209	0.584	0.125	0.325	0.205	0.458
Public Services	1.186	1.744	0.837	1.358	1.018	1.694	0.272	0.762	0.147	0.383	0.345	0.770
Other Remaining Services	1.189	1.749	0.868	1.409	1.194	1.988	0.195	0.545	0.154	0.400	0.348	0.776
Average Spillover Level	**0.680**	1.000	**0.616**	1.000	**0.601**	1.000	**0.357**	1.000	**0.384**	1.000	**0.448**	1.000

Source: Calculations from the non-competitive I.O tables of 2007, 2012, and 2022 with 28 sectors.

Table 4 illustrates that among the three components of final demand during the 2007–2023 period, final consumption demand despite varying levels consistently exhibits the strongest spillover effect on value-added, although its impact on output is not always the highest.

During the 2018–2023 period, exports exhibited the lowest spillover effect on both output and value-added among the final demand components. Over time, the impact of exports on output and value-added has evolved as follows: in the 2006–2011 period, one unit of exports generated 1.703 units of output and 0.60 units of value-added; in the 2012–2017 period, one unit of exports generated 1.76 units of output but only 0.58 units of value-added; in the 2018–2023 period, the spillover effect on output increased to 1.99 units, while the effect on value-added declined further to 0.54 units.

This trend suggests an increasing shift towards processing and assembly in exported products, likely due to the rising dominance of the foreign direct investment (FDI) sector in Vietnam's export structure. The share of exports from the FDI sector increased from 53.2% in 2006 to over 74% in 2023 (Appendix 2).

Table 4. Spillover Effects of Final Demand Components on Output and Value-Added

		Final demand induce to output	**Final demand induce to value added**
2007	Final Consumption	1.763	0.827
	Gross capital formation	1.724	0.608
	Exports	1.703	0.600
2012	Final Consumption	1.752	0.7149
	Gross capital formation	1.838	0.5789
	Exports	1.756	0.5839
2022	Final Consumption	2.096	0.748

	Gross capital formation	2.101	0.543
	Exports	1.990	0.537

Source: Calculations from the non-competitive I.O tables for 2007, 2012, and 2022 with 28 sectors.

IV. Conclusions and policy implications

The analysis of spillover and linkage indices across economic sectors from 2007 to 2023 reveals significant shifts in Vietnam's economic structure. The livestock, fisheries, and agro-processing industries consistently exhibit spillover indices above the economy-wide average, underscoring their substantial influence and critical role in driving total output across sectors. However, during the 2018–2023 period, the spillover effects of these sectors declined rapidly despite an increase in their backward linkages. This trend may be attributed to the rising backward linkages of other sectors, which diminished the relative spillover impact of livestock, fisheries, and agro-processing industries.

An examination of spillover indices further indicates that most final products within the manufacturing sector—excluding agricultural and fisheries processing—demonstrate low spillover effects on value-added but exert a strong impact on imports. This suggests that manufacturing activities are heavily dependent on processing and assembly, leading to increased reliance on imported inputs and a reduced capacity for domestic value creation. Efforts to elevate the contribution of manufacturing to GDP in terms of value-added may inadvertently constrain the growth of sectors with high value-added spillover and low import dependence, thereby leading to a misallocation of policy resources.

Over the 2007–2023 period, final consumption demand has consistently exhibited the strongest spillover effect on value-added, even though its impact on total output has not always been the highest. This highlights the critical role of consumption in driving economic growth and value-added generation. An increase in final consumption demand not only contributes to total economic output but also generates substantial spillover effects across various sectors, fostering sustainable economic development.

These findings provide valuable insights into structural changes within the economy and the varying impacts of different sectors and final demand components on economic linkages and spillovers. Understanding these dynamics enhances our comprehension of Vietnam’s economic evolution between 2007 and 2023 and offers crucial policy recommendations for future economic development strategies. Optimizing the benefits derived from sectoral spillovers and linkages will play a vital role in fostering sustainable growth and national prosperity.

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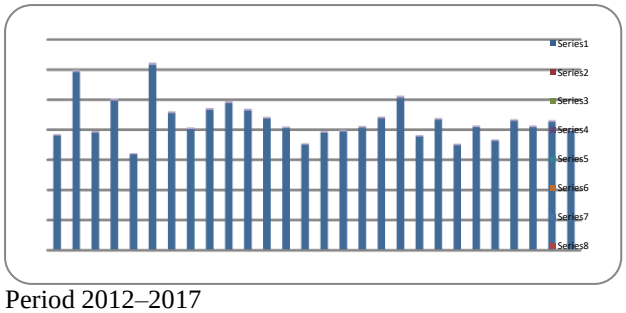
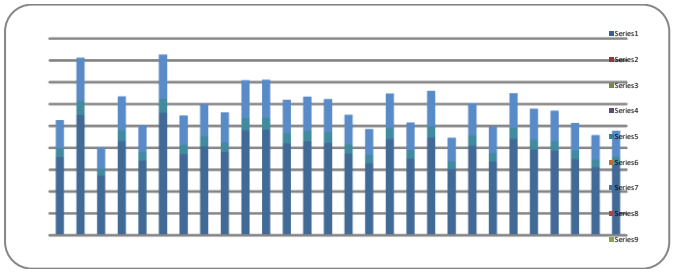
Appendix 1. Economic Landscape across Three Periods

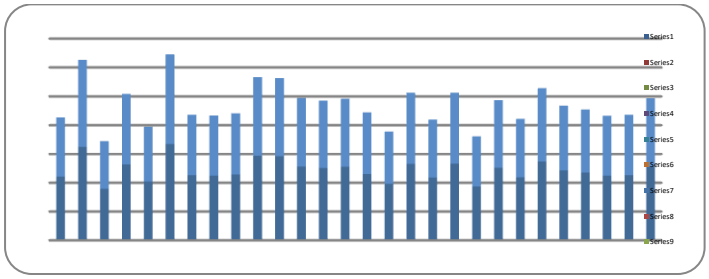
Period: 2006–2011



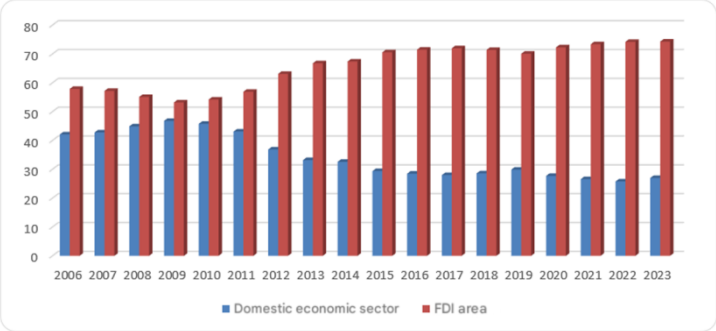
Period 2012–2017



Period 2018 – 2023



Appendix 2. Export Share of Domestic and FDI Sectors (%)



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