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

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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.

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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:

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

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

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:

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

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

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		