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Decomposition Analysis of Factors Affecting Energy Demand in Vietnam From 1990 To 2018

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ABSTRACT
Total energy consumption in Vietnam has doubled in the last decade. Investigating the factors that make changes in the use of energy is crucial for future predictions. Decomposition analysis enables the quantification of factors contributing to the change of aggregate energy. This study attempts to analyze the main factors' effect on the overall change in total energy consumption in Vietnam from 1990 to 2018 using Logarithmic Mean Divisia Index (LMDI). LMDI decomposes the overall change in energy use into three effects, namely activity, structural, and intensity effects. Results of the study show that the increase in Vietnamese energy consumption is primarily due to economies of activity. Structural factors and intensity in the recent period have changed in the direction of reducing total energy demand, reflecting the technology development and production efficiency.

I. INTRODUCTION

Energy is the driving force of the economy, plays an essential role, and directly affects every aspect of socio-economic life. Energy consumption growth is inevitable in economic growth. Final energy consumption in Vietnam increased from 3.703 million tons of oil equivalent (MTOE) in 1990 to 49.831 MTOE in 2018, with an average increase of about 1.5 times every 5 years [1]. The growth of energy demand depends on the activity, the economic structure, and energy–economic intensity. The impacts of these factors on the energy demand growth are changing over time, making the job of policymakers and energy planners challenging. Hence, this study seeks to quantify the impact of the three effects on the total energy demand in Vietnam in 1990 – 2018.

Decomposition analysis is a widely used technique to track the relative contributions of different factors on the change of energy use, energy consumption structure between economic sectors, and intensity. Logarithmic Mean Divisia Index (LMDI) is robust due to being consistent in aggregation, residual free, and easy interpretation. This method is also being used by International Energy Agency (IEA) in training courses [2, 3]. Until now, many research has applied this method in energy development problems: Study on the effect of three factors activity, structural and intensity to energy consumption in Pakistan [4]; Evaluation on factors affecting greenhouse gas emissions from power plant in Nigeria [5]; Intensity analysis on industrial industries in California [6], Turkey [7]; Identify the main factors that lead to the declined trend in energy intensity in APEC since 2005 [8]; Analyze the factors affecting on energy-related carbon dioxide emission from residential consumption in Beijing (China) [9]; Energy-related CO2 emissions in South Africa [10]; Analysis on the three changes in energy use: changes in production or quantity (activity), changes in the combination of subdivisions (structural), and changes in the needed energy for every output in each subsector (intensity) in Canada [11]; US energy intensity indexes [12]; Decomposition analysis on the changes in Korean manufacturing sector's energy consumption [13]; Decomposition analysis of energy-related CO2 emissions in China's Logistics [14]; Analysis on the origin of changes in CO2 emissions and CO2 intensity in Thai manufacturing sector in the period 2005-2017 [15].

This study decomposition analysis on three factors: total energy consumption, energy consumption structure according to sectors, and industries' intensity to assess the impact of the agricultural, industrial, and service on Vietnam's energy consumption in 1990-2018 to clarify the main factors affecting the structure and energy consumption demand.

The rest of the report is as follows. Sector 2 provides an overview of the energy sector in Vietnam. Sector 3 describes the methodology and data. Sector 4 discusses the result. Finally, Sector 5 concludes the study.

AN OVERVIEW OF THE VIETNAMESE ENERGY SECTOR AND THE ECONOMY

In general, final energy consumption in Vietnam is increasing moderately: 48 MTOE in 2010, 75 MTOE in 2020, and is expected to reach 112 MTOE in 2030 [16]. Major sources of energy include natural gas, petroleum, hydroelectricity, coal, wind, and solar. In 2020, the proportion of final energy consumption was: 19% coal, 39% crude oil, 2% natural gas, 21% electricity, and 19% renewable energy. Since 2015, Vietnam has

become an energy importer due to the depletion of coal, crude oil, and natural gas reserves, hydroelectricity production has reached its peak while energy demand has increased rapidly. The rate of final energy consumption in 2010: industrial 56.08%, agriculture 7.24%, service 41.85%; in 2018: industrial 60.76%, agriculture 7.24%, service 32.01% [17]. Therefore, considering the past 10 years, final energy demand in Vietnam has increased by an average of 10% per year, energy consumption in the industrial sector is over 50%, followed by service with about 30-40%, and finally is agriculture with the least energy consumption, roughly 2-7%.

II. METHODOLOGY AND DATA

An overall of Decomposition Analysis

Decomposition Analysis was first introduced by B.W. Ang, Department of Industrial and Systems Engineering, National University of Singapore through "A Simple Guide to Decomposition Analysis" in 2012 [18]. IEA is currently using this method in training documents [2,3]. Decomposition analysis indicates that there are three main factors in the explanation of the changes of energy consumption, including:

- Activity effect: this factor points out the changes in the activity of the economy or the output of an economic sector, with the assumption that the increase of productivity of the economy (or an economic sector) is related to the increasing of energy demand. Most of these factors are being measured through the value-added target.
- Structural effect: this factor shows the changes in the structure of each economic sector, economic structure changes affect on the consumption of energy since each activity and sector has different intensity.
- Intensity effect: this factor shows the changes in intensity. Intensity is measure by energy consumption per output unit (TOE/ millions of USD). This factor is considered a representative factor to reflect the effectiveness of energy use.

The mathematical formula of this method is based on the following: analyze the affective factors on energy consumption of a country, a sector, an area, … using different factors:

$$E = \sum_{i}^{n} Q \cdot \frac{Q_i}{Q} \cdot \frac{E_i}{Q_i} = Q \cdot \sum_{i}^{n} \left(S_i \cdot I_i \right) \quad (1)$$

Where:
E: Total energy consumption of a country, a sector, or an area
Q: The economic activity of a country, a sector, or an area
i: A certain sub-sector or a sector index
Qi: The economic activity of a sector or a field
Si: The structure of a sector or a field
Ii: Intensity of a sector or a field

Hence, energy consumption (E) is performed by 3 factors:

- Activity (A) of a country, a sector, or a considerable field
- Structure (S) of a country, a sector, or a considerable field
- Intensity (I) of a country, a sector, or a considerable field

The changes in energy consumption are explained through 3 factors:

$$\Delta E_{tot} = E_t - E_0 = \Delta E_{act} + \Delta E_{str} + \Delta E_{int} \quad (2)$$

Where:
E_t: energy consumption in year T
E_0: energy consumption in year 0
ΔE_{tot}: changes in energy consumption in decomposition
ΔE_{act}: changes in energy consumption due to activity changes
ΔE_{str}: changes in energy consumption due to structural changes
ΔE_{int}: changes in energy consumption due to intensity changes

These changing components are calculated by the following equations:

$$\Delta E_{act} = \sum_i W_i \ln \frac{Q^T}{Q^0} \quad (3)$$

$$\Delta E_{str} = \sum_i W_i \ln \frac{S_i^T}{S_i^0} \quad (4)$$

$$\Delta E_{int} = \sum_i W_i \ln \frac{I_i^T}{I_i^0} \quad (5)$$

$$W_i = \frac{E_i^T - E_i^0}{\ln E_i^T - \ln E_i^0} \quad (6)$$

In all of the above equations, act, str, int indicates activity effect, structural effect, and intensity effect, respectively.

To calculate the activity effect (ΔEAct) for the three sectors, we divide total current period output by total base period output for all 3 sectors (Q_t/Q_0) and take their natural logarithm, then multiplied by Wi, we will get the final value of the activity effect. Structural effect (ΔEStr) is calculated for three sectors by dividing the current period output share of the i^{th} sector in total output by base period output share of the same sector, in other words, (S_i^T/S_i^0) multiplied by Wi. Similarly, the intensity effect (ΔEint) is calculated for the three sectors by diving the current period energy intensity of the i^{th} sector by base period energy intensity of the same sector, which means that (I_i^T / I_i^0) multiplied by Wi. The total value of the three equations (3), (4), and (5) must be equal to the term $\Delta E = E_T - E_0$ in equation (2).

Data

The input data in this study including statistics on energy consumption and gross domestic product value according to 3 economic sectors: construction industry, agriculture, forestry and fishery, trade, and services in Vietnam in the period 1990-2018.

Table 1: Energy consumption in Vietnam 1990-2018 (KTOE) [17]

Year	1990	1995	2000	2005	2010	2015	2018
Industrial	1713	3099	4653	8976	15709	26374	30276
Agriculture	244	366	400	545	580	694	3606
Services	1746	3144	4814	8563	11721	13318	15949
Total	3703	6609	9867	18084	28010	40386	49831

Table 2: Gross domestic product of Vietnam 1990-2018 [19]

Year	1990	1995	2000	2005	2010	2015	2018
Industrial	7.35	12.95	21.43	32.53	37.25	52.78	66.75
Agriculture	10.01	12.23	15.18	18.42	21.31	24.85	26.89
Services	12.29	18.60	24.53	34.40	42.83	59.17	72.79
Total	29.64	43.77	61.15	85.35	101.39	136.80	166.43

Results and discussions

The results include 2 groups: intermediate results and final results.

Intermediate results include "economic activity" (proportion of gross domestic product of sectors), economic sectors' intensity (Ii value), and Wi value (calculated by equation (6)).

The final results are the changes in energy consumption according to 3 factors: activity, structural, and intensity (equations (2), (3), (4), (5)).

Intermediate results

Table 3. Economic activity (%)

Year	1990	1995	2000	2005	2010	2015	2018
Industrial	24.79	29.58	35.05	38.11	36.74	38.58	40.11
Agriculture	33.76	27.94	24.83	21.58	21.02	18.17	16.16
Services	41.45	42.49	40.12	40.30	42.24	43.25	43.74
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 4. intensity (KTOE/10^6 USD)

Year	1990	1995	2000	2005	2010	2015	2018
Industrial	0.233	0.239	0.217	0.276	0.422	0.500	0.454
Agriculture	0.024	0.030	0.026	0.030	0.027	0.028	0.134
Services	0.142	0.169	0.196	0.249	0.274	0.225	0.219

Table 5. Wi coefficient calculation results

Year	1990	1995	2000	2005	2010	2015	2018
Industrial	0.233	0.239	0.217	0.276	0.422	0.500	0.454
Agriculture	0.024	0.030	0.026	0.030	0.027	0.028	0.134
Services	0.142	0.169	0.196	0.249	0.274	0.225	0.219

Final results

Table 6. Energy demand based on 3 factors in different periods

Period	1990-95	95-2000	2000-05	2005-10	2010-15	2015-18
ΔEact	1954.69	2714.05	4522.81	3900.98	10100.93	8752.13
ΔEstr	414.69	379.32	515.24	15.79	1210.00	1051.44
ΔEint	536.62	164.63	3178.96	6009.23	1065.07	-358.57
ΔEtot	2906.00	3258.00	8217.00	9926.00	12376.00	9445.00

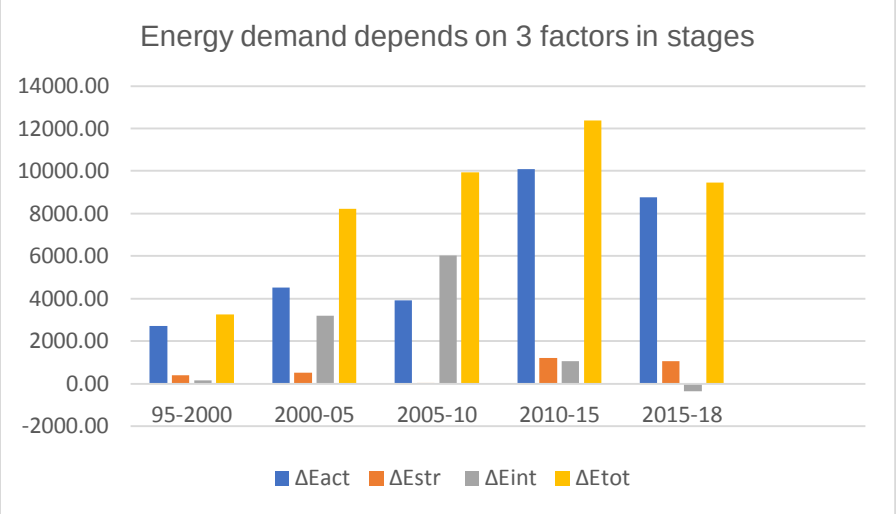


Figure 1. Energy demand based on 3 factors in different periods

From 1990 to 1995, the energy consumption of the country increased from 3703 KTOE to 6609 KTOE (a climb of 2906 KTOE). Figure 1 shows that the increase in energy consumption is due to the effects of the three trends in the same direction. In which, the economic activity changes led to the energy consumption to increase at the maximum of 1954.69 KTOE, followed by was the changes in intensity that made energy consumption had an increase of 536.62 KTOE, and finally energy consumption observed a climb of 164.63 KTOE due to the changes of the economic structure.

In the period 1995-2000, the country's energy consumption increased from 6609 KTOE to 9867 KTOE (an increase of 3258 KTOE). In which, changes in the economic activity led to the fact that energy consumption could increase by a maximum of 2714.05 KTOE, followed by the changes in the structure of the economy that increase the energy consumption by 379.32 KTOE, and finally the changes in intensity made the energy consumption to increase by 164.63 KTOE.

Between 2000 and 2005, the energy consumption of the country grew from 9867 KTOE to 18084 KTOE (increased by 8217 KTOE). The increase in energy consumption was due to the 3 trends in the same direction. In which, changes in the economic activity led to a maximum climb of energy consumption by 4522.81 KTOE, followed by the economic structure, with an increase of 3178.96 KTOE for energy consumption, and finally was the changes in intensity that made energy consumption have an increase of 515.24 KTOE. In this period, there was a large fluctuation in intensity. The changes in intensity led the energy consumption to increase to almost equal to the changes in energy consumption due to economic activity's changes.

From 2005 to 2010, the energy consumption of the country climbed from 18084 KTOE to 28010 KTOE (an increase of 9926 KTOE). Energy consumption increased due to the effects of the 3 trends in the same direction. In which, changes in intensity had the largest effect with 6009.23 KTOE, changes in the

economic activity led to an increase of 3900.98 KTOE for energy consumption, finally was the changes in the structure of the economy that made energy consumption increase by 15.79 KTOE.

From 2010 through 2015, the country's energy consumption increased from 28010 KTOE to 40386 KTOE (which grew by 12376 KTOE). The increasing trend of energy consumption was due to the effects of the 3 trends in the same direction. In which, changes in economic activity increased by 10100.93 KTOE, 1210.00 KTOE for the structure of the economy, and 1067.07 KTOE for intensity.

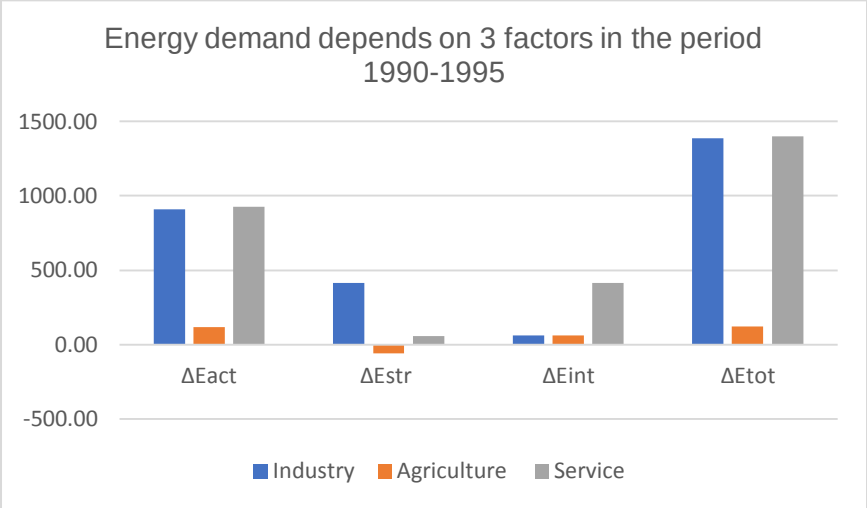
Between 2015 and 2018, the energy consumption of the country increased from 40386 KTOE to 49831 KTOE (an increase of 9445 KTOE). Energy consumption increased because of the effects of the 3 trends in opposite directions. In which, changes in the activity of the economy, the structure of the economy, and intensity increased by 8752.13 KTOE, 1051.44 KTOE, and -358.57 KTOE respectively.

Details on the factors that affect energy consumption in different sectors are analyzed as below:

1990-1995 period:

Table 7. Energy demand based on 3 factors in the period of 1990-2005 (KTOE)

90-95	Industrial	Agriculture	Services
ΔEact	911.12	117.26	926.30
ΔEstr	413.07	-56.99	58.62
ΔEint	61.81	61.73	413.08
ΔEtot	1386.00	122.00	1398.00



In this period, energy consumption in industrial increased by 1386 KTOE, detailly, changes in structure, activity, and intensity according to the GDP of the sector had made an increase of 911.12 KTOE, 413.07 KTOE, and 61.81 KTOE on energy consumption, respectively.

Energy consumption in agriculture grew by 122 KTOE, in which the changes in the activity of the sector lead to an increase of 117.26 KTOE on energy consumption, changes in the sector's structure experienced a fall of -56.99 KTOE, and finally changes in intensity according to the GDP of the sector made the energy consumption to increase by 61.76 KTOE.

Energy consumption in the services sector increased by 1598 KTOE, in which the changes in the sector's activity, structure, and intensity based on GDP lead to an increase of 926.30 KTOE, 58.62 KTOE, and 413.08 KTOE respectively in the changes of energy consumption.

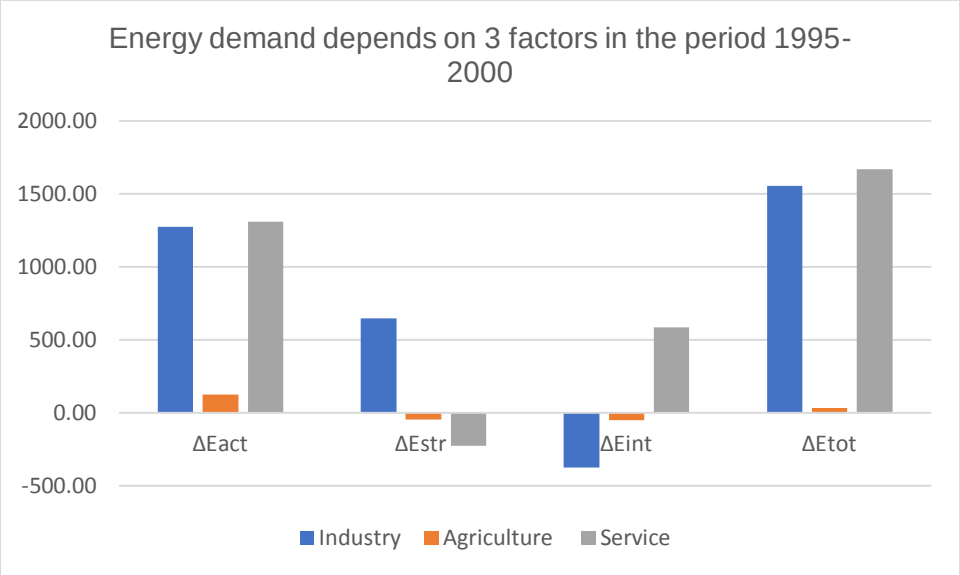
In the period of 1990-1995, changes in the structure of agriculture led to the fact that its effect on total energy demand had an opposite trend with the other two factors, but at a low rate.

1995-2000 period

Table 8. energy demand based on 3 factors in the period of 1995-2000 (KTOE)

95-2000	Công nghiệp	Nông nghiệp	Dịch vụ
ΔEact	1277.01	127.83	1309.20
ΔEstr	648.88	-45.13	-224.43

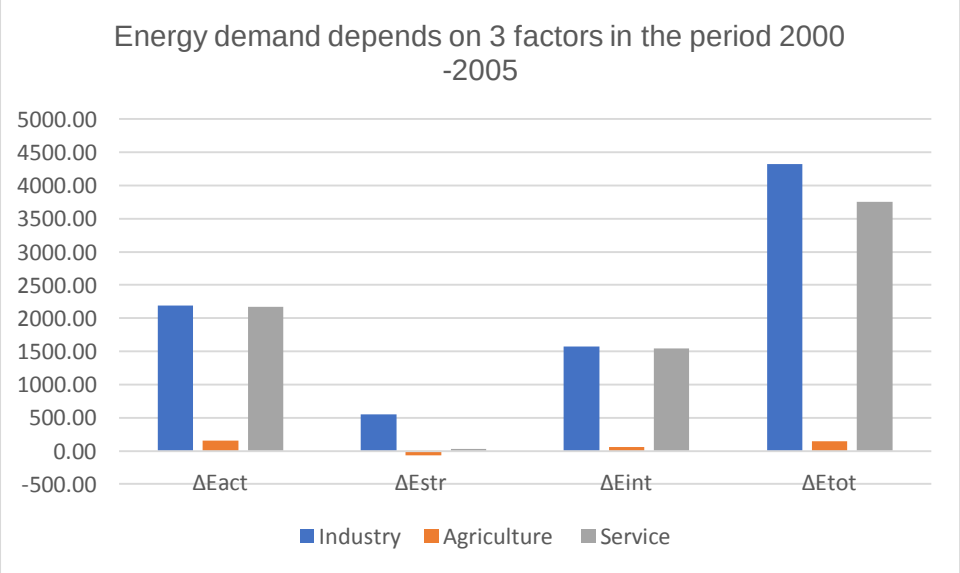
ΔEint	-371.89	-48.71	585.23
ΔEtot	1554.00	34.00	1670.00



In this period, the structure of the agriculture and services sector; the intensity of the industrial and agriculture sector had an opposite effect to the remaining sectors. In which the industrial's intensity decreased by -371.89 KTOE, the services sector's structure fell by -224.43 KTOE.
2000-2005 period:

Table 9. Energy demand based on 3 factors in the period of 200-2005 (KTOE)

2000-05	Công nghiệp	Nông nghiệp	Dịch vụ
ΔEact	2194.88	156.38	2171.55
ΔEstr	551.21	-65.69	29.72
ΔEint	1576.91	54.31	1547.73
ΔEtot	4323.00	145.00	3749.00

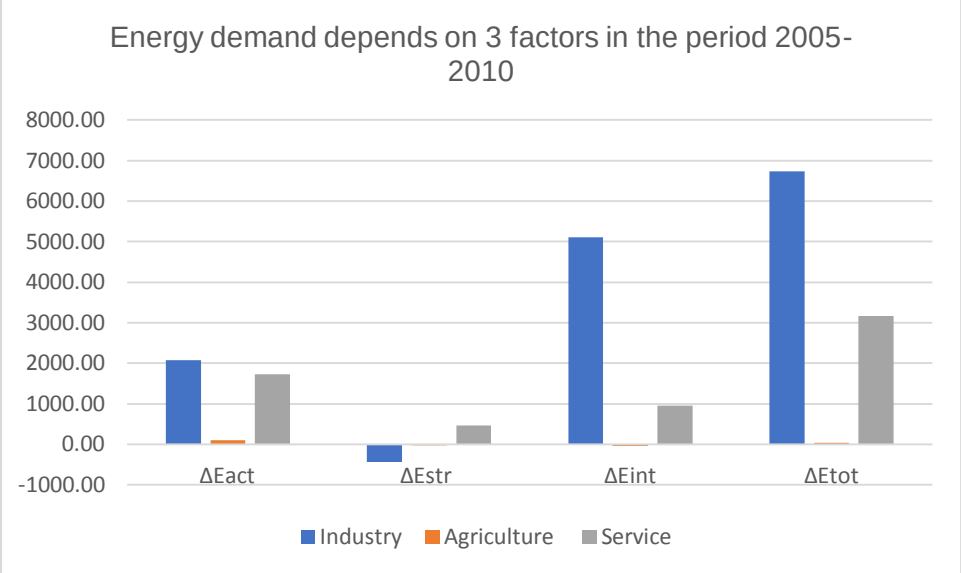


The period of 2000-2005 only had the agriculture's structure that had an opposite effect compared with other factors, but it was not big (-65.69 KTOE).

2005-2010 period:

Table 10. Energy demand according to 3 factors in he period of 2005-2010 (KTOE)

2005-10	Công nghiệp	Nông nghiệp	Dịch vụ
ΔEact	2071.75	96.84	1732.39
ΔEstr	-441.80	-14.89	472.48
ΔEint	5103.05	-46.95	953.13
ΔEtot	6733.00	35.00	3158.00

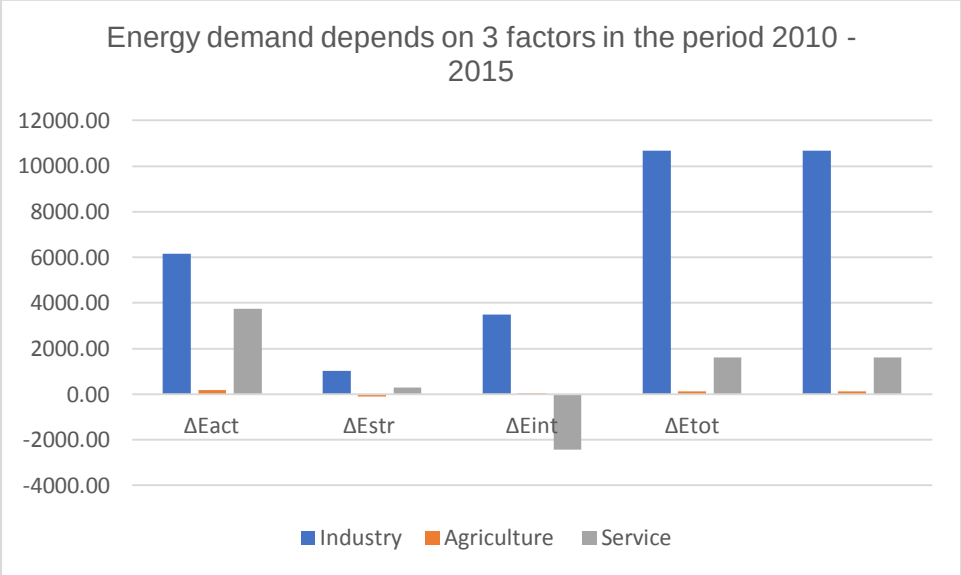


The period of 2005-2010 had 3 opposite-effected factors: industrial's structure (-441.80 KTOE), agriculture structure (-14.89 KTOE), and agriculture's intensity (-46.95 KTOE).

2010-2015 period:

Table 11. Energy demand based on 3 factors in the period of 2010-2015 (KTOE)

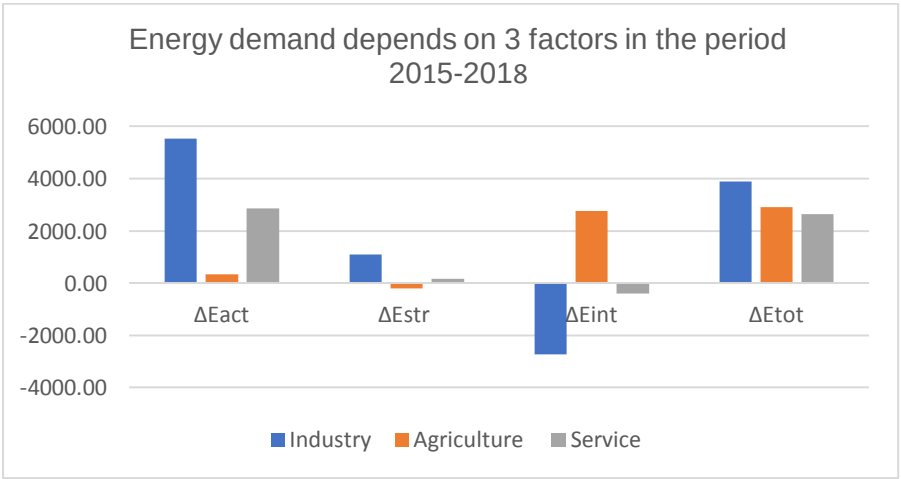
2010-15	Công nghiệp	Nông nghiệp	Dịch vụ
ΔEact	6165.56	190.30	3745.07
ΔEstr	1007.23	-92.67	295.44
ΔEint	3492.21	16.37	-2443.51
ΔEtot	10665.00	114.00	1597.00



The period of 2010-2015 had 2 opposite-effected sectors: agriculture's structure (-92.67 KTOE) and services' intensity (-2443.51 KTOE), in which the intensity of services had a quite big impact (-1443.51 KTOE)
2015-2018 period

Table 12. Energy demand based on 3 factors in the period of 2015-2018 (KTOE)

2015-18	Công nghiệp	Nông nghiệp	Dịch vụ
ΔEact	5544.46	346.45	2861.22
ΔEstr	1096.34	-207.03	162.13
ΔEint	-2738.80	2772.58	-392.35
ΔEtot	3902.00	2912.00	2631.00



The period of 2015-2018 had 3 sectors that had opposite effects: agriculture' structure (-207.03 KTOE), industrial' intensity (-2738.80 KTOE), and services' intensity (-392.35 KTOE), in which the intensity of industrial had a quite big impact with -2738.80 KTOE

III. CONCLUSION

The results on decomposition analysis to evaluate the factors' effect on activity, structural and intensity of different sectors on energy consumption showed that:

- Economic activity was increasing quite regularly throughout the periods and was in the same direction with the increase of energy demand. The factors affecting the total energy demand on the same increasing trend.

- The economic structure had changes in all 3 sectors (industrial, agriculture, and services), and also had different effects on total energy demand. Since 2005, industrial and services structures have had effects that decrease the need for energy, but not too much.
- The intensity was the factor that showed the most decreasing effects on energy demand. Particularly the services sector since 2010, industrial since 2015.

Although there were positive changes in some sectors that reduce the need for general energy, it is obvious that it was still low, showing that the ability to change the technology, economic structure in Vietnam still has some limitations, we still have many outdated technologies, consuming a huge amount of energy, the structural shift towards high-tech development is still limited.

REFERENCES

[1]. Diễn đàn kinh tế các nước châu Á – Thái Bình Dương (APEC), Cơ sở dữ liệu năng lượng: https://www.egeda.ewg.apec.org/egeda/database/php/rev_newbalance2/balance.php

[2]. IEA, "Analyzing Energy Use with Decomposition Methods", Energy Training Week Paris, 10th April 2013, https://pdfs.semanticscholar.org/379e/5db6b0e7eb96e3bb84a54f0049078617cf5c.pdf

[3]. IEA, "IndicatorsAnalyzing changes in energy and potential improvements in energy consumption", Energy Statistics and Indicators TrainingTbilisi (Georgia), 5-9 November 2012, http://www.inogate.org/documents/EE_Indicators_Introduction_4.pdf

[4]. Faisal Jamil and Arbab Shahzad, "Decomposition Analysis of Energy Consumption in Pakistan for the Period 1990-2013", NUST JOURNAL OF SOCIAL SCIENCES AND HUMANITIES Vol.3 No.2 (July-December 2017) pp. 152-177, https://njssh.nust.edu.pk/index.php/njssh/article/download/21/19

[5]. Nnaemeka Vincent Emodi, Kyung-Jin Boo, " Decomposition Analysis of CO2 Emissions from Electricity Generation in Nigeria", International Journal of Energy Economics and Policy, 2015, 5(2), 565-573, http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.923.8222&rep=rep1&type=pdf

[6]. Stephane de la Rue du Can, Ali Hasanbeigi Jayant Sathaye, "Analysis and Decomposition of the Energy Intensity of Industries in California", Reprint version of a journal article published in "Energy Policy", Volume 46 (2012), Pages 234-245, https://www.osti.gov/servlets/purl/1210894

[7]. Gülşah ÖZŞAHİN, " DECOMPOSITION OF INDUSTRIAL ENERGY CONSUMPTION IN TURKEY",

[8]. İktisat Araştırmaları Dergisi • Journal of Research in Economics • Cilt: 3 / Issue • Sayı: 2 Ekim • October 2019 • ss/pp. 192-211 ISSN: 2636-8307 • DOI: 10.35333/JORE.2019.55, https://dergipark.org.tr/en/download/article-file/841451

[9]. Elvira Torres Gelindon, "APEC ENERGY CONSUMPTION TRENDS: A DECOMPOSITION ANALYSIS", Asia Pacific Energy Research Centre (APERC), (+81)3-5144 8543, https://www.iaee.org/en/publications/proceedingsabstractpdf.aspx?id=16849

[10]. Fengyan Fan and Yalin Lei, "Index Decomposition Analysis on Factors Affecting Energy-Related Carbon Dioxide Emissions from Residential Consumption in Beijing", https://www.hindawi.com/journals/mpe/2017/4963907/

[11]. Ming Zhang; Shuang Dai; Yan Song, "Decomposition analysis of energy-related CO2 emissions in South Africa", Journal of Energy in Southern Africa, vol.26 n.1 Cape Town Feb. 2015, http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S1021-447X2015000100008

[12]. Jessica Palmer, Natural Resources Canada, "Decomposition of Changes in Energy Use: The Comparison of Two Approaches from a Canadian Perspective", https://www.eceee.org/static/media/uploads/site-2/library/conference_proceedings/ACEEE_industry/2003/Panel_6/P6_13/paper.pdf

[13]. DB Belzer, SR Bender, KA Cort, "A Comprehensive System of Energy Intensity Indicators for the U.S.: Methods, Data and Key Trends", the U.S. Department of Energy, June 2017, https://www.pnnl.gov/main/publications/external/technical_reports/pnnl-22267Rev2.pdf

[14]. Junghwan Lee and Jinsoo Kim, "A Decomposition Analysis of the Korean Manufacturing Sector: Monetary vs. Physical Outputs", Department of Earth Resources and Environmental Engineering, Hanyang University, 222 Wangsimni-ro, Seongdong-gu, Seoul 04763, Korea; https://www.mdpi.com/2071-1050/13/11/6192/pdf

[15]. Shiqing Zhang, JianweiWang and Wenlong Zheng, "Decomposition Analysis of Energy-Related CO2 Emissions and Decoupling Status in China's Logistics Industry", 25 April 2018, https://www.mdpi.com/2071-1050/10/5/1340/htm

[16]. Jaruwan Chontanawat, Paitoon Wiboonchutikula, Atinat Buddhivanich' "An LMDI decomposition analysis of carbon emissions in the Thai manufacturing sector", 6th International Conference on Energy and Environment Research, ICEER 2019, 22–25 July, University of Aveiro, Portugal https://www.sciencedirect.com/science/article/pii/S2352484719305529

[17]. APEC Energy Supply and Demand Outlook, 6th Edition (2016), Appendix II: Data Forecast Tables, https://data.opendevelopmentmekong.net/dataset/8036d906-ad4f-496c-bd73-f136268b5805/resource/058cc39f-f49c-4fd8-8e80-7b804d0d2af3/download/apec_outlook6th_annexii_dataprojectiontables.xlsx
[18]. Vietnam Energy Balance Table 1990- 2018, https://www.egeda.ewg.apec.org/egeda/database/php/rev_newbalance2/balance.php
[19]. B.W. Ang, "A Simple Guide to LMDI", https://www.scribd.com/doc/316487584/A-Simple-Guide-to-LMDI
[20]. WB, World Development Indicators, Last Updated Date 30/07/2021, https://data.worldbank.org/country/vietnam?view=chart

Le Tat Tu, et. al. "Decomposition Analysis of Factors Affecting Energy Demand in Vietnam From 1990 To 2018." *IOSR Journal of Engineering (IOSRJEN)*, 11(09), 2021, pp. 47-56.