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The effect of Vietnam's key export products to China on the growth of export turnover to China and the growth of export turnover to the US

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ABSTRACT

With the quantitative method by SEM model, the objective of the paper is to analyze the effect of Vietnam's key products to the Chinese market on the growth of export turnover from Vietnam to China and from Vietnam to the US. The striking results are that (1) The magnitude of the coefficients is quite small, and the exogenous variables effect the two endogenous variables in different directions. (2) Export turnover to China's Growth is effected directly and totally by exporting products of Wood and wood products, Raw materials for textiles, leather, shoes, Chemical products, Steel, and Fabrics. (3) Exporting products of Fruit & vegetable goods and Household electrical goods and components effect Export turnover to the US's Growth. (4) Export turnover to the US's Growth is not effected by Export turnover to China's Growth. (5) In terms of the magnitude of the coefficients and the effect direction, the direct and total effects of the exogenous variables effect on Export turnover to China's Growth are the same. However, exogenous variables that effect Export turnover to the US's Growth are the same in direction but have a rather small difference in the magnitude of the coefficients. From that, we propose that the solution is to increase the export of the products with the coefficients having the positive effect and to reduce the export of the products with the coefficients having the opposite effect.

KEYWORDS

export products; Vietnam; export turnover; China; the US

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(1) INTRODUCTION

According to data from the General Department of Customs, two-way trade between Vietnam and China in 2021 will reach 165.8 billion USD, up 24.6% over the previous year. In which, the export of goods to this market reached nearly 56 billion USD, up 14.5%, and imported approximately 110 billion USD from China, up 30.5% compared to 2020. With this result, China continues to be Vietnam's largest trading partner. According to the Ministry of Industry and Trade, China is also the world's largest rubber import market, with US$ 11.35 billion, up 16.2% over the same period in 2020. According to the Ministry of Agriculture and Rural Development, each year China's dairy market is worth an estimated 30 billion USD.

According to the General Department of Customs, in 2021, the import-export turnover of Vietnam and the US will reach 111.56 billion USD, an increase of nearly 21 billion USD compared to 2020. the US will become Vietnam's second trading partner after China. In which, Vietnam's export turnover to the US reached 96.29 billion USD, an increase of 24.9% compared to 2020. In 2021, there are 13 groups of goods exported to the US with a turnover of 1 billion USD or more. There are 3 groups reaching more than 10 billion USD.

Assessing the US market, the Counselor of the Vietnamese Mission and Trade in the US said that the US is a potential market for Vietnamese goods. “Different needs and consumption habits according to income, cultural and regional characteristics create great room for Vietnamese businesses to exploit the US market. In addition, the large number of Vietnamese people in the US is a bridge and an important customer group of Vietnamese goods. However, according to experts, the US is also a "fastidious" market with high requirements on food safety and hygiene, technical barriers in terms of labor and environment.

From the above characteristics, we see that it is necessary to assess the actual situation of Vietnam's exports of key products to China and to the US. The objective of the paper is to evaluate the current situation of Vietnam's export of key products to China and to the US by quantitative method with SEM model. We measure the eight exogenous variables of eight key export products export to China and to the US. We measure if they effect and how they effect to the growth of export turnover to China and the growth of export turnover to the US.

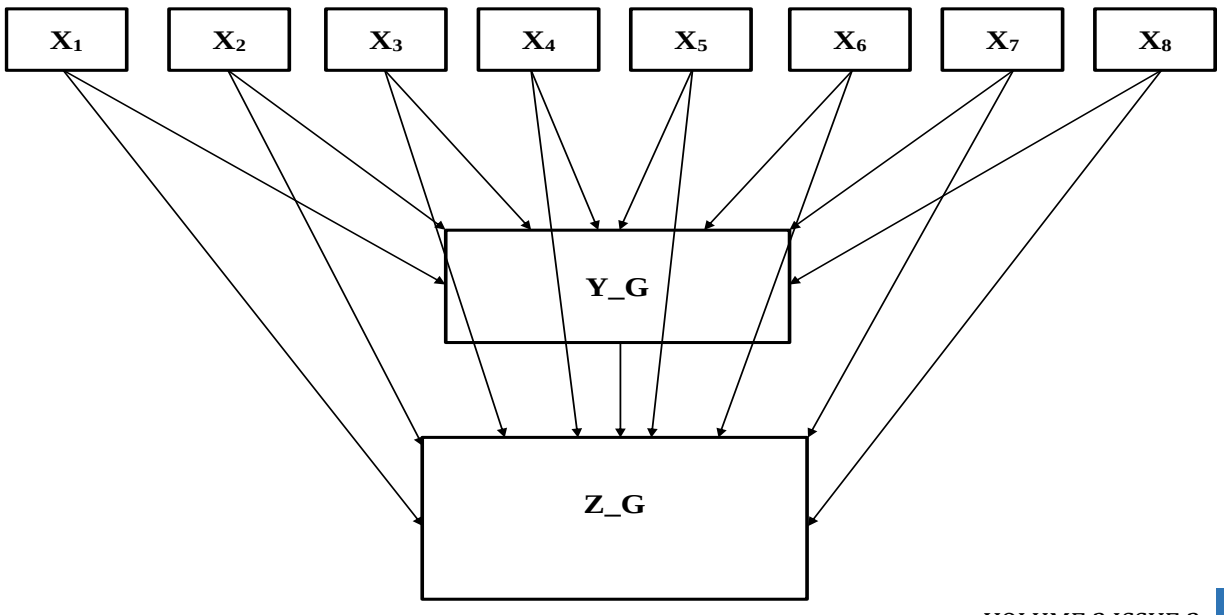
The paper consists of 7 parts, including an Introduction, literature review, Methodology, Data resource, Study result, Discussion and Conclusion.

(2) LITERATURE REVIEW

The United States imposed standards that encouraged Vietnamese exporters to look for other market alternatives (Tram Anh Thi Nguyen, Curtis M. Jolly, 2020). The maritime network between Vietnam and China supporting Vietnam's economy and trade is booming. The changing maritime convection represents an ever-evolving supply chain between the two countries. China's Belt and Road Initiative, maritime connectivity facilities and opportunities for commerce between the 2 countries (Zhi-Hua Hu, Chan-JuanLiu, Wanting Chen et al., 2020). The Vietnam-US Bilateral Trade Agreement in 2001 expanded exports from Vietnam to the US (Emiko Fukase, 2013). The impact of the China-US trade war has strongly effected global trade flows, including Vietnam. The United States levies a 25% tariff on $200 billion of goods imported from China, in return for imposing differential tariffs on $60 billion of goods imported from the United States. The US increased the tariff rate from 25% to 30% and China added tariffs on $75 billion of imported goods. Some trade flows between China and the US shift to other parts of the world. Vietnam and New Zealand were the biggest winners while Thailand suffered relatively heavy losses. About 10% change in price. Asia and Europe are where major product substitution takes place. As a result, China benefits a little, but the US suffers (Wenqi Pan, Wei-Yew Chang, Ting Wu et al., 2021). Since the beginning of the transition to a market economy in 1986, Vietnam has expanded and developed international trade with ASEAN-5 countries including China and other developing countries (inh Thai Pham, Hector Sala, José I.Silva, 2020).

(3) METHODOLOGY

3.1 Study model



3.2 Explanation of variables in study model

TABLE 1: Study model's variables explanation

Variables	Variables type	Explanation of variable names
X_1	exogenous	Fruit and vegetable exporting goods (1,000 USD).
X_2	exogenous	Seafood exporting products (1,000 USD).
X_3	exogenous	Exporting products are Household electrical goods and components (1,000 USD)
X_4	exogenous	Wood and wood exporting products (1,000 USD).
X_5	exogenous	Exporting products are Raw materials for textiles, leather, shoes (1,000 USD)
X_6	exogenous	Chemical exporting products (1,000 USD).
X_7	exogenous	Steels exporting products (1,000 USD).
X_8	exogenous	Fabrics exporting products (1,000 USD)
Y_G	endogenous	Export turnover to China's Growth
Z_G	endogenous	Export turnover to the US's Growth

Source: Study result of authors

3.3. Methodology to handle tuddy model

- **Structural equation model (SEM)**

SEM is an extension of the regression model, sem can estimate direct, indirect and general effects. In addition, SEM also combines with latent variables (Moshagen, 2012; Shi, D., Lee, T., and Terry, R. A., 2018).

- **SEM estimation**

Sem estimation goes through 2 steps; first is Observed Information matrix (OIM), then Expected Information matrix (EIM) to determine the best fit of the SEM model (Satorra, A., & Bentler, P. M., 1994; Stata Corp., 2021; Fisher (Fisher, 1921).

3.4. Goodness of Fit of SEM

- **Root Mean Square Error of Approximation (RMSEA)**

RMSEA values ≤ 0.05 is a good fit (Browne, M. W., & Cudeck, R., 1993). CI equal to 90% is the appropriate index for the model (MacCallum, R. C., Browne, M. W., and Sugawara, H. M., 1996).

- **The Coefficient of Determination (CD)**

CD >= 0.75 is significant (Chin, W. W., 1998; Hair, J. F., Ringle, C. M., & Sarstedt, M., 2011).

- **Stability analysis of simultaneous systems**

Eigenvalue = 0 is perfectly stable (Liptak, Bela G., 2006; Daniel Katzman, Jessica Moreno, Jason Noelanders, et al., 2021).

- **Modification Indices (MI)**

If $\Delta\chi^2 > 3.84$, then the model might be considered to increase the fit (Hair, J.F., Anderson, R.E., Tatham, R.L. and Black, W.C., 1998; Topcu, Ç., & Erdur-Baker, Ö., 2010).

(4) DATA SOURCE

Data is from the General Statistics Office of Vietnam.

(5) STUDY RESULTS

5.1. SEM estimation result

- **SEM estimation Graph**

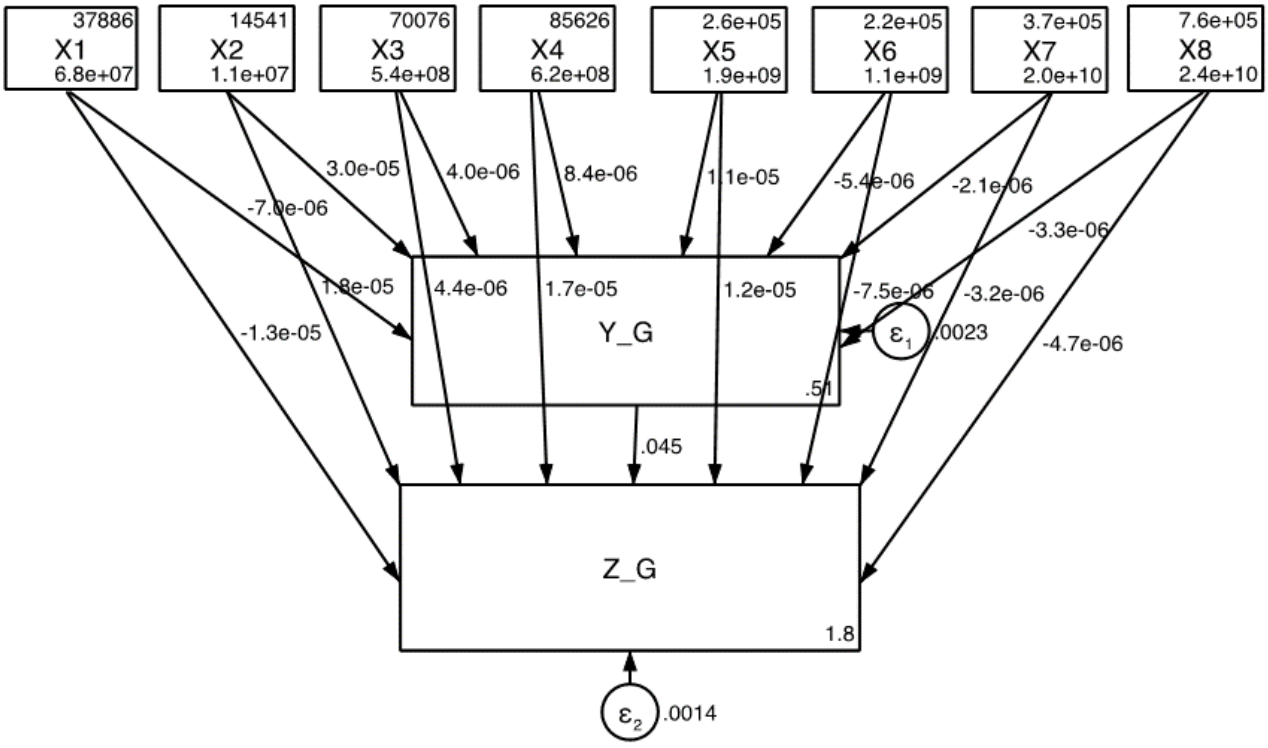


FIGURE 1: Graph of SEM estimation
Source: Study result of authors

Figure 1 is a graph of the SEM estimation. Describing the relationship between the exogenous variables including X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8 with the endogenous variables is Y_G and Z_G.

5.2. SEM estimation's results

TABLE 2: Result of SEM estimation processed by Observed Information matrix (OIM).

Structural		Coefficient	OIM std. err.	z	P > |z|	[95% conf.	interval]
Endogenous variables	**Exogenous variables**						
Y_G	**X_1**	-7.04e-06	7.78e-06	-0.91	0.365	-.0000223	8.21e-06
	X_2	.0000302	.000016	1.89	0.058	-1.04e-06	.0000615
	X_3	3.96e-06	2.03e-06	1.95	0.052	-2.73e-08	7.94e-06
	X_4	8.44e-06	2.75e-06	3.07	0.002	3.05e-06	.0000138
	X_5	.0000109	2.30e-06	4.75	0.000	6.42e-06	.0000154
	X_6	-5.42e-06	1.61e-06	-3.37	0.001	-8.58e-06	-2.27e-06
	X_7	-2.15e-06	6.85e-07	-3.14	0.002	-3.49e-06	-8.05e-07
	X_8	-3.30e-06	7.63e-07	-4.33	0.000	-4.80e-06	-1.81e-06
	Constant	.5104865	.489433	1.04	0.297	-.4487845	1.469757

Structural		Coefficient	OIM std. err.	z	P > |z|	[95% conf.	interval]
Endogenous variables	Exogenous variables						
Z_G	Y_G	.0454158	.2345161	0.19	0.846	-.4142274	.5050589
	X_1	-.0000126	6.27e-06	-2.00	0.045	-.0000249	-2.63e-07
	X_2	.0000182	.0000143	1.28	0.202	-9.78e-06	.0000462
	X_3	4.39e-06	1.83e-06	2.40	0.017	8.00e-07	7.99e-06
	X_4	.0000167	2.91e-06	5.74	0.000	.000011	.0000224
	X_5	.0000117	3.12e-06	3.74	0.000	5.57e-06	.0000178
	X_6	-7.45e-06	1.79e-06	-4.17	0.000	-.000011	-3.95e-06
	X_7	-3.19e-06	7.33e-07	-4.35	0.000	-4.63e-06	-1.75e-06
	X_8	-4.70e-06	9.76e-07	-4.81	0.000	-6.61e-06	-2.78e-06
	Constant	1.822877	.3990626	4.57	0.000	1.040728	2.605025
var(e.Y_G)		.0022919	.0009773			.0009937	.0052863
var(e.Z_G)|		.0013865	.0005912			.0006011	.0031981

Source: Study result of authors.

Table 2 is processed by OIM shows that Y_G is effected by five variables. Specifically, while X4, X5 effect in the positive direction, X6, X7, X8 negatively effect Y_G at the level of P-value < 0.05. And X1, X2, X3 do not effect Y_G. Also, it is worth noting that the magnitude of the coefficients is quite small, ranging between -5.42e-06 and .0000109.

For Z_G: Similar to Y_G, the magnitude of the coefficients is quite small. Besides, we see that Z_G is effected mostly by exogenous variables except for X2. Specifically, X3, X4, X5 have a positive effect, X1, X6, X7, X8 have a negative effect on Z_G with the significance level of P-value is very high is = 0.000 mostly. Also, a highlight to note is that Y_G does not effect Z_G.

TABLE 3: Result of SEM estimation processed by Expected Information matrix (EIM).

Structural		Coefficient	EIM std. err.	z	P > |z|	[95% conf.	interval]
Endogenous variables	Exogenous variables						
Y_G	X_1	-7.04e-06	7.78e-06	-0.91	0.365	-.0000223	8.21e-06
	X_2	.0000302	.000016	1.89	0.058	-1.04e-06	.0000615
	X_3	3.96e-06	2.03e-06	1.95	0.052	-2.73e-08	7.94e-06
	X_4	8.44e-06	2.75e-06	3.07	0.002	3.05e-06	.0000138
	X_5	.0000109	2.30e-06	4.75	0.000	6.42e-06	.0000154
	X_6	-5.42e-06	1.61e-06	-3.37	0.001	-8.58e-06	-2.27e-06
	X_7	-2.15e-06	6.85e-07	-3.14	0.002	-3.49e-06	-8.05e-07
	X_8	-3.30e-06	7.63e-07	-4.33	0.000	-4.80e-06	-1.81e-06
	Constant	.5104865	.489433	1.04	0.297	-.4487845	1.469757
Z_G	Y_G	.0454158	.2345161	0.19	0.846	-.4142274	.5050589
	X_1	-.0000126	6.27e-06	-2.00	0.045	-.0000249	-2.63e-07
	X_2	.0000182	.0000143	1.28	0.202	-9.78e-06	.0000462
	X_3	4.39e-06	1.83e-06	2.40	0.017	8.00e-07	7.99e-06
	X_4	.0000167	2.91e-06	5.74	0.000	.000011	.0000224
	X_5	.0000117	3.12e-06	3.74	0.000	5.57e-06	.0000178
	X_6	-7.45e-06	1.79e-06	-4.17	0.000	-.000011	-3.95e-06
	X_7	-3.19e-06	7.33e-07	-4.35	0.000	-4.63e-06	-1.75e-06
	X_8	-4.70e-06	9.76e-07	-4.81	0.000	-6.61e-06	-2.78e-06
	Constant	1.822877	.3990626	4.57	0.000	1.040728	2.605025
var(e.Y_G)		.0022919	.0009773			.0009937	.0052863
var(e.Z_G)|		.0013865	.0005912			.0006011	.0031981

Source: Study result of authors

Table 3 is processed by EIM, showing the same results as OIM in table 2. In particular, Y_G does not effect Z_G. Five exogenous variables effect Y_G, seven exogenous variables effect Z_G. The effect is varied in different directions. The magnitude of the coefficients is quite small.

TABLE 4: Result of SEM estimation processed by OIM and EIM for direct effect, indirect effect, and total effect

DIRECT EFFECT

Structural		Coefficient	EIM std. err.	z	P > |z|	[95% conf. interval]	
Endogenous variables	Exogenous variables						
Y_G	X_1	-7.04e-06	7.78e-06	-0.91	0.365	-.0000223	8.21e-06
	X_2	.0000302	.000016	1.89	0.058	-1.04e-06	.0000615
	X_3	3.96e-06	2.03e-06	1.95	0.052	-2.73e-08	7.94e-06
	X_4	8.44e-06	2.75e-06	3.07	0.002	3.05e-06	.0000138
	X_5	.0000109	2.30e-06	4.75	0.000	6.42e-06	.0000154
	X_6	-5.42e-06	1.61e-06	-3.37	0.001	-8.58e-06	-2.27e-06
	X_7	-2.15e-06	6.85e-07	-3.14	0.002	-3.49e-06	-8.05e-07
	X_8	-3.30e-06	7.63e-07	-4.33	0.000	-4.80e-06	-1.81e-06
Z_G	Y_G	.0454158	.2345161	0.19	0.846	-.4142274	.5050589
	X_1	-.0000126	6.27e-06	-2.00	0.045	-.0000249	-2.63e-07
	X_2	.0000182	.0000143	1.28	0.202	-9.78e-06	.0000462
	X_3	4.39e-06	1.83e-06	2.40	0.017	8.00e-07	7.99e-06
	X_4	.0000167	2.91e-06	5.74	0.000	.000011	.0000224
	X_5	.0000117	3.12e-06	3.74	0.000	5.57e-06	.0000178
	X_6	-7.45e-06	1.79e-06	-4.17	0.000	-.000011	-3.95e-06
	X_7	-3.19e-06	7.33e-07	-4.35	0.000	-4.63e-06	-1.75e-06
	X_8	-4.70e-06	9.76e-07	-4.81	0.000	-6.61e-06	-2.78e-06

INDIRECT EFFECT

Structural		Coefficient	EIM std. err.	z	P > |z|	[95% conf. interval]	
Endogenous variables	Exogenous variables						
Z_G	X_1	-3.20e-07	1.69e-06	-0.19	0.850	-3.63e-06	2.99e-06
	X_2	1.37e-06	7.13e-06	0.19	0.847	-.0000126	.0000153
	X_3	1.80e-07	9.33e-07	0.19	0.847	-1.65e-06	1.65e-06 2.01e-06
	X_4	3.83e-07	1.98e-06	0.19	0.847	-3.50e-06	4.27e-06
	X_5	4.96e-07	2.56e-06	0.19	0.847	-4.53e-06	5.52e-06
	X_6	-2.46e-07	1.27e-06	-0.19	0.847	-2.74e-06	2.25e-06
	X_7	-9.76e-08	5.05e-07	-0.19	0.847	-1.09e-06	8.92e-07
	X_8	-1.50e-07	7.75e-07	-0.19	0.847	-1.67e-06	1.37e-06

TOTAL EFFECT

Structural		Coefficient	EIM std. err.	z	P > |z|	[95% conf.	interval]
Endogenous variables	**Exogenous variables**						
Y_G	**X_1**	-7.04e-06	7.78e-06	-0.91	0.365	-.0000223	8.21e-06
	X_2	.0000302	.000016	1.89	0.058	-1.04e-06	.0000615
	X_3	3.96e-06	2.03e-06	1.95	0.052	-2.73e-08	7.94e-06
	X_4	8.44e-06	2.75e-06	3.07	0.002	3.05e-06	.0000138
	X_5	.0000109	2.30e-06	4.75	0.000	6.42e-06	.0000154
	X_6	-5.42e-06	1.61e-06	-3.37	0.001	-8.58e-06	-2.27e-06
	X_7	-2.15e-06	6.85e-07	-3.14	0.002	-3.49e-06	-8.05e-07
	X_8	-3.30e-06	7.63e-07	-4.33	0.000	-4.80e-06	-1.81e-06
Z_G	**Y_G**	.0454158	.2345161	0.19	0.846	-.4142274	.5050589
	X_1	-.0000129	6.06e-06	-2.12	0.034	-.0000248	-9.96e-07
	X_2	.0000196	.0000124	1.58	0.115	-4.76e-06	.000044
	X_3	4.57e-06	1.58e-06	2.89	0.004	1.47e-06	7.68e-06
	X_4	.0000171	2.14e-06	7.99	0.000	.0000129	.0000213
	X_5	.0000122	1.79e-06	6.81	0.000	8.68e-06	.0000157
	X_6	-7.70e-06	1.26e-06	-6.13	0.000	-.0000102	-5.24e-06
	X_7	-3.29e-06	5.34e-07	-6.16	0.000	-4.33e-06	-2.24e-06
	X_8	-4.85e-06	5.95e-07	-8.15	0.000	-6.01e-06	-3.68e-06

Source: Study result of authors

Table 4 describes the result of SEM estimation processed by OIM and EIM for direct effect, indirect effect and total effect. The result of direct effect is the same as the results of treatment by OIM and EIM in table 2 and table 3, respectively.

The indirect effect results show that there is no effect of the exogenous variable on the endogenous variable Z_G.

The total effect result is similar to those processed by OIM and EIM. In particular, Z_G is not effected by Y_G. The endogenous variable Y_G is effected by five exogenous variables, the endogenous variable Z_G is effected by seven exogenous variables. The exogenous variables affect Y_G and Z_G with relatively small magnitudes of coefficients and the effects in different direction.

5.3. Testing the Goodness of Fit of SEM

- **Root Mean Square Error of Approximation (RMSEA)**

TABLE 5: RMSEA test result

SEM	
RMSEA	0.000
Probability RMSEA	<= 0.05
CI	90%

Source: Research results of the authors.

Based on table 5, we see Probability RMSEA = 0.000. CI = 90%. So, the model is theoretically suitable.

- **The Coefficient of Determination**

TABLE 6: Coefficient of Determination test result

SEM	
CD	0.990

Source: Research results of the authors.

Table 6 describes Coefficient of Determination = 0.990. The conclusion is that the model fits the theory.

- **Stability analysis of simultaneous systems**

TABLE 7: Result of Stability analysis of simultaneous systems

SEM	
Eigenvalue stability condition	
Eigenvalue	**Modulus**
0	0
0	0

Source: Research results of the authors.

Table 7 shows Stability index = 0. All the eigenvalues lie inside the unit circle. SEM satisfies stability condition.

- **Wald Test**

TABLE 8: Wald test result

SEM			
Endogenous variables	**Chi-square**	**Degree of freedom**	**P-value**
Y_G	141.51	8	0.0000
Z_G	125.40	9	0.0000

Source: Research results of the authors.

Table 8 shows us chi square of Y_G = 141.51 and of Z_G = 125.40, P-value = 0.000. So satisfy the theory of Wald test.

- **Modification Indices.**

The result of Modification Indices is there is no modification indices to report. Because, all MI values less than 3.84145882069.

(6) Discussion

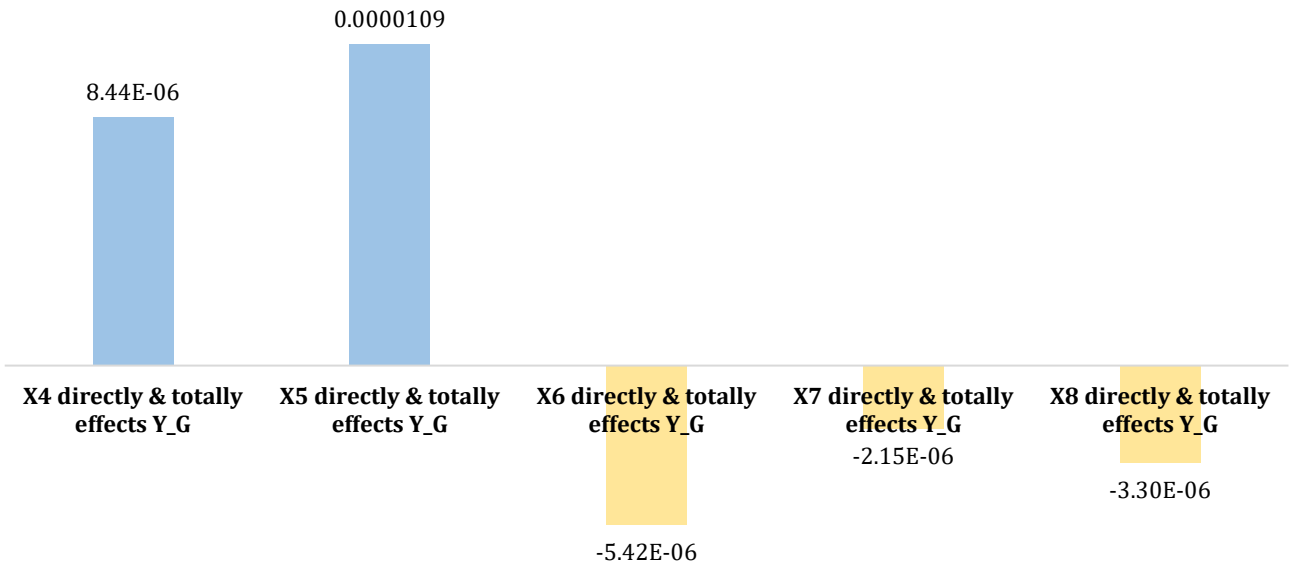


FIGURE 2: The exogenous variables X_4, X_5, X_6, X_7, X_8 effect the endogenous variable Y_G
Source: Research results of the authors

Figure 2 shows;
X_4 has a direct and total effect on Y_G with the magnitude of coefficient = 8.44e-06
X_5 has a direct and total effect on Y_G with the magnitude of coefficient = .0000109
X_6 has a direct and total effect on Y_G with the magnitude of the coefficient = -5.42e-06
X_7 has a direct and total effect on Y_G with the magnitude of coefficient = -2.15e-06
X_8 has a direct and total effect on Y_G with the magnitude of coefficient = -3.30e-06

We find that X_4, X_5, X_6, X_7, X_8 directly effect and the totally effect on Y_G is exactly the same.

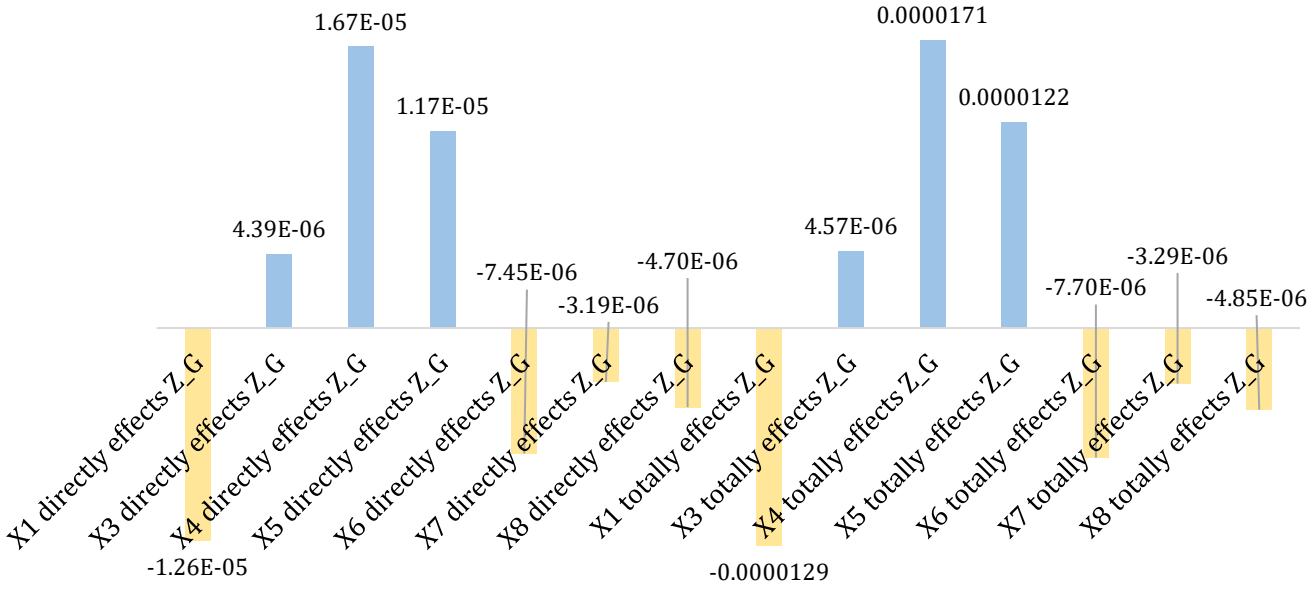


FIGURE 3: Figure 2: The exogenous variables X1, X3, X4, X5, X6, X7, X8 effect the endogenous variable Z_G.
Source: Research results of the authors

Figure 3 shows;

The effect of X1, X3, X4, X5, X6, X7, X8 on Z_G has a small difference in the magnitude of the coefficients between the direct effect and the total effect. However, it is exactly the same in the effect direction.

X1 has a direct effect on Z_G with coefficient = -.0000126, but a total effect with coefficient = -.0000129.
X3 has a direct effect on Z_G with coefficient = 4.39e-06, but a total effect with coefficient = 4.57e-06
X4 has a direct effect on Z_G with coefficient = .0000167, but a total effect with coefficient = .0000171
X5 has a direct effect on Z_G with coefficient = .0000117, but a total effect with coefficient = .0000122
X6 has a direct effect on Z_G with coefficient = -7.45e-06, but a total effect with coefficient = -7.70e-06
X7 has a direct effect on Z_G with coefficient = -3.19e-06, but a total effect with coefficient = -3.29e-06
X8 has a direct effect on Z_G with coefficient = -4.70e-06, but a total effect with coefficient = -4.85e-06

(7) CONCLUSION

Based on the analysis results in section 5 and discussion in section 6. We see that The first is that the magnitude of the coefficients is quite small. The second is almost two endogenous variables Growth in export turnover of key products to China (Y_G) and Growth in export turnover of key commodities to the US (Z_G) are effected by the entire variables Wood and wood exporting products (X4), Exporting products are Raw materials for textiles, leather, shoes (X5), Chemical exporting products (X6), Steels exporting products (X7), abrics exporting products (X8). The third is that while three variables Fruit and vegetable exporting goods (X1), eafood exporting products (X2), Exporting products are Household electrical goods and components (X3) do not effect variable Y_G, two variables X1 and X3 effect variable Z_G. Fourth, the exogenous variables effect the two endogenous variables Y_G and Z_G in different directions. Fifth, the endogenous variable Y_G has no effect on the endogenous variable Z_G. Finally, the direct and total effects of the variables X4, X5, X6, X7, X8 on Y_G are exactly the same in terms of the magnitude of the coefficients and the direction. However, the direct effect and total effect of the variables X1, X3, X4, X5, X6, X7, X8 to Z_G are exactly the same in direction but have a rather small difference in the magnitude of the coefficients.

Solution: From the above conclusion, the authors propose that the solution is to increase the export of goods where exogenous variables have a positive effect including Wood and wood products (X4), Raw materials for textiles, leather, shoes (X5) export to China. And Household electrical goods and components (X3), Wood and wood products (X4), Raw materials for textiles, leather, shoes (X5) export to the US.

It is advisable to reduce the export of goods where exogenous variables have a negative effect including Chemical products (X6), Steels (X7), Fabrics (X8) export to China. And Fruit and vegetable goods (X1), Chemical products (X6), Steels (X7), Fabrics (X8) export to the US.

Limitations: Series data of 12 months in 2021 is supposed to be a fairly short period of time.
Next study: We will study Trade Barriers to Vietnam's exports.

(8) DECLARATION OF COMPETING INTEREST

We declare that we have no significant competing interests including financial or non-financial, professional, or personal interests interfering with the full and objective presentation of the work described in this manuscript.
We have described our financial or non-financial interests in the space below

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(11) Author contributions

There is only author Nguyen Hoang Le Na and Vu Thi Kim Hanh have done the whole this article.

(12) Data Availability Statement

The data is time series data which has been collected and extracted by manual method by the authors are Nguyen Hoang Le Na and Vu Thi Kim Hanh and. Data is between 2011 and 2020.

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