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## Article

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# Effects of Deglobalization on Food and Energy Insecurity in the GMS Countries

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## ABSTRACT

Amidst the trend of globalization, which has been disrupted by various global situations such as trade wars, the pandemic, and the effects of war, concerns about deglobalization have arisen, particularly among countries vulnerable to food and energy insecurity. The aim of this study was to analyze the effects of deglobalization on the food and energy insecurity of Greater Mekong Subregion (GMS) countries. Food insecurity was determined by the percentage of malnourished people within a country, while energy insecurity was determined by the percentage of dependence on oil energy imports. Such influences were found to be transmitted through price factors and each country's level of participation in globalization. A simultaneous equation was analyzed to determine the correlations. The findings of the study were as follows: (1) Deglobalization will increase food insecurity in Cambodia, Laos, Myanmar, and Thailand as they become less involved in globalization, but will decrease it as the effects of deglobalization are transmitted to the price factors for China, Laos, Myanmar, and Thailand. (2) When the influence of deglobalization is transmitted through the price factors, it could increase China's energy insecurity but reduce energy insecurity for Vietnam. Additionally, the impact of deglobalization has increased the energy insecurity of Laos, Myanmar, and Vietnam, as their involvement in globalization is linked to such influences.

**Keywords:** Deglobalization, Food Insecurity, Energy Insecurity, Greater Mekong Subregion Countries

**JEL Classifications:** F5, F6

## 1. INTRODUCTION

Over the past few decades, globalization has brought the world closer together, resulting in increased interconnectivity among countries. This has led to greater opportunities for countries to engage in international trade and investment, resulting in more efficient production and distribution processes. Consequently, both direct and financial investments from individuals and multinational companies have expanded, providing investors with the opportunity to diversify their investment portfolios and receive attractive returns. In turn, host countries benefit from these investments, as they can leverage them to develop their economies and other relevant sectors (Erixon, 2018). However, globalization can be hindered by international relations issues, such as trade and investment countermeasures (Garcia-Herrero, 2019; Paul, 2023). These actions can have external effects on other countries, even if

they are not directly involved in the conflict. Thus, these effects can spread to the global trade and investment sector, which could be regarded as one of the processes leading to deglobalization.

The Greater Mekong Subregion (GMS) is a group of six member countries that includes Thailand, Myanmar, Laos, Cambodia, Vietnam, and China (Yunnan and Guangxi provinces). These countries cooperate in various areas such as transport, telecommunications, energy, trade, investment, agriculture, environment, tourism, and human resource development within the region. The region is known for its rich natural resources and large population (Greater Mekong Subregion Secretariat, 2023). However, national development in these countries is hindered by significant obstacles (The Asian Development Bank, 2021). Food and energy security are particularly important for economic development in both the manufacturing and consumption sectors

(Taher, 2020); nevertheless, each country faces different problems (Prabhakar, 2012). For example, in Laos, there is a problem with food production potential (Santos et al., 2022), and the country relies on imported oil for transportation purposes (International Energy Agency, 2023). Therefore, globalization may be considered an important solution for these countries to gain access to imported goods in order to alleviate domestic shortages at market-determined prices (Young, 2004).

However, ongoing crises can have a negative impact on the flow of globalization, making it difficult for countries facing shortages to access food and energy. This can be observed from the global value of exports of goods and services (Table 1). Apart from being impacted by the economic crisis of 2008 (Silva et al., 2022) and the sovereign debt crisis in Europe in 2009 (Li et al., 2013), the value of exports may have also been affected by the trade war between the United States and China that began in 2017 (Garcia-Herrero, 2019) and the COVID-19 pandemic that began in 2019, which has had a wide-ranging impact on the global economy and various sectors in each country.

In the aftermath of the US-China trade war, Garcia-Herrero (2019) considers this factor to be the beginning of deglobalization. The case study shows a decline in several key economic factors from 2017 to 2018, such as global trade volume and world outward FDI flow, due to the use of trade barriers and countermeasures between the two countries, with each side continuing to increase the level of protectionism. Subsequently, the value of world trade declined further due to the spread of the COVID-19 virus in the following year, putting some countries at risk of food insecurity (Gundersen et al., 202; Kakaei et al., 2022). These countries faced barriers to domestic production due to epidemic control measures as well as more stringent import-export measures during the pandemic (Asian Development Bank, 2021). At the same time, the pandemic has significantly reduced transport demand, resulting in a sharp drop in global oil prices (Gharib et al., 2021; Organization for Economic Co-operation and Development, 2020). However, after the relaxation of anti-epidemic measures and the return of travel demand, oil prices rose sharply again and further increased due to the impact of the 2022 war between Ukraine and Russia (U.S. Energy Information Administration, 2023), which may escalate into a new Cold War era (Paul, 2023). Additionally, the impact of economic sanctions on Russia and its retaliatory measures have created barriers to trade and affected the prices of agricultural and energy products worldwide, putting pressure on

other countries that face food and energy security issues due to the COVID-19 outbreak and indirectly forcing them to take sides, which may lead to a move away from globalization at any moment.

In these turbulent times, the GMS countries were inevitably affected. Subsequently, the aim of this study is to consider the impacts of counter-globalization on the food and energy security of GMS countries by using a simultaneous equation model to estimate the relationship between the factors affecting the food and energy security of these countries during deglobalization.

## 2. LITERATURE REVIEW

Globalization is a long-standing concept alongside the history of global trade, which may be traced back to Columbus’s discovery of the New World in 1492, or possibly to the days of trade along the Silk Road at the beginning of the 20<sup>th</sup> century. Attention was again brought to this issue by Clark (2000) and Norris (2000), who defined globalization as “the process of creating networks of connections among actors at intra- or multi-continental distances, mediated through a variety of flows including people, information and ideas, capital, and goods. Globalization is a process that erodes national boundaries, integrates national economies, cultures, technologies, and governance, and produces complex relations of mutual interdependence.”

Under the interpretation and further development of concepts from the definitions, globalization indicators have been developed. In 2006, Dreher (2006) published a method for measuring the level of globalization under the name of the KOF Globalization Index (KOF index) to measure the phenomenon for every country by categorizing globalization in terms of the economic, social, and political dimensions and updating this index frequently. According to this definition, the world’s KOF index may represent a globalization that is attempting to connect networks of different dimensions, while the KOF index of each country may reflect their level of participation in the global economy, which is one of the globalization trends of each country. Recently, the KOF index has been calculated and published by the KOF Swiss Economic Institute with the method of Gygli et al. (2019). Globalization is divided into 12 dimensions: two dimensions of commerce, two dimensions of finance, two dimensions of interpersonal relations, two dimensions of information, two dimensions of culture, and two dimensions of politics, with each dimension divided into de facto and de jure.

One of the most popular and oldest dimensions to consider in globalization is Trade Globalization, de facto. This dimension considers three related components: Trade in goods, which is the percentage of total imports and exports of goods to GDP, Trade in services, which is the percentage of total imports and exports of services to GDP, and Trade partner diversity, or the average of the Herfindahl-Hirschman market concentration index for exports and imports of goods (inverted). In other words, Trade Globalization, de facto, is a variable that reflects the rate of openness of countries and is often used to represent globalization (Gygli et al., 2019). Therefore, the factors that influence the above components, such as the influence of GDP (Caleb et al., 2014), exchange rates, and the

**Table 1: World trade in goods and service value**

| Year | Trade value | % change | Year | Trade value | % change |
|------|-------------|----------|------|-------------|----------|
| 2005 | 25,547      | -        | 2014 | 47,220      | 2.01     |
| 2006 | 29,357      | 14.91    | 2015 | 42,016      | -11.02   |
| 2007 | 34,151      | 16.33    | 2016 | 41,161      | -2.03    |
| 2008 | 39,240      | 14.90    | 2017 | 45,407      | 10.31    |
| 2009 | 31,405      | -19.97   | 2018 | 49,906      | 9.91     |
| 2010 | 37,311      | 18.81    | 2019 | 49,215      | -1.39    |
| 2011 | 44,325      | 18.80    | 2020 | 44,068      | -10.46   |
| 2012 | 45,041      | 1.62     | 2021 | 54,859      | 24.49    |
| 2013 | 46,292      | 2.78     |      |             |          |

Source: United Nations Conference on Trade and Development (2023)  
Billion US dollars

influence of GDP on openness (Qabobho et al., 2022), also affect the KOF index. In addition, because of the globalization trend or KOF index of the world, more countries may be attracted to join the globalization trend due to market expansion in terms of supply and demand. This allows each country to have the opportunity to import and export goods to and from the global market, which has also increased (Erixon, 2018).

At the same time, because of globalization, countries have greater access to resources, even in remote areas, and this may provide opportunities for the countries that lack food and energy to manage food security (Lineback et al., 2009) and energy more effectively (Gault and Gault, 2006).

Regarding the issue of “food security,” the Food and Agriculture Organization of the United Nations (FAO) defined food security in its World Food Summit in 1996 by stating that “Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life.” This definition of food security may be divided into four dimensions: food availability, food access, utilization, and stability (FAO, 2006). One of the indicators of food security is the prevalence of undernourishment, which is also one of the indicators of SDG Target 2.1, reflecting the issue of food security in the opposite direction (FAO, n.d.).

Factors that may affect the percentage of people who are undernourished in a country include price barriers (Gustafson, 2013), which make food less accessible to people. The influence of exchange rates on the cost of imported goods is also significant, as illustrated in Ethiopia in 2008, where the prices of goods were affected by both world prices and exchange rate reasons (Eugenio, 2015). Additionally, the effects of globalization may help address food security issues (Lineback et al., 2009).

When considering “Energy Security,” the International Energy Agency (IEA) defines energy security as “the uninterrupted availability of energy sources at an affordable price.” Energy security has many aspects: long-term energy security mainly deals with timely investments to supply energy in line with economic developments and environmental needs. On the other hand, short-term energy security focuses on the ability of the energy system to react promptly to sudden changes in the supply-demand balance (IEA, 2023b). Efforts have also been made to improve the indicators. Several models of energy security, such as those of Kruyt et al. (2009), Lobova et al. (2019), and Shah et al. (2019), were studied using a large number of relevant variables, including resource estimates, reserves-to-production ratios, diversity indices, import dependence, etc. These variables are considered for evaluation of energy security in different dimensions, which may result in various outcomes.

For example, in the case of Lobova et al. (2019), energy security can be classified into four dimensions: Energy Availability, which is often considered from Import Dependence, Energy Affordability from the level of fuel prices and access to electricity, Energy and Economic Efficiency from using renewable energy and the value

of use, and Environmental Stewardship from environmental impacts such as CO<sup>2</sup> emissions. One of the key dimensions found in these studies and most relevant to international trade is the energy availability dimension. Kruyt et al. (2009) noted that this dimension is most important in terms of the actual availability or physical presence of resources such as finite fossil fuels. Energy security in this dimension is often considered from dependence on energy imports, which may be viewed differently according to the nature of energy consumption of each country. Lobova et al. (2019) also considered the combined dependence on energy imports of oil, natural gas, and coal for energy security extraction in terms of energy availability. The choice of such energy sources is an issue related to the suitability for the characteristics of the group of countries that Lobova et al. (2019) investigated. The method for calculating dependence on energy imports considers the net energy import percentage from that resource per energy consumption from all those resources. In addition, Kruyt et al. (2009) described dependence on energy imports as a measure that is inversely related to energy security. Thus, it can be said that dependence on energy imports is a factor that directly reflects energy instability.

Energy from oil products is one of the most important energy sources for the economy, as it is a key raw material used in transportation. Dependence on energy imports from oil is often considered in terms of energy security in the energy availability dimension, along with dependence on energy imports from other fuels, such as those used in households or in various industrial sectors (Lobova et al., 2019). However, each country in the Greater Mekong Subregion has a different energy dependence structure based on different energy sources, except in the case of oil products (IEA, 2023a). This variability may hinder the determination of energy sources for energy security in terms of energy availability. Dependence on oil energy imports can be influenced by exchange rates, price factors, as well as the number of people living in each country’s urban areas and their energy consumption behaviors (Sheng et al., 2017).

Relevant documents and research suggest a possible relationship between the influence of globalization and food and energy insecurity. The impact of globalization can be considered from the influence of the world’s KOF index in terms of trade globalization, which is de facto transmitted to the prevalence of undernourishment to assess its impact on food security and to oil import dependence to assess its impact on energy security. In this study, the impact of globalization is considered by passing on the input factor as part of the globalization of each country, or KOF, and the transmission from the price factor of both food and energy.

### 3. RESEARCH METHODOLOGY

In this study, the influence of deglobalization on food and energy insecurity in GMS countries comprising Cambodia, Laos, Myanmar, Thailand, Vietnam, and China was analyzed using whole country data, and the variables representing these factors were analyzed. Globalization was determined by the world’s KOF index, and food insecurity was determined by the percentage of malnourished people. Energy instability, on the other hand,

was determined by the percentage of dependence on oil energy imports. The Simultaneous Equation system, which assumes that the reduction in the global KOF index signifies the extent of deglobalization, was employed.

Time series data from 2005 to 2020 was used in the analysis. The analysis was interpolated from annual data using a linear method. This technique was adapted from Chow and Lin (1971) by using EVIEWS 11 to create quarterly data from the 4<sup>th</sup> quarter of 2005 to the 4<sup>th</sup> quarter of 2020, totaling 61 quarters. The data includes the following information:

1. The KOF is a variable used to indicate the “globalization” level of each country, based on the KOF Globalization Index of Gygli et al. (2019), calculated and published by the KOF Swiss Economic Institute (2020).
2. The FIS is a variable used to indicate “food insecurity,” which is determined by the percentage of malnourished people according to the Food and Agricultural Organization (2023).
3. EIS is a variable used to indicate “energy insecurity” based on the “percentage of oil import dependence,” which is calculated from:

$$EIS = \frac{\text{Oil Product Import} - \text{Oil Product Export}}{\text{Oil Product Consumption}} \times 100$$

Oil Product Import refers to the quantity of oil energy that is imported (TJ), while Oil Product Export is the amount of oil energy that is exported (TJ). On the other hand, Oil Product Consumption is the amount of domestic oil energy consumption (TJ). The data for these measurements was collected from the International Energy Agency (2023a).

4. CPIF represents the consumer price index in the category of food, compiled from the Food and Agricultural Organization (2023).
5. WKOF represents the degree of “Globalization” based on the KOF Globalization Index of Gygli et al. (2019), which is calculated and published by the KOF Swiss Economic Institute (2020).
6. GASP is the price of domestic gasoline expressed in US dollars per liter, collected from various sources such as the World Bank (2023), Lao State Fuel Company (2023), the Ministry of Commerce, The Republic of the Union of Myanmar (2023), and FXEMPIRE (2023).
7. COPD is the price of crude oil on the Dubai market, collected from Statista (2023) and expressed in US dollars per barrel.
8. GDP represents Gross Domestic Product in units of 1 billion US dollars, collected from the World Bank (2023).
9. POP is the population of each country in millions of people, collected from the World Bank (2023).
10. Ex represents the local currency exchange rate per US dollar, collected from the World Bank (2023).
11. UP is the percentage of the population living in urban areas, collected from the World Bank (2023).
12. FPI is the Food Production Index, compiled from the World Bank (2023).

The model used in this study was estimated using the simultaneous equation model known as the Three Stage Least Squares (3SLS) estimation method, as follows:

$$KOF = \alpha_0 + \alpha_1 Ex + \alpha_2 GDP + \alpha_3 WKOF + u \tag{1}$$

$$CPIF = \delta_0 + \delta_1 FPI + \delta_2 Ex + \delta_3 WKOF + x \tag{2}$$

$$GASP = \eta_0 + \eta_1 COPD + \eta_2 Ex + \eta_3 WKOF + y \tag{3}$$

$$FIS = \beta_0 + \beta_1 CPIF + \beta_2 EX + \beta_3 POP + \beta_4 KOF + v \tag{4}$$

$$EIS = \gamma_0 + \gamma_1 GAPS + \gamma_2 EX + \gamma_3 UR + \gamma_5 KOF + w \tag{5}$$

The model used in this study passed the Order Condition of Identification and Rank Condition of Identification tests, and it was found that this model has clear and distinct characteristics.

## 4. RESULTS AND DISCUSSION

Tables 2-6 presents the results of estimating the correlations based on Equations 1-5, which show the direct effects of the independent variables on the dependent variables. As per the results in Table 2, the direction of the relationship between WKOF and KOF for each country was found to be the same, indicating the impact of globalization, which has brought all countries together. This outcome aligns with Erixon’s (2018) findings, except for Myanmar, where correlations were in the opposite direction. This could be attributed to security reasons, Myanmar’s internal politics, and trade policies that protected its interests during that period, as well as the customs procedures that may have been unsuitable for international trade.

Table 3 shows that there were inverse correlations between WKOF and CPIF in all countries, indicating that the direction of globalization’s flow contributed to lower food expenditures. Additionally, changes in the same direction of FPI and CPIF were observed in all Member States, which could be due to overall food production in those countries already being higher than the level of efficiency under existing production technologies. This increased production capacity for agricultural products, which resulted in an increase in the cost of production per unit that ultimately affected the consumer price index in the food category.

The results of the alignment between WKOF and GASP in China, Myanmar, and Vietnam due to the globalization of transport demand are presented in Table 4. This led to an increase in fuel, which is a factor of production, according to market forces. Similarly, the correlations between COPD and GASP in Cambodia, China, Laos, Myanmar, and Vietnam were in the same direction, as crude oil is an important input used in processing gasoline. However, the relationship was different regarding the research results for Thailand, where it was in the same direction. This could be attributed to measures taken to control the level of domestic oil prices, such as the Oil Fund system, which collects income from domestic oil trading when oil prices are low and uses it to subsidize oil prices in the country during periods when oil prices are high, ensuring that the oil price level does not become excessively high. This can mitigate the impact of global crude oil price volatility to some extent.

Table 5 presents the inverse relationship between FIS and CPIF. This is because food is a necessity for survival, and when food

**Table 2: Estimated outcomes of the factors that influence the KOF index in each country**

| Variable | Cambodia               | China                    | Laos                     | Myanmar                 | Thailand                 | Vietnam                  |
|----------|------------------------|--------------------------|--------------------------|-------------------------|--------------------------|--------------------------|
| Constant | -124.2462<br>(-1.3428) | -30.9699<br>(-3.6249)*** | -66.3011<br>(-3.0767)*** | 253.7857<br>(5.431)***  | -40.5286<br>(-5.1346)*** | 36.6779<br>(5.3051)***   |
| EX       | 0.0148<br>(0.8875)     | 3.6291<br>(11.5477)***   | -0.0016<br>(-2.5918)**   | 0.0299<br>(6.9471)***   | 0.4989<br>(7.3795)***    | -0.0020<br>(-16.5557)*** |
| GDP      | 0.5829<br>(5.0973)***  | -0.0015<br>(-25.6343)*** | 1.1912<br>(10.5715)***   | -0.7403<br>(-5.005)***  | 0.0029<br>(0.9364)       | 0.0289<br>(5.0927)***    |
| WKOF     | 2.4102<br>(4.5481)***  | 1.0608<br>(8.0655)***    | 1.8058<br>(5.2518)***    | -3.6302<br>(-4.5178)*** | 1.9239<br>(16.2335)***   | 1.1750<br>(9.459)***     |

\*Is statistically significant at the 90%, \*\* is statistically significant at the 95% and \*\*\* is statistically significant at the 99% respectively

**Table 3: Estimated results of factors that affect the consumer price index for the food category in each country**

| Variable | Cambodia                | China                   | Laos                    | Myanmar                 | Thailand                | Vietnam                   |
|----------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|---------------------------|
| Constant | -201.5585<br>(-1.8232)* | 81.3759<br>(3.0487)***  | 103.9436<br>(3.3703)*** | -17.9224<br>(-0.5482)   | 110.1832<br>(2.5642)**  | -109.9340<br>(-4.7748)*** |
| FPI      | 2.2865<br>(34.7708)***  | 1.2104<br>(29.3181)***  | 0.9101<br>(32.4361)***  | 1.8473<br>(17.6679)***  | 2.4294<br>(13.6527)***  | 0.7859<br>(5.645)***      |
| EX       | 0.0292<br>(1.4801)      | 2.5228<br>(2.0872)**    | -0.0017<br>(-1.867)*    | 0.0229<br>(16.5837)***  | 1.2057<br>(2.4951)**    | 0.0065<br>(9.1354)***     |
| WKOF     | -0.7433<br>(-1.2377)    | -2.1822<br>(-5.7631)*** | -1.3723<br>(-2.8244)*** | -1.6018<br>(-3.0067)*** | -5.3775<br>(-8.4364)*** | -0.1862<br>(-0.3783)      |

\*Is statistically significant at the 90%, \*\* is statistically significant at the 95% and \*\*\* is statistically significant at the 99% respectively

**Table 4: Estimated results of factors that affect gasoline prices in each country**

| Variable | Cambodia               | China                    | Lao                      | Myanmar                 | Thailand                | Vietnam                 |
|----------|------------------------|--------------------------|--------------------------|-------------------------|-------------------------|-------------------------|
| Constant | 5.0525<br>(1.6321)     | -0.2113<br>(-0.4081)     | 2.1859<br>(4.0065)***    | -2.4633<br>(-4.0999)*** | 3.7970<br>(6.2509)***   | -3.5273<br>(-5.0049)*** |
| COPD     | 0.0021<br>(2.55)**     | 0.0056<br>(11.8385)***   | 0.0007<br>(1.8129)*      | 0.0030<br>(4.6581)***   | -0.0013<br>(-2.1438)**  | 0.0025<br>(5.0398)***   |
| EX       | -0.0014<br>(-2.4543)** | -0.2519<br>(-13.2151)*** | -0.0002<br>(-10.6803)*** | 0.0001<br>(2.2916)**    | -0.0615<br>(-11.195)*** | 0.0000<br>(5.7462)***   |
| WKOF     | 0.0289<br>(1.5243)     | 0.0438<br>(4.8631)***    | 0.0021<br>(0.2163)       | 0.0522<br>(4.8437)***   | -0.0142<br>(-1.3475)    | 0.0626<br>(5.157)***    |

\*Is statistically significant at the 90%, \*\* is statistically significant at the 95% and \*\*\* is statistically significant at the 99% respectively

**Table 5: Estimated results of the factors that affect the percentage of malnutrition in each country**

| Variable | Cambodia                | China                   | Laos                    | Myanmar                 | Thailand                | Vietnam                 |
|----------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Constant | 70.5401<br>(6.5758)***  | -57.1015<br>(-4.636)*** | 44.7452<br>(11.8244)*** | 161.4796<br>(4.9627)*** | 13.3993<br>(1.1917)     | 32.2656<br>(2.7141)***  |
| CPIF     | -0.0624<br>(-3.46)***   | -0.1063<br>(-5.2389)*** | -0.1389<br>(-8.3515)*** | -0.0971<br>(-2.8506)*** | -0.1318<br>(-6.1307)*** | -0.0972<br>(-6.8758)*** |
| Ex       | -0.0042<br>(-2.1618)**  | 1.0199<br>(5.7958)***   | 0.0010<br>(12.4372)***  | -0.0031<br>(-3.5149)*** | -0.0678<br>(-3.2816)*** | 0.0002<br>(2.1124)***   |
| POP      | -1.8403<br>(-4.674)***  | 0.0453<br>(4.3276)***   | -3.7475<br>(-5.1193)*** | -3.0877<br>(-4.3733)*** | 0.2706<br>(1.5011)      | -0.2347<br>(-1.4946)*** |
| KOF      | -0.1273<br>(-6.5168)*** | 0.0301<br>(0.9808)      | -0.1666<br>(-9.2585)*** | 0.4580<br>(26.6)***     | -0.1100<br>(-5.8311)*** | 0.0280<br>(1.452)       |

\*Is statistically significant at the 90%, \*\* is statistically significant at the 95% and \*\*\* is statistically significant at the 99% respectively

prices rise, consumers fear food shortages and increase their purchase volume of such products to prevent future impacts. This, in turn, causes decreased FIS in those countries. The symmetrical relationship between WKOF and CPIF of China, Laos, Myanmar, and Thailand, as seen in Table 3, indicates that more and more countries were becoming part of globalization, which forced each country to share more food resources with other nations, even at the expense of domestic food prices, which could affect other commodities. However, consumers could also choose to buy alternative products instead of food, causing deviations in consumption behavior that would reverse the effect of WKOF on FIS transmitted through CPIF.

Myanmar's integration into globalization has resulted in a symbiotic relationship between KOF and FIS. Although Myanmar has resources, such as oil and natural gas, that are in demand in the global market, it lacks the resources to produce enough food to meet the demand. Additionally, due to internal political problems, Myanmar has limited trade options, which minimizes the benefits received from globalization. In contrast, Cambodia, Laos, and Thailand have a positive relationship between KOF and FIS, as they have benefited from reduced barriers to access food and more suitable raw materials for food production due to globalization. When examining the influence of WKOF on FIS transmitted via KOF, there were opposite correlations for Cambodia, Laos,

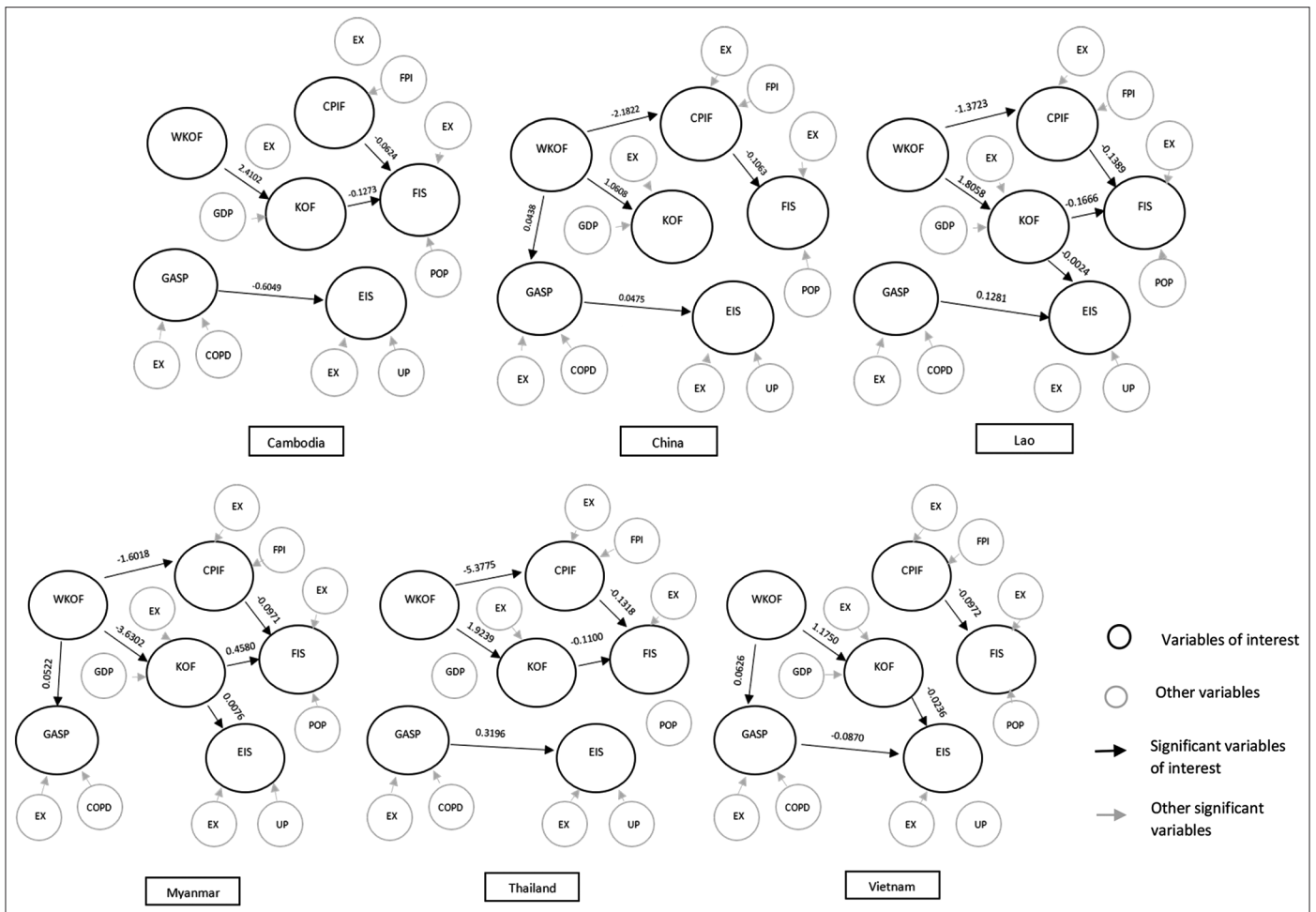
Myanmar, and Thailand. Due to globalization, these countries experienced increased access to food products from various regions of the world, which reduced FIS. Myanmar, on the other hand, implemented stricter measures to protect domestic interests from globalization, moved away from assimilation, and focused more on domestic food production, which also helped reduce FIS.

Table 6 displays the correlations between GASP and EIS in China, Laos, and Thailand, which were a result of the relationship between oil prices and transportation services affecting the import of oil products from foreign countries. This was due to the constant increase in demand for oil as an essential commodity. The adjustment of GASP to the volume of imports might not have

been as noticeable as the effect of the demand for energy from oil. Conversely, the opposite direction of the relationship between gasoline prices and the ability to use gasoline in Cambodia and Vietnam could explain the decrease in demand for oil imports. When examining the impact of WKOF on EIS via GASP in each country, China had a positive correlation, as the expansion of international trade led to an increase in demand for oil and subsequent imports. In contrast, globalization had a negative impact on GASP in Vietnam, hindering the transportation sector and decreasing the dependency on oil imports.

The analysis of KOF's influence on EIS revealed a similar relationship between KOF and EIS in Myanmar and Vietnam, as these countries

**Figure 1:** The relationship and influence of WKOF on food and energy security



**Table 6: Estimated outcomes of the factors that influence the proportion of reliance on imported oil energy in each country**

| Variable  | Cambodia                 | China                   | Laos                    | Myanmar                | Thailand                | Vietnam                 |
|-----------|--------------------------|-------------------------|-------------------------|------------------------|-------------------------|-------------------------|
| Constant  | 7.7205<br>(6.9773)***    | 0.1384<br>(2.2903)**    | 1.3208<br>(19.3102)***  | 4.4393<br>(5.6683)***  | -1.8669<br>(-7.3514)*** | -0.2148<br>(-2.4259)    |
| GASP      | -0.6049<br>(-9.9529)***  | 0.0475<br>(4.8111)***   | 0.1281<br>(4.8188)***   | 0.1252<br>(0.959)      | 0.3196<br>(4.9691)***   | -0.0870<br>(-3.0598)*** |
| EX        | -0.0010<br>(-4.1726)***  | 0.0129<br>(2.5769)**    | 0.0000<br>(-0.31)       | 0.0005<br>(10.3421)*** | 0.0275<br>(7.8572)***   | 0.0000<br>(-5.5207)***  |
| UP        | -0.0845<br>(-14.8153)*** | -0.0046<br>(-9.2906)*** | -0.0096<br>(-7.1432)*** | -0.1504<br>(-5.757)*** | 0.0069<br>(3.3661)***   | 0.0032<br>(3.0108)      |
| KOF index | 0.0007<br>(0.2556)       | 0.0004<br>(0.8511)      | -0.0024<br>(-3.4532)*** | 0.0076<br>(3.9782)***  | 0.0027<br>(1.1838)      | 0.0236<br>(8.6107)***   |

\*Is statistically significant at the 90%, \*\* is statistically significant at the 95% and \*\*\* is statistically significant at the 99% respectively

experienced an increase in international trade due to globalization. This resulted in an increase in demand for transportation services and a subsequent rise in the need for oil. Despite being oil exporting countries, both countries still require crude oil imports due to processing technology limitations. However, these advantages could not offset the impact of KOF on EIS. However, these findings contrast with those of Laos, where the relationship between KOF and EIS was in the opposite direction. This was due to Laos' geographical features, which hinder the transportation of goods within the country, leading to a significant need for energy from oil in domestic transportation, unlike trade with neighboring countries, which have contiguous borders, and international transportation is more convenient and less energy intensive. Therefore, Laos' KOF index increase reduced its dependence on oil imports. Looking at the influence of WKOF on EIS through KOF, a positive impact from WKOF to EIS was found in Vietnam. This indicates that globalization drew Vietnam into a world with increased traded and more services provided, resulting in more energy consumption and energy imports. Unlike Laos and Myanmar, there was a correlation between globalization and oil dependency. While the impact of WKOF attracted Laos to become a part of globalization, Laos has extensive contact with neighboring countries, leading to less energy required for transportation and lower energy dependence. In contrast, Myanmar experienced a pushback from globalization, reducing the demand for oil for transportation and lowering the country's EIS.

Based on the results of the study, the relationship and influence of WKOF on food and energy security could be summarized as shown in Figure 1.

## 5. CONCLUSIONS AND SUGGESTIONS

The aim of this study was to examine the impacts of deglobalization on food and energy insecurity in the GMS countries. In the study, food insecurity was considered through the percentage of domestic malnutrition and energy insecurity was assessed through the proportion of dependence on oil energy imports of each country. The results show that the impacts of deglobalization on food and energy insecurity differed among these countries. Both the channels of influence and the direction of the relationship suggested that all the countries in the GMS are affected by deglobalization in some way or another.

Deglobalization is expected to have a mixed impact on food insecurity in the GMS countries. While it may reduce food insecurity in China, Laos, Myanmar, and Thailand through the price factor, it could increase food insecurity in Cambodia, Laos, Myanmar, and Thailand as the effects of deglobalization pass through each country's level of involvement in globalization.

Furthermore, regarding the impact of deglobalization on energy instability, the study reveals that it is likely to aggravate China's energy instability but improve Vietnam's energy insecurity due to its effect on gasoline prices. However, the impact of deglobalization on Laos, Myanmar, and Vietnam could increase energy insecurity when taking into account the effects that pass through each country's level of globalization.

The study reveals that the effects of globalization on food and energy insecurity vary for each member country in the GMS. Concerning food insecurity, the GMS countries should enhance their food production technology. Expanding food production using traditional manufacturing technology may increase unit costs, which could lead to an increase in reliance on imported food due to the impact of domestic food production on prices. Fear of scarcity and participation in the globalization trend increases food insecurity due to reasons related to trade between countries. Therefore, the deglobalization impact, transmitted through prices, helps alleviate food insecurity.

Overall, deglobalization is expected to increase energy insecurity, particularly in countries that heavily rely on oil as their main source of energy. Moreover, this issue may have a significant impact when oil is the main source of energy. This is due to technological reasons involved with the oil processing industry, which may result in countries having to import oil despite their ability to produce crude oil domestically. Therefore, each country in the region should choose an appropriate source of energy for transportation, by considering the natural resources available in their country. For example, using electric vehicles, vehicles powered by hydrogen, or public transportation systems powered by electricity. These can help reduce the impact of the demand for oil energy, especially in the transportation sector. In addition, countries that rely on energy from foreign countries. It is necessary to control energy imports at an appropriate level to prevent oversupply problems that cause currency fluctuations or inflation that will occur in the future.

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