Factors Influencing the Lao PDR Import Value of Processed Agricultural Products from Thailand during the Covid-19 Pandemic

Thanet Wattanakul[1], Malliga Sompholkrang[2] and Tanawat Watchalaanun[3]

Abstract

This study investigates the impact of the Lao macroeconomic factors of real gross domestic product, the Openness Index, and the exchange rate between the Thai and Lao currencies on the Lao import value of agricultural processed products from Thailand. Using product classifications and data from the International Trade Centre, this research examined the total import value (IM) and value of the imported product categories of sugar (HS17), flour (HS19), miscellaneous edible preparations (HS21), beverages (HS22), and animal fodder (HS23) (as dependent variables). The analysis employed the Autoregressive Distributed Lag approach, and the Vector Error Correction Model was applied to analyze the level relationship and test causal relationships among variables by using quarterly time series data from Q1 2012 to Q3 2021. Results show long-run and short-run relationships between GDP and both IM and HS17, but only a long-run relationship with HS22 and a short-run effect on HS19. Following the effects of COVID-19, HS22 will be the fastest market to recover. GDP has the greatest effect on IM in the long run. Granger causality of real GDP was seen running to imports on IM, HS17, and HS19; Openness running to IM and HS19; and exchange rate running to HS17, HS19, HS21, and HS22, with only HS23 unaffected by any factor.[4]

Keywords: Import Value, Processed Agriculture Products, Lao PDR, Covid-19, ARDL

JEL: F13

[1] Associate Professor, Department of Economics, Faculty of Interdisciplinary, Khon Kaen University, Nong Khai Campus, Thailand,
[2] Assistant Professor, Department of Economics, Faculty of Interdisciplinary, Khon Kaen University, Nong Khai Campus, Thailand
[3] Researcher

Acknowledgement
This research had funding support from the research scholarship program of the Research and Graduate Studies Division, Khon Kaen University. The researchers are deeply grateful for contributions from the Research and Graduate Studies Division, Khon Kaen University. [4]

Introduction

Food insecurity is among the most important concerns of many international organizations because of its direct and immediate effects on the well-being of a country's population. This issue became prominent in 1974 after the Food and Agriculture Organization of the United Nations (FAO) published a report on the extent of hunger in the world (Food and Agriculture Organization of the United Nations, 2019). Since then, many international organizations such as the FAO, World Bank, and International Fund for Agricultural Development have monitored and addressed this problem across the globe. The extenuation of food insecurity has become a prime target of these organizations as outlined in Goal 2 ("Zero Hunger") of the UN's Sustainable Development Goals (United Nations, 2019).

Since the emergence of the COVID-19 pandemic in December 2019, food insecurity has worsened in many countries. In January 2021, Baquedano et al. (2021) presented numerical estimates of food insecure people from the International Food Security Assessment (IFSA), which reported about 921 million persons in 76 countries suffering from food insecurity as of August 2020. Asia had the largest number of food insecure people that year, about 437.5 million, or 18.1 percent of the population.

Providing agricultural processed products (AP) is among the most effective remedies to mitigate food insecurity. Food processing can extend the lifetime of foods and make them easy to transport. Because of these properties, AP is suitable for transport from a food-abundant area to a food-scarce area. Thus, AP plays an important role in creating sustainable food chains (Dietrich Knorr, Mary Ann Augustin, and Brijesth Tiwari, 2020).

The Lao People's Democratic Republic (Lao PDR) has been among the least developed countries affected by the COVID-19 pandemic. The World Bank reported that during the pandemic many businesses in Lao closed either temporarily or permanently, household incomes declined, or the rates of unemployment and food insecurity rose (World Bank, 2021). In the pandemic's first full year (2020), the International Monetary Fund (IMF) estimated the real gross domestic product growth rate (real GDP growth) of Lao at -0.4 percent. For 2021, the IMF raised its growth estimate to 2.1 percent, citing policies to provide protective health measures while reviving the Lao economy, such as re-opening many borders for trading critical products such as foodstuffs (International Monetary Fund, 2021).

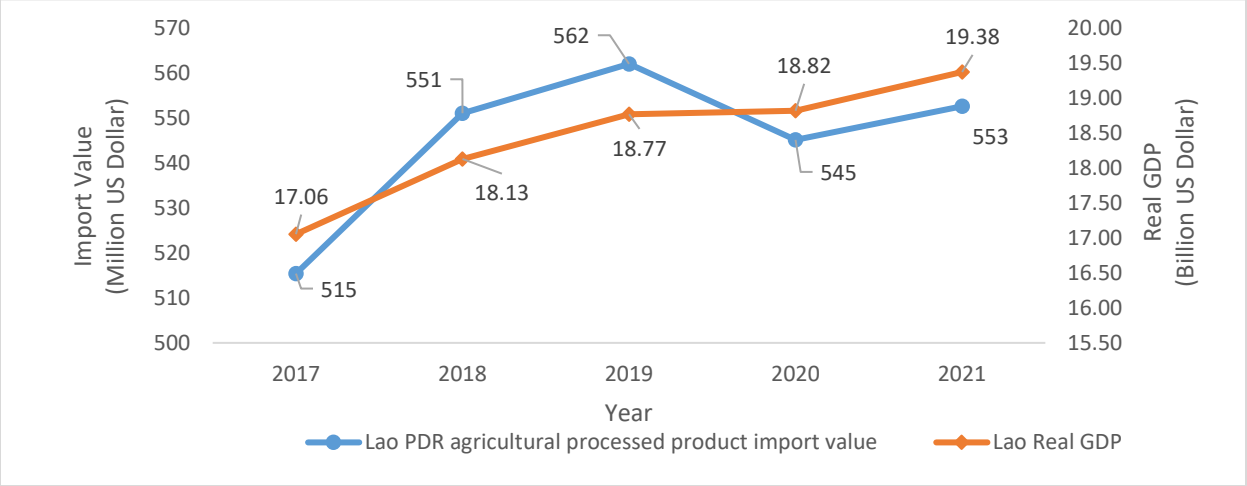
Food insecurity in Lao PDR existed for years before the pandemic. In 2012, the Lao Statistics Bureau analyzed food insecurity with data from the country's expenditure and consumption surveys (2002/03 and 2007/08). The analysis found suboptimal consumption of protein and fat among the population, but excessive carbohydrate consumption (Lao Statistics Bureau, 2012). Before the pandemic, the Crop and Food Security Assessment Mission (CFSAM) estimated the number of food-insecure Laotians at 67,800 (as cited in Baquedano et al., 2021), or approximately one percent of the population. In stark contrast, the World Food Program (WFP) estimated through surveys in the pandemic months of April and May 2020 that 31.8 percent of households experienced mild, moderate, or severe food insecurity (World Food Program, 2020).

Despite persistent food insecurity in Lao, its agricultural processing industry hasn't developed widely; many AP are imported from neighboring countries. In 2010, although about 70 percent of Laotians were working in the agricultural sector, their yields were primarily used for the workers' livelihoods. Moreover, Lao smallholder farmers produce most of the country's fresh

food supply and rarely engage in storing and processing their production (Lao PDR Ministry of Agriculture and Forestry, 2010). Although many policies exist to encourage behavioral change among agricultural workers to improve yields, the results still fail to meet domestic demand.

The pandemic significantly reduced the Lao import value of AP. In 2020, it fell to US$545 million from $562 million in 2019 before recovering to $553 million in 2021. This decrease may have affected the slowing of real GDP growth in 2020, though both statistics rose in 2021 (Figure 1).

Figure 1 World processed agriculture product import value



Source: International Trade Centre (2022) and International Monetary Fund (2021)

Thailand is the biggest AP exporter to Lao PDR because of the countries' border links and Thailand's robust AP export capacity. From 2017 to 2021, Thailand accounted for 74.28 percent of the Lao market share of agricultural imports, followed by Viet Nam (7.46 percent), China (4.93 percent) and Singapore (4.47 percent) (Table 1). Thailand and Lao share more than 1,800 kilometres of borders covering Upper, Central, and Lower Lao with 49 customs checkpoints (Department of International Trade Promotion, Ministry of Commerce, THAILAND, 2021). The Thai AP industry is among the nation's most important economic sectors, which developed over the past 30 years through a government import substitution policy to promote exports (Tanrattanaphong et al., 2020). Nowadays, the industry is among Thailand's highest-value sectors among First S-curve industries under the country's national sustainable development goals. Moreover, Thailand is a key exporter of AP products in world markets (The Office of Industrial Economics, 2015).

Table 1 Processed agriculture products import market share of Lao PDR

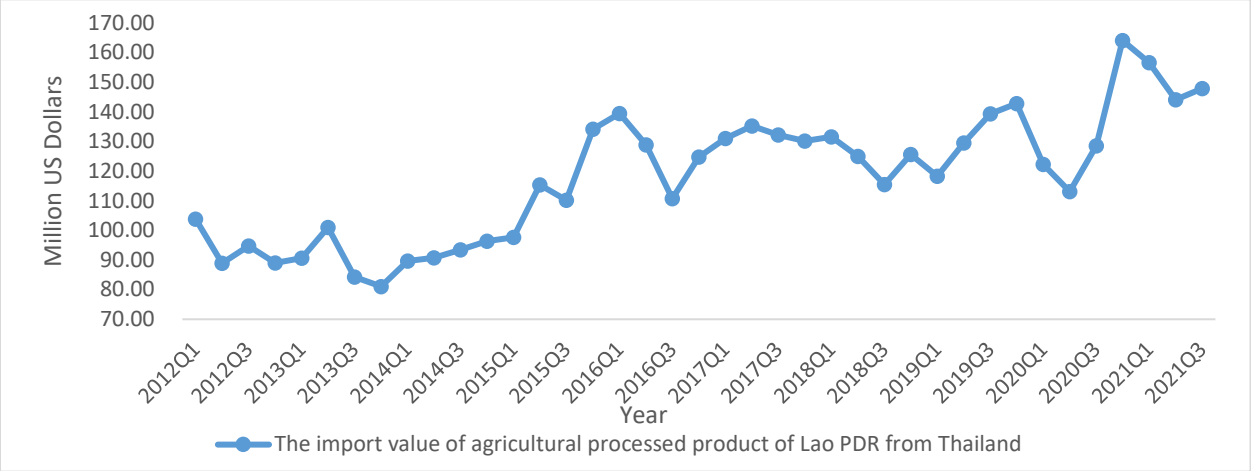
Country	2017	2018	2019	2020	2021	Average
Thailand	79.77%	78.21%	70.35%	70.52%	72.55%	74.28%
Viet Nam	2.99%	8.33%	7.47%	9.80%	8.69%	7.46%
China	4.20%	4.11%	5.35%	6.19%	4.81%	4.93%

Singapore	4.63%	3.00%	5.37%	5.09%	4.28%	4.47%
Others	8.41%	6.35%	11.46%	8.40%	9.68%	8.86%

Source: International Trade Centre (2022)

From Q1 2012 to Q3 2021, Lao AP imports from Thailand trended upwards, though with some temporary decreases. In Figure 2, before the pandemic began, the Lao AP import value from Thailand expanded from $103.81 million in Q1 2012 to $142.84 million in Q4 2019. This period included a significant decline from $139.51 million to $110.77 million between Q1 and Q3 2016. During the pandemic, in the first quarter of 2020, the import value was only slightly affected, but it decreased around 12.67 percent in the second quarter and 7.74 percent in the third quarter before rising more than 14 percent over Q4 2020 and the three first quarters of 2021 (International Trade Centre, 2021).

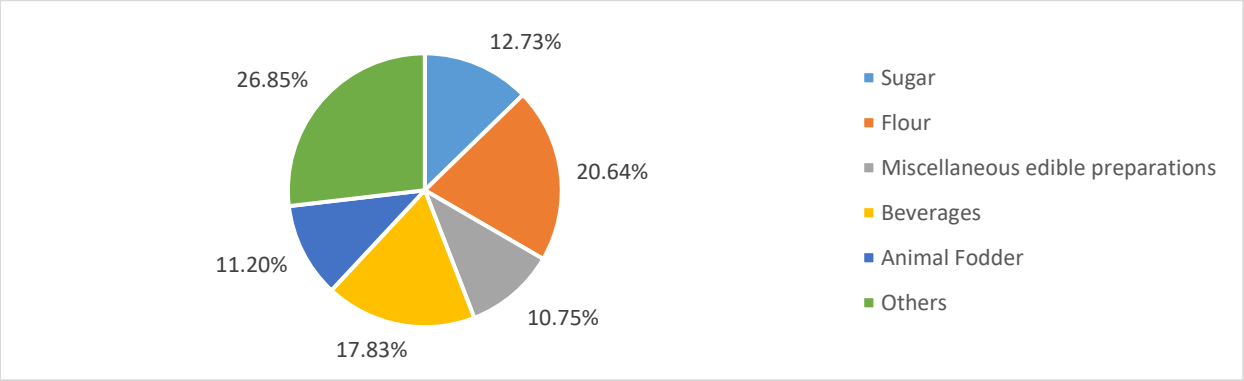
Figure 2 Import value of processed agriculture products of Lao PDR from Thailand



Source: International Trade Centre (2022)

In the period from Q1 2012 to Q3 2021 covered in this study, five products as categorized by the International Trade Centre accounted for about 73 percent of Lao's processed agricultural products import value from Thailand: sugar (as sugars and sugar confectionery: HS17) at 12.73 percent, flour (as preparations of cereals, flour, the starch of milk; pastry cooks' products: HS19) at 20.64 percent, miscellaneous edible preparations (HS21) at 10.75 percent, beverages (as beverages, spirits, and vinegar: HS22) at 17.83 percent, and animal fodder (as food industries, residues and wastes thereof; prepared animal fodder: HS23) at 11.20 percent (Figure 3). These comprise important products used in daily life. Furthermore, they are not only components of other foods but also sources of nutritional value and are necessary as raw materials in other related industries.

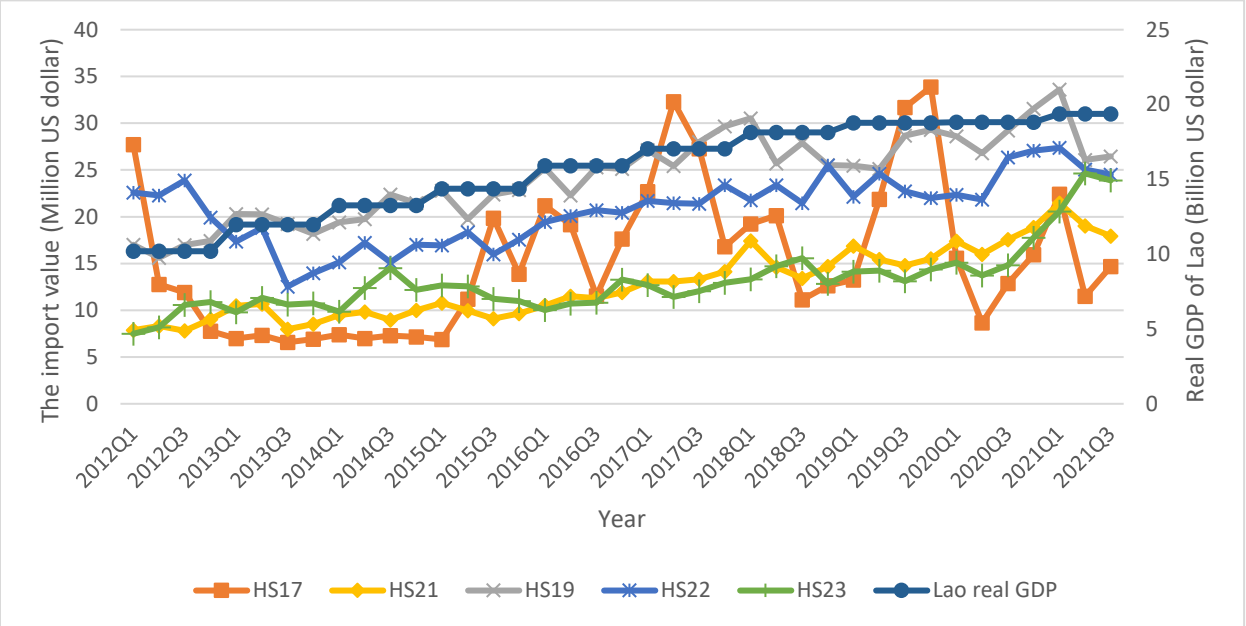
Figure 3 Main Lao PDR's processed agriculture products import from Thailand



Source: International Trade Centre (2022)

As shown in Figure 4, all import values of these products except for HS 17 (sugars and sugar confectionery) rose over the period 2012 to 2021, along with Lao's real GDP. However, their trending was probably affected by the differing effects from GDP when one considers fluctuations during some points of the period.

Figure 4 Lao import value of main processed agriculture product from Thailand



Source: International Trade Centre (2022)

In general, import value is affected by many macroeconomic factors, such as national income, exchange rates, and the Openness Index. National income factors can function as a proxy for the market size of an importer country, while exchange rate factors affect the cost of trade for the importer, and the Openness Index indicates the difficulty of an importing country's trading. The impact of these factors on import value is found in many studies, such as that of Alwell

Nteegah and Nelson Mansi (2017) in Nigeria, who found a negative and significant effect from real income levels and real exchange rates on total import demand. In a study of Iran, Nasser Ebrahimi (2017) found that the Openness Index had a positive and significant impact on total import demand with a co-integrated relationship between real GDP and total demand. Moreover, in the case of pineapple processed from Thailand, the per capita GDP of Thailand's partner countries had an effect on the market share of canned pineapple and pineapple juice markets, while the exchange rate affected only canned pineapple (Wattanakul, Nonthapot and Watchalaanun, 2021).

As food insecurity in Lao rose because of the pandemic, the relationship among macroeconomic factors was disrupted by COVID-19, and this disruption may be a barrier to revivifying Lao AP imports from Thailand. Therefore, this study aims to investigate the impact of Lao macroeconomic factors on the Lao import value of AP products from Thailand. The results can be used to guide policy recommendations for solving food insecurity problems and enhance Lao's economic recovery.

Methodology

This study analyzed the impact of macroeconomic factors on Lao AP product imports from Thailand using quarterly data from Q1 2012 to Q3 2021, or 39 quarters, to observe the long-run relationship employing the ARDL co-integration method and running the Granger causality test with an applicable model from ARDL and VAR methods.

The relationship was separated into six dependent variables: the total import value for analysis of the overall impact and the impact on five main imported product groups: sugar (as Sugars and Sugar Confectionery: HS17), flour (as preparations of cereals, flour, starch or milk; pastry cooks' products: HS19), miscellaneous edible preparations (HS21), beverages (beverages, spirits, and vinegar: HS22), and animal fodder (as food industries, residues and wastes thereof; prepared animal fodder: HS23). The import values in each market were collected from ITC data (2021). All independent variables are presented in millions of US dollars.

For the independent variables, three Lao macroeconomic variables were used: real gross domestic product (real GDP) in billions of US dollars from the IMF (2021) that was interpolated into quarterly data from yearly data using the quadratic math summation method; the exchange rate between the Thai and Lao currencies in baht per 100 lak (Ex) from the Bank of Thailand (2021); and the Openness Index (Open) as calculated by Eq (1) with the total import and export values in this equation collected from Trade Map (2021).

$$The\ Openness\ index\ = \frac{Lao\ total\ export + Lao\ total\ import}{Real\ GDP\ of\ Lao} \qquad \text{Eq. (1)}$$

These variables were tested against the stationary property by using the Augmented Dickey-Fuller Test (ADF test) and Phillip-Perron Test (PP test). In this case, all variables in each relationship weren't stationary at the same order of integration, and there is no variable stationary in a higher one order of integration. Thus, the ARDL method was the most suitable for co-integration testing of Equation 2:

$$y_t = \alpha + \Sigma_{i=1}^{p} \delta_i y_{t-i} + \Sigma_{j=0}^{q} \beta_j GDP_{t-j} + \Sigma_{k=0}^{r} \gamma_k Open_{t-k} + \Sigma_{l=0}^{s} \theta_l Ex_{t-l} \varepsilon_t \qquad \text{Eq. (2)}$$

where y_t is each dependent variable in time t comprising Lao's total import value of AP products from Thailand (IM): sugar (HS17), flour (HS19), miscellaneous edible preparations (HS21), beverages (HS22), and animal fodder (HS23) from Thailand. GDP is the real gross domestic product (real GDP) of Lao. Open is the Openness Index. And Ex is the exchange rate between Thailand and Lao (baht/100 lak) of commercial banks in the Bangkok metropolitan region. α is the intercept parameter, and δ is the independent lag coefficient of itself. $\beta, \gamma \; and \; \theta$ are coefficients of each independent variable. p, q, r, s represent a number of lags selected by the least AIC value, which makes the model stable in cumulative sum (CUSUM) and cumulative sum of square (CUSUM ^{2}) testing.

According to Equation 2, the co-integration considered this hypothesis.

$$H_0 : \beta_1 = \beta_2 = \ldots = \beta_q = \gamma_1 = \gamma_2 = \ldots = \gamma_r = \theta_1 = \theta_2 = \ldots = \theta_s = 0$$
$$H_1 : \beta_1 \neq \beta_2 \neq \ldots \neq \beta_q \neq \gamma_1 \neq \gamma_2 \neq \ldots \neq \gamma_r \neq \theta_1 \neq \theta_2 \neq \ldots \neq \theta_s \neq 0$$

The testing is called a Bound test. If the F-stat from the Wald test was higher than the criteria of Pesaran et al. (2001), it implied a co-integration or long-run relationship as calculated in Equation 3 as

$$y_t = \Omega_0 + \Omega_1 \mathrm{GDP_t} + \Omega_2 \mathrm{Open_t} + \Omega_3 \mathrm{Ex_t} + \epsilon_t \qquad \text{Eq. (3)}$$

where Ω_1, Ω_2 and Ω_3 are the coefficient of each dependent variable in the long-run relationship.

An economic shock may occur during a long-run relationship, but these variables may adjust to the long-run equilibrium over time. To observe the adjustment, one applies the model from the ARDL method, which also detects the Granger causality running from these Lao economic variables to the import value in each model, as shown the Equation 4:

$$\Delta y_t = \psi + \Sigma_{i=1}^{p-1} \lambda_i \Delta y_{t-1} + \Sigma_{j=0}^{q-1} \eta_j \Delta GDP_{t-j} + \Sigma_{k=0}^{r-1} \kappa_k \Delta Open_{t-k}$$
$$+ \Sigma_{l=0}^{s-1} \varrho_l \Delta Ex_{t-j} - \phi EC_{t-1} + \mu_t \qquad \text{Eq. (4)}$$

Where $EC_t = y_t - \Omega_0 - \Omega_1 GDP_t - \Omega_2 Open_t - \Omega_3 Ex_t$

where λ_i is the short-run coefficient of dependent variable in time t – i; parameters η_j κ_k and ϱ_l are short-run coefficients of each independent variable in time t – i; ψ is a constant term; and the speed of adjustment is present in the term ϕ.

The basic concept of Granger causality is to detect the variable in the past that changed in the presence of other variables. Thus, in Equation 4, the independent variable will be the Granger causality of y_t when all the coefficients aren't significantly zero by the Wald test.

If they aren't co-integrated in the model, they won't adjust into a long-run equilibrium; however, they may have a relationship in the short run. To detect the short-run relationship and Granger causality, a VAR model as in Equation 5 may be suitable to observe:

$$\Delta y_t = \Lambda + \Sigma_{i=1}^{p-1} \Xi_i \Delta y_{t-1} + \Sigma_{j=0}^{q-1} \Gamma_j \Delta GDP_{t-j} + \Sigma_{k=0}^{r-1} \Pi_k \Delta Open_{t-k}$$
$$+ \Sigma_{l=0}^{s-1} \Upsilon_l \Delta Ex_{t-j} + v_t \qquad \text{Eq. (5)}$$

where Ξ_i is the short-run coefficient of the dependent variable in time t – i; parameters Γ_j, Π_k and Υ_l are short-run coefficients of each independent variable in time t – i; and Λ is the constant term. The independent variable will be the Granger causality of y_t when all their coefficients aren't significantly zero by the Wald test.

Results and Discussion

In Table 2, two non-stationary variables, HS23 and Ex, are in all testing models of both methods, and a stationary property in at least one model of testing of other variables. In this case, at least one variable in the model is non-stationary; thus, the long-run relationship of using these variables may be inaccurate because of the disruption of the unit root process unless there is an co-integration property in their relationship.

Table 2 Stationary test result at the level

Variable	ADF-test			PP-test		
	None	Intercept	Intercept and Trend	None	Intercept	Intercept and Trend
IM	0.3399	-1.4731	-3.5889**	1.4310	-1.1884	-3.4432*
HS17	-1.5919	-3.1232**	-3.5257*	-1.5452	-3.2801**	-3.78817**
HS19	2.1379	-1.5996	-2.0240	0.9424	-1.7770	-3.8523**
HS21	3.5445	0.5494	-2.8289	2.4216	-0.7448	-3.6593**
HS22	0.0733	-1.0570	-3.3165*	-0.0250	-1.5086	-3.1684
HS23	1.6940	-0.0050	-1.1937	1.6940	-0.0254	-1.3413
GDP	1.1503	-1.9264	-1.0477	3.5943	-4.8791***	-0.7826
Open	-0.9778	-2.8563*	-3.8358**	-1.5052	-2.6948*	-3.7333**
Ex	-0.5789	-1.0516	-1.8009	-0.8043	-0.2871	-1.4975

Notes: ***Significance level of 99%. **Significance level of 95%. *Significance level of 90%.
Source: Authors' estimation

With the co-integration testing method in the earlier Enger and Granger tests or the Johanson test, the same order of integration of investigated variables was a necessary condition. However, the developed method as an ARDL co-integration test was not; these variables mustn't be stationary at higher than order one.

According to Table 3, all tested variables were stationary in the first order of integration in at least one model in both stationary testing methods. These stationary tests imply that these variables were stationary at a different order of integration, not higher than order one. Thus, the ARDL co-integration test was suitable for observing the long-run relationship in the next progression.

Table 3 stationary test result at the first order of integration

	ADF test			PP test		
Variable	None	Intercept	Intercept and Trend	None	Intercept	Intercept and Trend
IM	-5.8362***	-5.6066***	-5.5173***	-6.6047***	-11.7873***	-11.3821***
HS17	-6.2467***	-6.1419***	-6.035***	-12.5884***	-12.7962***	-13.0153***
HS19	-2.9148***	-7.0781***	-7.1807***	-8.1794***	-11.0090***	-15.1527***
HS21	-2.2973**	-2.9315*	-7.1664***	-6.3918***	-9.9303***	-10.0963***
HS22	-8.9200***	-8.8066***	-8.8951***	-88.9200***	-8.8066***	-8.8241***
HS23	-5.4710***	-5.7882***	-5.8813***	-5.4540***	-5.7874***	-5.8813***
GDP	-1.6821*	-2.1668	-2.6233	-1.7344*	-2.1381	-2.7487
Open	-7.3946***	-7.3776***	-7.2427***	-8.7301***	-13.6679***	-14.2236***
Ex	-3.8960***	-3.8844***	-4.2467***	-3.7488***	-3.7146***	-3.5631**

Notes: ***Significance level of 99%. **Significance level of 95%. *Significance level of 90%.
Source: Model estimation

In Table 4, the co-integration property analyzed in Equation 2 was found in the stable model of the relationship from Lao economic factors running to IM, HS17, HS19, and HS22 as considered by the Bound Test. This result implies a long-run relationship among these factors. Thus, though the impact of Lao economics on these factors was disturbed by the pandemic shock, this relationship recovered.

Table 4 Co-integration test by the Autoregressive Distribution Lag (ARDL)

Variable	Lag	AIC	Bound test	CUSUM	CUSUM^2
IM	(2,4,4,0)	7.4472	3.9474**	Stable	Stable
HS17	(2,4,0,1)	6.1658	4.4716**	Stable	Stable
HS19	(1,4,2,3)	4.0340	8.4938***	Stable	Stable
HS21	(5,3,0,0)	2.7154	2.4782	Stable	Stable
HS22	(2,0,0,4)	3.8884	4.7293***	Stable	Stable
HS23	(4,3,1,5)	2.7346	2.7346	Stable	Stable

Notes: ***Significance level of 99%. **Significance level of 95%. *Significance level of 90%.
Source: Model estimation

The long-run relationship analyzed by Equation 3 is presented in Table 5; only GDP is affected in the long-run relationship with IM, HS17, and HS22. On the other hand, there is no factor influence on HS19 in the long run. Moreover, GDP was more influential on IM than on the others in the long-run relationship, followed by HS17 and HS22, respectively. This result implies the importance of economic recovery on product demand from Thailand in each market. Thus, Thailand exporters in each product should follow news of Lao's economic recovery to prepare

plans for production. Moreover, support from Thailand to bolster Lao's economy may indirectly increase the export value of these products to Lao.

Table 5 Long-term coefficient estimates.

Variable	C	GDP	Open	Ex
IM	90.9384	21.1959	-0.6472	-41.6250
	(0.9056)	(2.272)**	(-1.0469)	(-0.422)
HS17	-28.4363	9.4526	-0.1274	17.6070
	(-0.8459)	(2.6342)**	(-0.8212)	(0.3277)
HS19	20.6349	1.8616	-0.1021	14.5236
	(1.665)	(1.4201)	(-1.482)	(0.8401)
HS22	-6.4522	6.4716	0.0351	-3.5997
	(-0.3823)	(3.8068)***	(0.5157)	(-0.1742)

Notes: ***Significance level of 99%. **Significance level of 95 %. *Significance level of 90%.
Source: Model estimation

The adjustment to long-run relationships is presented in Table 6. HS22 saw the fastest adjustment to the long-run equilibrium at 59.15 percent of the quarter. or about 54 days; followed by HS17 at 74.36 percent, or about 67 days; and IM at 80.20 percent, or about 73 days. The slowest adjustment was HS19 at 94.63 percent, or about 86 days.

The Granger causality from the VECM model in Equation 4 and VAR model in Equation 5 are shown in Table 6. The Granger causality of GDP and Open of IM, GDP, and Ex run to HS17; GDP, Open, and Ex run to HS19; and only Ex runs to HS21 and HS22. This result implies that these variables indicate changing demand in each market. The previous value of Ex is the important variable to predict import value in the main market, but may not be a good indicator for the overall market (IM). The highest value in the overall market and flour can be explained by the previous value for Open. For GDP, the previous value explains the overall and main food components as sugar (HS17) and flour (HS19).

Table 6 Vector error correction model (VECM) and Vector Auto-regression Model (VAR) Results

Variable	Long-run Causality EC_{t-1} (t-stat)	Granger Causality (χ^2stat)		
		GDP	Open	Ex
IM	-0.8020 (-4.5220)***	20.2040***	8.2093*	0.3854
HS17	-0.7436 (-5.0608)***	35.1329***	0.2907	3.0052*
HS19	-0.9463 (-7.1104)***	30.1527***	13.0879***	27.0327***
HS21	-	4.9370	1.3722	14.1033***
HS22	-0.5915 (-4.7933)***	1.7239	2.4691	9.4944**
HS23	-	3.0119	0.0442	8.9579

Notes: ***Significance level of 99%. **Significance level of 95%. *Significance level of 90%.
Source: Model estimation

Regarding the empirical results, a summary of co-integration and Granger causality is presented in Figure 5. These results confirm the importance of real GDP on Lao AP product demand from Thailand. Overall, long-run and short-run relationships exist in the total import of AP products (IM) and one of the main markets, sugar (HS17), but only a long-run relationship in the beverage market (HS22), and a short-run relationship in the flour market (HS19). The real GDP impact on these variables can be explained by the terms "power puncher" and "market expanding" used by Nasser Ebrahimi (2017) and Wattanakul, Nonthapot and Watchalaanun (2021). Thus, a recovering Lao economy may raise demand for these products from Thailand. It can be noted that real GDP had a more visible effect on dairy products and also sugar, flour and beverages than on other processed agricultural products.

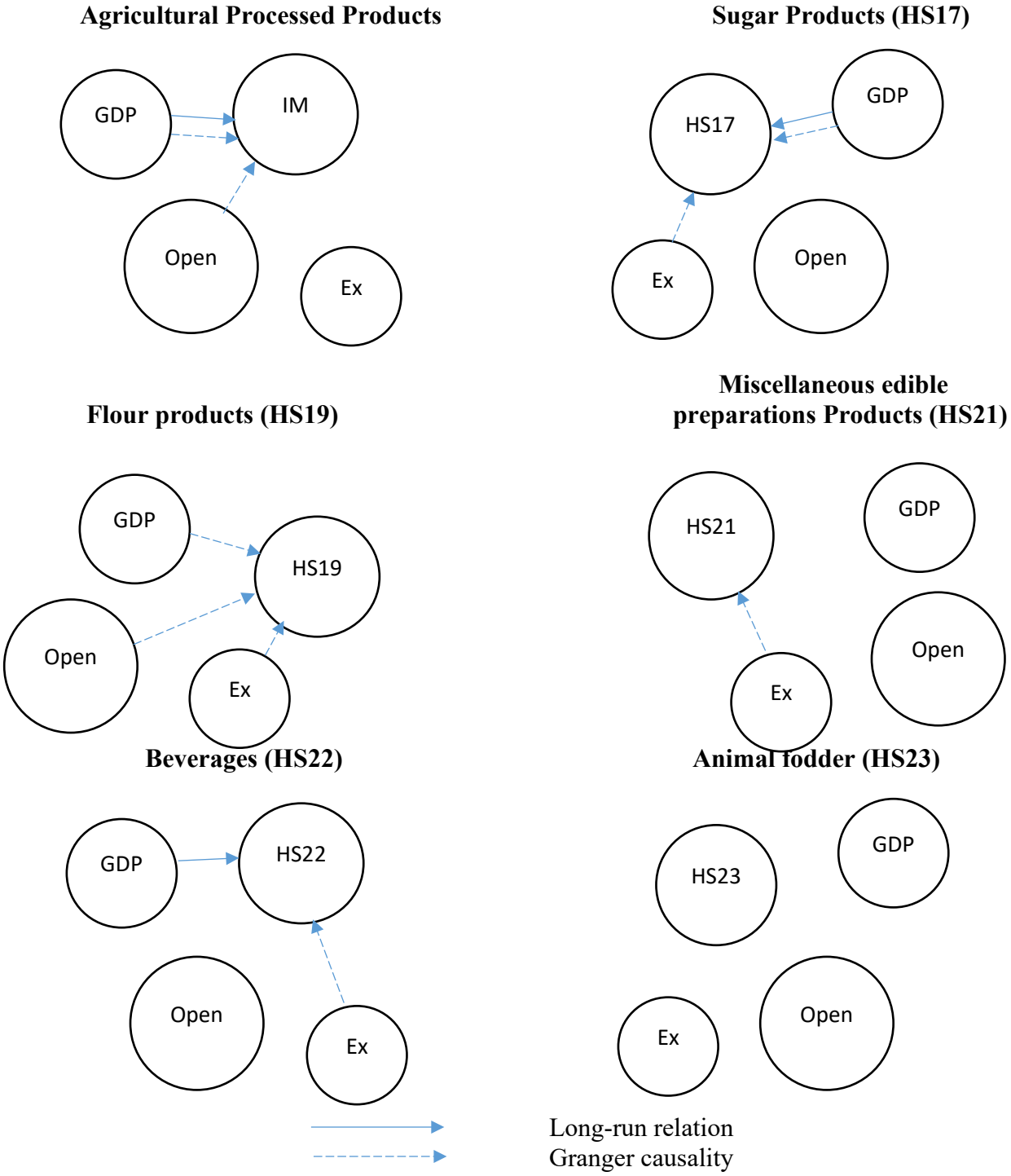
The Openness Index (Open) reflects the Granger causality of large markets such as flour (HS19) and the overall agricultural market (IM) in the short run. The determination of the Openness Index on these import values conforms to the study by Alwell Nteegah and Nelson Mansi (2017) of Nigeria's total imports. According to the Openness Index, which is one of the clearest country indicators of trade, these results show the importance of an efficient trading system on trade values in the short run. Thus, the appropriate trade facilitation policy direction of the Lao government may lead to a growing demand for large-scale agricultural products from Thailand for flour and overall agricultural products in the short run.

The exchange rate (Ex) movement was a sign of change in the main markets of sugar (HS17), flour (HS19), miscellaneous edible preparations (HS21), and beverages (HS22) in the short run. Fiaz et al. (2021) also found a short-run impact of exchange rates on total export and total import values in Viet Nam, contrary to their long-run results. The effect of exchange rates (Ex) on this trading can be explained by the basic international economic concept that a changing exchange rate affects the cost of these products in Lao; thus, import value is influenced by the exchange rate. However, despite these products being necessary for living, Lao can't produce them in sufficient quantities, and Thailand is the nearest significant producer of these products; therefore, the exchange rate's effect on import value can't impose a permanent change in the long run. However, Thai exporters should follow the exchange rate situation between both countries for production and trade planning.

Although the exchange rate (Ex) affects most of the main market in the short run, the total import of agricultural processed products (IM) isn't impacted by the exchange rate (Ex) in either the short or long run. On this point, the total import of agricultural processed products (IM) includes the five main markets; meanwhile, almost all main markets are affected by the exchange rate (Ex), and its effect on each main market probably occurs at different times. As a result, the exchange rate's effect (Ex) on the total import value of agricultural processed products (IM) is smaller and may be countered by the effects on other product categories. Moreover, the total import of AP products (IM) probably doesn't see an effect from the exchange rate (Ex) because of options and futures contracts.

Curiously, these variables have no impact on animal fodder (HS23). In this case, animal fodder may be subject to the relative demand of Lao's livestock industry, whose product is mostly consumed by its workers (Xayalath, et al., (2021). Thus, demand for animal fodder may not change even during a pandemic, a fluctuation in exchange rates, or a change in the Openness Index.

Figure 5 Summary of Co-integration and Granger Causality



Source: From the empirical results

Policy Recommendations

Based on this study's results, it can be affirmed that the Lao economy remains dependent on many sectors comprising trade, services, investment, and tourism. It can also be stated that the country has a variety of primary high-quality agriculture products. Nevertheless, its domestic producers have insufficient technology to create many value-added products for export and to compete in global markets: an essential problem requiring a solution. As a result, many Thai investors should consider entering Lao to develop its AP production industry to serve domestic demand as well as to build exports to Viet Nam and China.

Policy recommendations are proposed as follows. Thailand and Lao PDR must accelerate their mutual benefits from all related free-trade agreements and combine them with the sub-regional and regional agreements of GMS and ASEAN. Entrepreneurs in both countries should obtain opportunities to exchange and discuss trade policies that are adjustable and flexible to changing circumstances and environments. These recommendations can be implemented with support from both countries' relevant government organizations.

Furthermore, exporters from Thailand must guarantee high quality and sufficient supply to serve the Lao market due to intense competition from China and Viet Nam. At present, China can export large amounts of processed agriculture products to Lao via high-speed train. In addition, exporters from Thailand have the potential to invest in this industry because of various incentive policies designed to attract direct foreign investment (FDI) to boost Lao's economic recovery.

Conclusion

This study's results indicate that the recovery of trade with Lao can occur in the long-run and short-run relationships between GDP and import value from Thailand within the overall market of agricultural products and specifically that of sugar products, while occurring only in long-run relationships with beverage products, and only a short-run effect in flour products. When the pandemic's effects decline, beverage products will be the fastest market to recover in the long run followed by sugar, flour, and the total of all AP products. The greatest effect on GDP by import value is in the total agricultural import values followed by sugar and beverages.

In the short run, the value of real GDP has a relationship with Lao processed agricultural import value from Thailand due to the important processed agricultural import market. This important import market consists of many products from the sugar market and flour market. For a time, the Openness Index reflected the Granger causality of the value of almost all main agricultural products, including the total agricultural import market, sugar market, flour market, miscellaneous edible preparations market and beverage market. Only animal fodder was unaffected by any factor.

References

Alwell Nteegah, Nelson Mansi. (2017). Analysis of factors influencing import demand in Nigeria. West African Journal of Industrial and Academic Research, 17 (1)

Baquedano, F., Zereyesus, Y. A., Christensen, C., & Valdes, C. (2021). COVID-19 Working Paper: International Food Security Assessment, 2020-2030: COVID-19 Update and Impacts on Food Insecurity. In Economic Research Service.

Brown, H., Mills, S. & Albani, V. Socioeconomic risks of food insecurity during the Covid-19 pandemic in the UK: findings from the Understanding Society Covid Survey. BMC Public Health 22, 590 (2022). https://doi.org/10.1186/s12889-022-12964-w

Department of International Trade Promotion, Ministry of Commerce, THAILAND, (2021). 4 Thai-Lao border posts where the land is adjacent without the Mekong River in the middle. From: https://www.tradelogistics.go.th/th/article/4-´‘√µ∫ %Ш-Δ‘».

Fang, H. 2021. COVID-19: The Impact on the Economy and Policy Responses-A Review. ADBI Working Paper 1236. Tokyo: Asian Development Bank Institute. Retrieve from: https://www.adb.org/publications/covid-19-impact-economy-policy-responses-review

FIAZ, A., KHURSHID, N., SATTI, A., MALIK, M. S., & MALIK, W. shahid. (2021). Real Exchange Rate Misalignment in Pakistan: An Application of Regime Switching Model. The Journal of Asian Finance, Economics and Business, 8(12), 63-73. https://doi.org/10.13106/JAFEB.2021.VOL8.NO12.0063

Food and Agriculture Organization of the United Nations. (2019). Hunger and food insecurity. Retrieved from: https://www.fao.org/hunger/en/.

International Monetary Fund. (2021). Lao People's Democratic republic. https://www.imf.org/en/Countries/LAO

International Trade Centre, (2021). List of importers for the selected product group Product group: Processed food and agro-based products. https://www.trademap.org/Country_SelProduct_TS.aspx?nvpm=1%7c%7c%7c%7c%7c%7c107698%7c%7c6%7c1%7c1%7c1%7c2%7c1%7c2%7c1%7c1%7c1.

Knorr D, Augustin, MA and Tiwari B (2020) Advancing the Role of Food Processing for Improved Integration in Sustainable Food Chains. Front. Nutr. 7:34. https://doi.org/10.3389/fnut.2020.00034

Lao PDR Ministry of Agriculture and Forestry. (2010). Strategy for Agricultural Development 2011 to 2020. Retrieve from: https://data.opendevelopmentmekong.net/library_record/2011-2020.

Lao Statistics Bureau. (2012). Food Security in Lao PDR: A Trend Analysis. Retrieve From: https://www.fao.org/3/at765e/at765e.pdf

Nasser Ebrahimi. (2017). "An Analysis of the Relationship of Imports and Economic Growth in Iran (Comparison of Systematic and Unsystematic Co-integration Methods with Neural Network)," International Journal of Economics and Financial Issues, Econjournals, vol. 7(2), pages 338-347.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds Testing Approaches to the Analysis of Level Relationships. Journal of Applied Econometrics, 16(3), 289-326. https://doi.org/10.1002/jae.616

Tanrattanaphong el.at. (2020). An analysis of Thailand's processed food global value chains [Doctoral thesis, Lincoln University. https://researcharchive.lincoln.ac.nz/handle/10182/12462

The Office of Industrial Economics, (2015). Project examining the effects of global and supply chain (GSC) free trade agreements (FTAs) on Thai manufacturing (Final report).

The Office of Industrial Economics. (n.d.). First five S-Curve industries were aimed to hastily reach concrete result by this year withBht.10 billion ready funding, projected by Office of Industrial Economics. https://www.oie.go.th/assets/portals/1/files/public_relation_news/oie_prnews6866.pdf.

United Nations. (2019). The Sustainable Development Goals Report 2019. https://doi.org/10.18356/55eb9109-en

Wattanakul, Thanet; Nonthapot, Sakkarin and Watchalaanun (2021). Factors Influencing the Processed Pineapple Export Competitiveness of Thailand, Australasian Accounting, Business and Finance Journal, 15(3), 119-127. https://doi.org/10.14453/aabfj.v15i3.7

World Bank. (2021). Monitoring the Impact of Cocid-19 in Lao PDP. https://www.worldbank.org/en/country/lao/brief/monitoring-the-impact-of-covid-19-in-lao-pdr

World Food Program. (2020). Rapid Assessment of Food Security and Agricultural in Lao PDR. Retrieved From: https://reliefweb.int/report/lao-peoples-democratic-republic/rapid-assessment-food-security-and-agriculture-lao-pdr-may.

Xayalath, S., Mujitaba, M. A., Ortega, A. D. S. V., & Rátky, J. (2021). A review on the trend of livestock breeds in Laos. Acta Agraria Debreceniensis, (1), 227-237. https://doi.org/10.34101/actaagrar/1/9047