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The impact of e-commerce on Thai's economy and its role plays in driving economic recovery after COVID-19 pandemic – the CGE Analysis.

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Abstract

This research study aims to analyze the impact of e-commerce on Thai's economy and its role plays in driving economic recovery after COVID-19 pandemic by using the CGE simulation analytical model. Since the COVID-19 epidemic on the global and Thai economy, the International Monetary Fund (IMF) predicts a decline in global economic growth due to the pandemic control measures, rehabilitation with vaccines, and financial terms. Thailand has also experienced the impact of the COVID-19 epidemic for approximately one year, which has affected its economy, society, and environment. The government has implemented various measures and policies, including temporary closures and work from home, resulting in a decrease in trade, investment, and tourism. This has led to changes in economic activity, with electronic transactions growing due to the use of technology, which reduces the need for in-person contact. Overall, the pandemic has altered the way people conduct their daily transactions and has resulted in a significant change in living patterns in Thai society. The research findings indicate that the COVID-19 pandemic has significantly impacted the Thai economy with slow recovery. This study indicates that expanding e-commerce transactions could positively impact the economy, but only if it reaches a certain threshold of at least 25% of the predicted growth rate. In comparative analysis, the scenarios with a significant expansion of e-commerce transactions in five sectors of the economy would have had a different impact on the economy. In scenarios B and C, the economy has recovered rapidly, with real GDP growing at 91.81% and 79.81%, respectively, and a significant increase in investment. Scenario C has seen a contraction, but there has been an increase in exports, with overall household income and consumption increasing and government tax collection increasing significantly. Sectors with a low export base, such as construction, transportation, and technical and professional services, would benefit the most. Therefore, e-commerce plays a crucial role in driving the economy towards a more agile and faster recovery than the pre-pandemic period. The policy implications should be initiated are 1). Enhance the accessibility of e-commerce transactions to low-income households. 2). Promote more investment in digital infrastructure to expand e-commerce transactions across sectors. 3). Encourage businesses to adopt e-commerce by providing incentives such as tax breaks and subsidies for investments and 4). Provide training and support to improve people's digital capabilities.

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1. Introduction

The COVID-19 epidemic has significantly impacted the global economy and is expected to continue doing so. According to the International Monetary Fund (IMF²), the average global economic growth in 2021 is forecasted to be 6%, due to additional financial support in a few large economies and the expected recovery from vaccines in the second half of the year. However, this trend is highly uncertain due to the effectiveness of pandemic control measures, rehabilitation with vaccines, and financial terms. The IMF predicts a decline in global economic growth to 4.4% in 2022. Thailand has also experienced the impact of the COVID-19 epidemic for approximately one year, which has affected its economy, society, and environment. The government has implemented various measures and policies, including temporary closures and work from home, resulting in a decrease in trade, investment, and tourism. This has led to changes in economic activity, with electronic transactions growing due to the use of technology, which reduces the need for in-person contact. Overall, the pandemic has altered the way people conduct their daily transactions and has resulted in a significant change in living patterns in Thai society.

The Bank of Thailand³ has released its projections for economic and inflation trends in the country. Despite the impact of the new outbreak at the beginning of the year and the decrease in the number of foreign tourists, the Thai economy is still expected to expand in 2021 by 3.0 percent, albeit lower than the previous assessment. Additional government measures and recovering merchandise exports are expected to support this expansion. However, the number of foreign tourists is expected to decrease, but this is expected to recover in the second half of 2022, which will help the Thai economy return to pre-epidemic levels. Merchandise exports are expected to grow by 10.0 percent in 2021 and 6.3 percent in 2022 due to rising global crude oil prices and the economic trend of trading partner countries, particularly the United States. Service exports, on the other hand, will continue to contract and recover slowly. The number of foreign tourists is expected to decrease in 2021 and recover in 2022, with policies to restrict international travel for Chinese tourists, delays in vaccination of some countries, and mutations of COVID-19 affecting travel confidence. Moreover, private consumption in the fourth quarter of 2020 outperformed expectations, due to the promotion of car purchases and government aid measures following the outbreak. Nevertheless, labor income recovery remains limited and thus, future private consumption growth is expected to slow down, in keeping with households' fragile financial position and a weak labor market. The growth is projected to be moderate.

Private investment has gradually bounced back, primarily in the machinery and equipment category, driven by better-than-anticipated international trade and private consumption. Additionally, private investment in public-private partnership (PPP) projects, particularly in the Eastern Economic Corridor (EEC), is gaining clarity. However, the outlook for the Thai economy remains uncertain, and risks are lower than the base case due to several factors. Firstly, the gradual opening of foreign tourism in Thailand could be delayed as COVID-19 vaccine distribution restrictions persist. Secondly, government stimulus may not meet expectations if project approvals under the Royal Decree on remaining loans are delayed, which is slated to end in Q3 2021. Thirdly, the financial situation of businesses may deteriorate and lead to job losses, even after the pandemic subsides, resulting in scary effects. Finally, once

² <https://www.imf.org/en/Publications/WEO/Issues/2021/03/23/world-economic-outlook-april-2021>

³ <https://www.bot.or.th/Thai/PressandSpeeches/Press/2021/Pages/n2264.aspx>

the relief measures for debtors' end, the default rate of business and household debt could significantly rise.

The Thailand Economic Monitor January 2021 by the World Bank⁴ predicts that the Thai economy will contract by 6.4 percent in 2020 due to the relaxation of movement restrictions and government stimulus measures. The report forecasts that private consumption will shrink by 1.3 percent in 2020, resulting from movement restrictions, social distancing measures, and the consequent decline in jobs and income. Additionally, private investment is projected to decline by 4.4 percent, reflecting uncertainty about the medium-term outlook for exports and growth. Service exports have taken a severe hit from international border restrictions, while international tourism is still declining, causing a sharp contraction in service exports. Merchandise exports have been impacted by falling external demand but began recovering in late 2020. Nevertheless, the rise in household debt levels is a significant risk for the Thai economy, with household debt in Thailand being the second highest in East Asia, reaching 80.2 percent of GDP in March 2020, and NPLs remaining exceptionally high for SMEs. The fiscal deficit is also expanding rapidly, with the government budget deficit rising to 5.9 percent of GDP in the fiscal year 2020, ending in September, from 2.3 percent of GDP in the previous fiscal year, and government debt surging to 49.4 percent of GDP in September 2020. However, the report anticipates a recovery in domestic demand and fiscal policy to drive the budget deficit down to 4.0 percent in 2021 and 4.7 percent in 2022.

The Deloitte Economic Outlook Report 2021⁵ examines the impact of the crisis on Thailand's macro economy. As a result, the gross domestic product (GDP) contracted by 6.1 percent in 2020, the worst decline since the 7.6 percent drop in the 1998 Asian Financial Crisis (Tom Yam Kung). The Siam Commercial Bank Economic Intelligence Center (SCB EIC) forecasts a 2.2 percent growth in 2021, considering a slower-than-anticipated recovery in foreign tourism, sluggish export demand, and the COVID-19 recovery situation. The report emphasizes that the revival and stimulation of the global economy, along with vaccine developments, will be crucial to Thailand's economic recovery. Tourism, a critical driver of Thailand's economic growth, is one of the most affected sectors during the crisis. The report anticipates international tourist arrivals to reach 4 million in 2021, and it may take several years to return to pre-pandemic levels.

As reported by an analytical study by the Siam Commercial Bank Economic Research Center (SCB EIC)⁶, the high dependence on foreign economies has rendered the Thai economy vulnerable to the COVID-19 crisis, affecting it in three primary areas. Firstly, the tourism sector has been hit hard, with income from foreign tourists, which accounts for roughly 12% of Thailand's GDP, declining by 100% due to the COVID-19 situation and the April lockdown. The SCB EIC anticipates a 67% shrinkage in foreign tourists, with the tourism business recovering slowly. It is expected that only 50% of tourists will return by December 2020, given the lack of effective vaccines or treatments and global economic recession. Additionally, declining income has caused a delay in traveling abroad. Secondly, the export sector, which accounts for roughly 50% of Thailand's GDP, is anticipated to decline by 12.9% in 2020 due to the global recession. Thirdly, social distancing measures have affected domestic spending, particularly for businesses that require face-to-face interactions, such as tourism, travel, recreation, and hotels, and high-cost fixed products such as cars, resulting in mostly negative

⁴ <https://www.worldbank.org/en/country/thailand/publication/key-findings-thailand-economic-monitor-january-2021-restoring-incomes-recovering-jobs>

⁵ <https://www2.deloitte.com/th/en/pages/about-deloitte/articles/thailand-economic-outlook.html?fbclid=IwAR3er8XbcOaZJU5PtTa4bAmx3IJ-a32wSsIxscOBgX-rKG6DNpilozIsU8>

⁶ <https://www.scb.co.th/en/personal-banking/stories/business-maker/thailand-after-covid-ep1.html>

values. However, some positive aspects, such as online businesses and food delivery, have emerged. The SCB EIC predicts that a one-month lockdown could reduce consumer spending by 7.3%, resulting in a negative 2020 GDP figure of -0.6%.

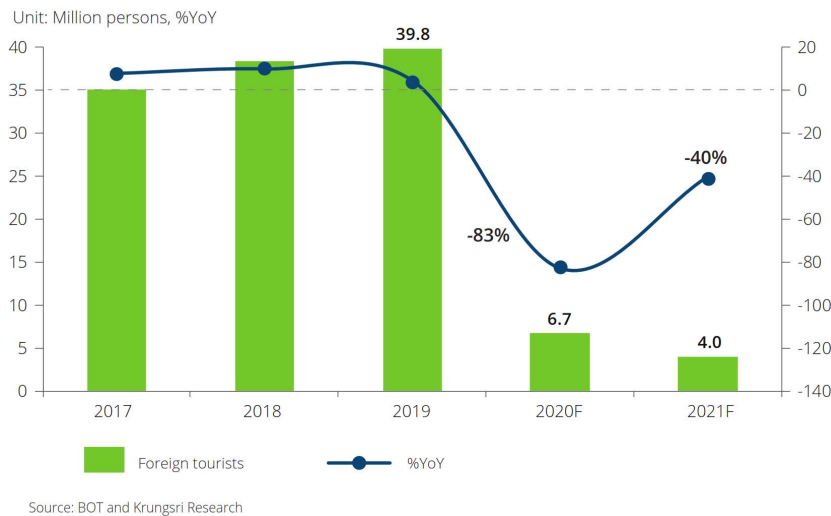


Figure 1 - Forecast of Foreign Tourists Visiting Thailand After COVID-19.

Despite efforts to mitigate the economic impact of the COVID-19 pandemic, many sectors in Thailand continue to face negative risks and shrinkage. To address these challenges, the government has implemented measures to help and stimulate the economy, including a cash giveaway of 7,000 THB to 31.1 million eligible people, a project to reduce household spending, tax relief measures, an extension of the tax filing deadline, a reduction in social security contributions, and a suspension of borrower and business loan debts. These measures aimed at coping with COVID-19 have amounted to 12.9 percent of GDP.

However, the COVID-19 pandemic has had a positive effect on electronic transactions, particularly in e-commerce. The epidemic situation of COVID-19, resulting in social distancing and travel restrictions, has changed consumer behavior, with more people switching to online transactions to reduce the risk of contracting the disease. As a result, e-commerce has played a greater role in stimulating the online retail market, especially for products used in daily life. Kasikorn Research Center predicts that the B2C e-commerce market (product-specific) will grow by about 8-10% in 2020, which is considered a slowdown compared to the expansion rate of 20% in 2019 (market value approximately 3.0-3.2 billion THB), due to more intense competition. Modern trade retail operators, such as supermarkets and hypermarkets, have also entered the online retail market for specific product categories. In addition, foreign e-marketplace entrepreneurs who sell luxury goods or non-essential products, specialty stores with websites or credible brands, and entrepreneurs linked to the manufacturing sector and retail trade code 146 in the table of production factors and outputs have all contributed to the growth of online transactions.

Moreover, the food delivery industry has experienced significant growth due to the COVID-19 pandemic. As government disease control measures limited the restaurant business, food delivery and take-out services through various applications have become essential for both restaurant operators and consumers. Kasikorn Research Center predicts that in 2020, the food delivery business is expected to grow by 78% to 84% in terms of the number of orders, and competition in this industry is becoming more intense. The platform service providers are introducing new food and using various marketing strategies such as discounts and promotions

to attract customers. Kasikorn Research Center also predicts that after the COVID-19 outbreak, the food delivery industry may enter a maturity stage in the next 2-3 years, and the number of food orders may increase by an average of 4-7% compared to 2019.

Likewise, changes in consumer behavior due to the COVID-19 pandemic have led to significant growth in the logistics service business. The growth in e-commerce and online marketing has affected the transportation and logistics systems, which are a group of related businesses. According to the Department of Business Development, the logistics business saw full-year profits increase by 116% in 2019 compared to 2018. The food delivery service and logistics service businesses are linked to the manufacturing sector and restaurant and drinking place industry, respectively, and both are service-related. Road transport is a crucial factor in the inputs and outputs table (I/O table).

Finally, the electronic financial service business, including e-banking, has seen significant growth in Thailand. Over the past four years (2017-2019), the number of payment transactions via mobile banking and internet banking has continued to increase, considering the transaction value, volume, and the number of customer accounts that use the service. The value of payment transactions via mobile banking and internet banking in the form of money transfer, payment, and cash withdrawals in Thailand has increased every year, reaching 62.61 trillion THB in 2020, accounting for 22.43% of the previous year (2019). Payment transactions via mobile banking and internet banking are related to the banking and life insurance sectors in the inputs and outputs table (I/O table).

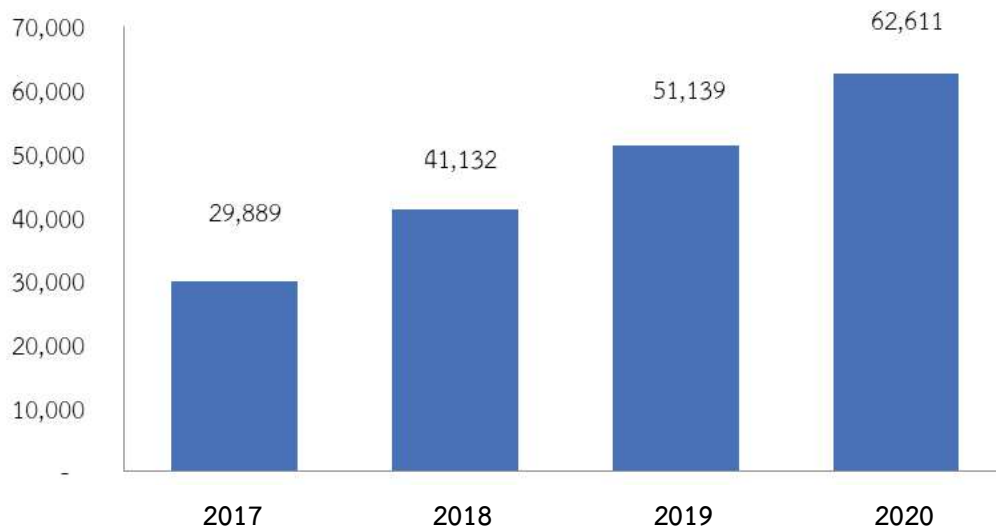


Figure 2 - Value of Payment Transactions via Mobile Banking and Internet Banking⁷ (in billions of THB)

⁷ Source PS_PT_009_S2 Payment transactions via Mobile Banking and Internet Banking
https://www.bot.or.th/App/BTWS_STAT/statistics/ReportPage.aspx?reportID=949&language=th

2. Data and Methodology

To assess the impact of the COVID-19 pandemic on the Thai economy, this study employs the Computable General Equilibrium (CGE) model, a large-scale model that includes a set of multivariate equations and a detailed database. The CGE model is based on Neoclassical economic theory and assumes that producer behavior minimizes production costs while household demand is based on optimization behavior. However, to conform to general equilibrium principles, CGE models must adjust other factors in accordance with the real economic system, such as demand and supply equality, imperfectly competitive markets, unemployment rates, inventory balances, and external impact factors like environmental pollution.

The database used in this study is presented as an Input/Output (I/O) matrix in the Table of Economic Transaction Values. Elasticity, a response behavior parameter, is calculated from a set of nonlinear equations using I/O table data from 1998 to 2018. The elasticity calculation includes constant elasticity of substitution and Armington elasticity, which indicates that the products of each country are completely interchangeable.

To conduct a detailed study of the economics of electronic transactions, this study employs a value ratio analysis and verifies the coefficient of the industry. For sub-industries not listed in the I/O table, overseas I/O data or comparisons with nearby industries will be used for comparison, and a study on the cost-effectiveness of production will be conducted. The calculation coefficient base will be adjusted according to the economic transaction equation between production branches, known as Inter-Industrial Transactions. Each horizontal (ROW) represents the distribution of industry output. Assuming that there are n branches of production,

$$\sum_{j=1}^n X_{ij} + F_i = X_i \quad (i = 1, 2, 3, \dots, n)$$

where X_{ij} = Demand for industrial i products for production of industrial j products
 X_i = The output value of industry i
 F_i = Final demand for industrial goods i

likewise Vertically, it represents the expenditure structure (or cost) of industrial production j is

$$\sum_{i=1}^n X_{ij} + V_j = X_j \quad (j = 1, 2, 3, \dots, n)$$

where V_j = added value of the production branch

Assume that the use of the factors of production (Input) is directly proportional to the value of the output.

$$X_{ij} = a_{ij} \cdot X_j \quad \text{or} \quad a_{ij} = \frac{X_{ij}}{X_j}$$

where a_{ij} called the production coefficient (technical coefficients) of each factor used in the production of industrial goods i . Secondary data collected were used to adjust the coefficients to the current year.

This study has provided a framework for conducting an economic impact analysis to support the development of electronic transactions, during the COVID-19 pandemic, consisting of the following steps:

1. Developing a social accounting matrix (SAM) for the year 2019 to provide a comprehensive overview of the economy.
2. Updating the SAM for 2019 with relevant sectors related to electronic transactions to capture their contribution to the economy.
3. Conducting scenario-based economic analysis through a combination of secondary data and research, strategic planning, and focus group meetings.
4. Simulating the Computable General Equilibrium (CGE) model to evaluate the economic impacts of electronic transactions.
5. Developing policy proposals based on the results of the CGE simulation.
6. Sharing knowledge and presenting findings to relevant stakeholders.

Table 1: Equation group of CGE model

GROUP	EQUATION	DEFINITION
*Households	EQC (SEC)	Consumer demand for commodity(sec)
	EQSH	Household savings
* Firms	EQK (SEC)	Capital demand function firm(sec)
	EQL (SEC)	Labor demand function firm(sec)
	EQPROFIT (SEC)	Zero profit condition for the firms
* Investment	EQS	Total savings
	EQI (SEC)	Investment demand function for commodities
* Government	EQCG (SEC)	Government demand for commodities
	EQKG	Government capital demand function
	EQLG	Government labor demand function
	EQTAXREV	Total tax revenues
	EQTRANSFER	Total transfers
* Imports and Exports	EQEXPORT (SEC)	Export supply
	EQXDD (SEC)	Domestic supply of domestic good
	EQPROFIT (SEC)	Cet zero profit condition
	EQIMPORT (SEC)	Import demand
	EQARMD (SEC)	Demand for domestic goods
	EQPROFIT (SEC)	Armington zero profit condition
* Market clearing	EQMARKETL	Market clearing for labor
	EQMARKETK	Market clearing for capital
	EQMARKETC (SEC)	Market clearing for commodities
	EQTRADEBAL	Balance of payments
* Definitions	EQEXPRICE (SEC)	Export price equation
	EQIMPRICE (SEC)	Import price equation
	EQPCINDEX	Laspeyres consumer index
	EQINCOME	Household income
	EQCBUD	Household expenditure on commodities
	EQPHILLIPS	Wage curve
* Objective function	OBJECTIVE	Objective function

Furthermore, to analyze the impact of electronic transactions, this study focuses on a specific sector. After reviewing previous research, sectors related to electronic transactions have been identified and grouped into three categories: agriculture (001-029), manufacturing (030-144), and services (145-180). These three groups correspond to the national income accounts list. The economy is categorized only in the services sector, while the agriculture (001-029) and manufacturing (030-144) groups are grouped separately. The input/output (IO) table used in the analysis consists of 180*180 sectors.

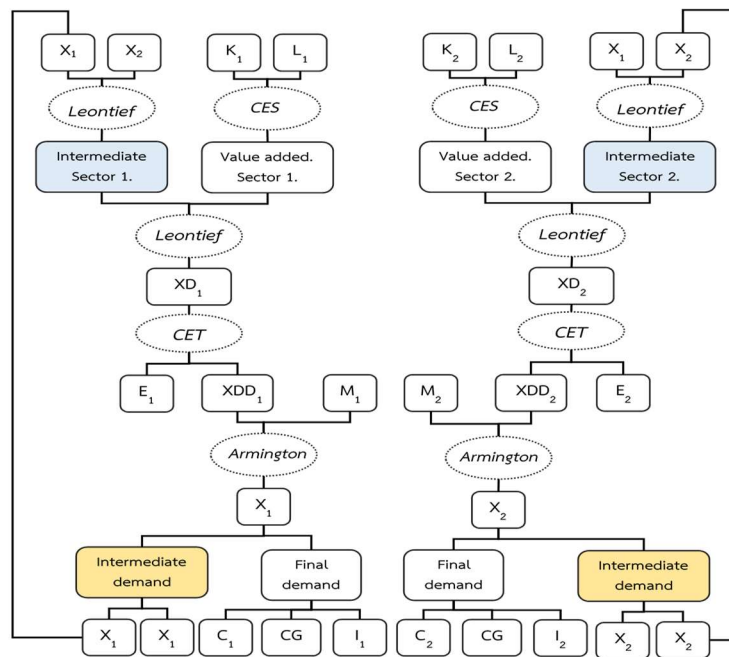


Figure 3 - CGE economic model structure

Source: modified from Ecomod modeling

The CGE model consists of a set of equations that are divided into 8 groups of equations, as presented in Table 2. Each equation includes variables and parameters that are linked across economic sectors and within the macroeconomic system while Figure 3 provides further details on the model and the relationship between variables in the economy.

4. Defining Analytical Scenarios

This section outlines the analytical scenarios for assessing the impact of the COVID-19 pandemic on Thai's economy together with electro transaction expansion in many sectors. The baseline scenario is set in 2019, prior to the outbreak of the coronavirus (COVID-19), while the analysis of the impact on the macroeconomic and various economic sectors from previous research is used as analytical situation at the end of 2021, as shown in Table 2 and 3.

Table 2: Sector Definition for Analysis

No.	Code	Sector	No.	Code	Sector
1	001	Agriculture (001-029)	11	161	Life insurance service (161)
2	002	Manufacturing (030-144)	12	162	Other insurance service (162)
3	145	Wholesale trade (145)	13	163	Real estate (163)
4	146	Retail trade (146)	14	164	Business service (164)
5	147	Restaurant and drinking place (147)	15	165	Public administration (165)
6	148	Hotel and lodging place (148)	16	166	Sanitary and similar services (166)
7	022	Transportation (149-150, 152-158)	17	167	Education (167)
8	151	Road freight transport (151)	18	168	Research (168)
9	159	Post and telecommunication (159)	19	169	Hospital (169)
10	160	Banking services (160)	20	057	Other services (152-157 , 170-180)

Table 3: Expected impact COVID-19 pandemic on macroeconomics

	Economic variables	2020	2021	Note
1	GDP	-6.1%	+4.7%	Digital economy value +7% growth 30% are new users
2	Inflation	-0.9%	+3.0%	
3	Exchange rate	30.2	30.0	THB per USD
4	Export	-6.1%	+6.0%	Estimated export - import equivalent to the global economic growth of 6.0%
5	Import	-13.8%	+6.0%	
6	Travel	-83%	+70%	3.0 million tourists expected Year 2021
7	Investment	-3.2%	+6.6%	Private -8.9% and +4.2% Public sector +13.7% and +12.4%
8	Government consumption	+6.7%	+3.1%	
9	Unemployment rate	0.6%	+2.0%	
10	Private and Household Consumption	-0.9%	+2.4%	Financial transactions increase +37%

* All rates are compared to the previous year.

Source : modified from Office of the Economic Development Council and the National Society of Thailand (NESDB) - https://www.nesdc.go.th/ewt_dl_link.php?Nid=10956&filename=QGDP_report

However, in that period, the business sectors that have experienced significant growth in electronic transactions⁸ include e-commerce, online media (such as advertising, games, video-on-demand services, and music-on-demand services), and digital financial services. Meanwhile, online food delivery services and digital financial services such as insurance and investment have shown steady growth. On the other hand, industries such as tourism and travel, as well as financial services have experienced a decline, as shown in Table 4.

Table 4: The COVID-19 epidemic and electronic transaction impact to economic sector

Economic Sector	Be Impacted		Note
Overall Economy	Covid-19		Overall economy : unemployment rate 2.0% Retail : e-Commerce increased by 81%. The online retail market in Thailand grew by more than 35%. Restaurants and Beverage outlets and Hotels and Accommodations: 2020, shrinking by -39.6% Road transport: transport and online food delivery services increased by 78%-84%. Tourist Information Services : Online Travel (Business of hotel reservations, accommodations and flights) Decrease - 47% Banking and insurance services - life insurance : financial transactions increase +37% Business services : Online Media (advertising, games, video services / music on demand) +20% increase Public Administration - Education : EdTech grows more than 3 times Education users 51% increase Arts - Entertainment - Leisure : Online Travel (Business of hotel reservations, accommodations and flights) Decrease - 47%
Agriculture	Covid-19		
Manufacturing Industry	Covid-19		
Construction			
Wholesale			
Retail	Covid-19	ET	
Restaurants and Beverage outlets	Covid-19		
Hotels and Accommodations	Covid-19		
Road transport	Covid-19	ET	
Other transportation and warehousing			
Tourist information service Travel and delivery services	Covid-19		
Postal and communication			
Banking and insurance services	Covid-19	ET	
Real estate			
Business services, technical services and professional services.	Covid-19	ET	
Health, environmental, waste and related services			
Public Administration - Education - Research	Covid-19	ET	
Hospital			
Arts - entertainment and leisure	Covid-19		
Other services			

Note: Covid-19 = Overall economic sectors that are directly affected from COVID-19 pandemic and ET = Economic sectors have been expanding due to electronic transactions. However, some of those sectors have been affected by COVID-19, causing abrupt declines in both consumption and manufacturing before that.

⁸ A study of the trend of the digital economy of Thailand and the SEA region in 2020 after COVID-19 from GOOGLE researched together with Temasek and Bain & Company.

The COVID-19 pandemic has accelerated the adoption of electronic transactions by households and businesses, as well as various sectors of the economy, to maintain economic activities under disease control measures and decreased consumer demand. But on negative impacts, the tourism sector has been hit hard, and the impact on the macro economy is assessed by considering the recovery of the situation in 2020 and 2021. Comparing to the baseline 2019, the domestic production decreased by 1.69%, exports dropped by 0.47%, imports dropped by 8.63%, investment increased by 3.19%, consumption increased by 10.10%, unemployment rate was 2.0%, labor wages decreased by 15.0%, commodity price index increased by 2.07%, and household consumption budget dropped by 5.4%.

In addition, the analytical situation for electronic transactions is defined as an expansion in five sectors of the economy, namely retail, road transport, banking and insurance services, business services, technical services, and professional services, and public administration, education, and research. The analysis focuses on the role and importance of electronic transactions in the Thai economy in the recovery situation after the COVID-19 epidemic. Five scenarios are considered:

1. Scenario A: an economic situation where the COVID-19 pandemic causes a sudden decrease in economic activity, employment, and demand in the economy without bringing positive effects from economic growth in some sectors due to the expansion of electronic transactions.
2. Scenario B: an economic situation where the COVID-19 pandemic causes a sudden decline in economic activity, employment, and demand in the economy, but with positive effects from economic growth in some sectors due to the expansion of electronic transactions. These sectors include e-commerce with 81% growth, road transport business with an 81% increase (corresponding to e-commerce), 37% increase in financial transactions, online media increased by 20%, and research transactions increased by 51%.
3. Scenario C: an economic situation where only 50% of the positive impact occurs in each economic sector of Scenario B under the impact of the COVID-19 pandemic.
4. Scenario D: an economic situation where only 25% of the positive impact occurs in each economic sector of Scenario B under the impact of the COVID-19 pandemic.
5. Scenario E: an economic situation where only 10% of the positive impact occurs in each economic sector of Scenario B under the impact of the COVID-19 pandemic.

5. Research findings

The study analyzed the results obtained from the model. Under scenario A, which does not include electronic transactions in the Thai economy, the natural economic recovery from the COVID-19 pandemic was slow and is not expected to happen anytime soon. Even with government spending reaching 12% of GDP to stimulate the economy, real GDP continued to decrease by -2.86%, and consumption and investment decreased by -25.89% and -28.80%, respectively. On the other hand, exports and imports increased by 23.51% and 17.27%, respectively.

Table 5: Macroeconomic Impacts in each scenarios.

Macroeconomic aspects	Economic Impact				
	A	B	C	D	E
Real GDP	-9.26%	91.81%	79.81%	-9.69%	-10.37%
Consumption	-26.62%	-52.30%	-53.11%	-61.27%	-28.84%
Investment	-34.41%	649.05%	535.46%	17.27%	-35.31%
Export	22.26%	16.13%	-9.22%	-11.29%	18.77%
Import	13.29%	305.64%	222.59%	-18.11%	10.08%
Commodity price index	80.32%	80.32%	80.32%	80.32%	80.32%
Household consumption budget	1.15%	1.15%	1.15%	1.15%	1.15%
Household income	1.15%	1.15%	1.15%	1.15%	1.15%
Household savings	1.15%	1.15%	1.15%	1.15%	1.15%
Government tax revenue	3.06%	21.57%	14.80%	14.84%	1.64%
Government consumption	-8.18%	-1.74%	-9.92%	-56.95%	-9.57%
Use of government funds	-23.17%	1.63%	-7.44%	-7.38%	-25.07%
Use of government labor	-23.17%	1.63%	-7.44%	-7.38%	-25.07%
Utility	-50.38%	-61.14%	-61.11%	-68.45%	-53.28%

The household sector experienced an increase in income and consumption of goods/services by 1.15%, and the savings rate increased by 1.15%. Government tax revenues increased by 3.91.7%, while the use of government capital and labor factors decreased by -2.57% and government consumption decreased by -7.79%. Overall, society experienced a decrease of -50.24%. However, this scenario is not a representation of the actual economic system but is used as a comparison to the economic impact that will occur due to the expansion of electronic transactions.

Comparing scenarios B, C, D, and E that consider the positive effects of electronic transactions, the study found that scenarios B and C led to rapid economic recovery, with real GDP growing by 91.81% and 79.81%, respectively, compared to the situation in 2019 before COVID-19. Consumption continued to decrease by -52.30% and -53.11%, respectively, indicating that government stimulus did not increase domestic consumption. However, there was a significant increase in investment, with a growth of 645.05% and 535.46%, respectively. The export sector increased by 16.13% in scenario C but continued to shrink by -9.22% in scenario D. Imports increased significantly in both scenarios, with a growth of 305.64% and 222.59%, respectively. In the household sector, both scenarios B and C showed a 1.15% increase in income and consumption of household goods/services, and a 1.15% increase in savings. Government tax revenue increased by 21.57% and 14.80%, respectively, while government consumption decreased by -1.74% and -9.92%, respectively. The use of capital and labor factors of the public sector decreased by 1.63% in scenario B and by -7.44% in scenario C. The overall utility of society decreased by -61.14% and -61.11% in scenarios B and C, respectively.

However, scenarios D and E, with 25% and 10% e-transaction growth compared to the main scenario (B), respectively, also have a positive impact on the Thai economy. The study found that the economy declined by -9.69% and -10.37%, respectively, indicating that the projected expansion of electronic transactions should not be less than 25% to drive economic growth and achieve a quick economic recovery.

In both scenarios D and E, the consumption sector contracted by -61.27% and -28.84%, respectively, indicating that government stimulus has yet to increase domestic consumption, while investment increased by 17.27% in scenario D but decreased by -35.31% in scenario E. Exports and imports in scenario D decreased by -11.29% and -18.11%, respectively, but increased in scenario E by 18.77% and 10.08%. In the household sector, both scenarios D and E showed an increase in income and household consumption of goods/services by 1.15%, and

the savings rate also increased by 1.15%. Government tax revenues increased by 14.84% and 1.64%, respectively, while government consumption decreased by -56.95% and -9.57%, respectively. The use of capital and labor factors of the government sector decreased by -7.38% and -25.07%, respectively, and the overall utility of society decreased by -68.45% and -53.28%, respectively.

Regarding the impact on each economic sector, the study found that the expansion of electronic business not less than 25% of the estimate had a positive impact on the economy, which is the growth between scenarios C and D. Overall, the economy expanded through the domestic manufacturing sector, and the economic sectors that grew were construction (154.54% - 427.94%), wholesale (67.24% - 317.03%), retail (13.09% - 21.80%), Road transport (50.79% - 92.00%), travel information services, travel and delivery services (12.60% - 13.44%), business - technical - professional services (43.52% - 77.53%), public administration - education - research (23.71% - 68.13%), and other services (21.56% - 798.93%). These economic sectors were positively affected by the expansion of electronic transactions, resulting in an increase in production and exports in 12 economic sectors, including construction, wholesale, retail, hotels and accommodation, Road transport, other transport and warehousing, postal and communication, Real Estate, Business Services - Technical and Professional, Public Administration - Education - Research, Hospital, and Arts - Entertainment and Leisure. Although domestic demand continued to decline, and government consumption decreased in each economic sector, there was a change in the business structure of each sector of the economy due to a significant expansion of investment after the COVID-19 situation, with an expected growth of 17.27% - 535.46% as a result of government stimulation measures. The impact of export-import sectors on sectors that were not very high, for example, in the construction sector, exports and imports were not very high as before, at 15.8 and 15.76 million THB to 269.34 and 303.8 million THB, respectively

Currently, Thailand economy relied heavily on stimulating fast-growing exports and consumption. However, the role of electronic transactions, particularly in the manufacturing sector, has the potential to drive the economy and promote growth in many sectors. The economy is now in a dynamic dimension, and the slow recovery of the original dimension will not be able to keep up with the progress of the country. Therefore, the expansion of electronic transactions and increased access for all income levels, particularly low-income households, is necessary to drive the digital economy forward. This will lead to more agility and flexibility in the economy. However, it is important to note that volatility and uncertainty are part of the modern economy, and caution should be taken when interpreting and applying the results of the model. Overall, the adaptation of the economic system and its indirect effects on each economic sector will determine the situation and its potential impact on variables and forecast values.

Table 6: Sectoral Economic Impact – Scenario A

No.	Economic sector	Domestic price	Domestic Production	Domestic Consumption	Export	Import	Government Consumption
1	Agriculture	74.02%	19.23%	61.62%	14.62%	-12.05%	37.79%
2	Manufacturing Industry	177.48%	-29.56%	-80.25%	-61.91%	-31.18%	-88.72%
3	Construction	302.35%	-43.25%	-30.08%	157.55%	201.71%	-33.62%
4	Wholesale	13.41%	-26.40%	-65.76%	222.57%	222.57%	-42.82%
5	Retail	22.36%	-2.43%	2505.60%	-1.09%	-0.88%	1683.93%
6	Restaurants and Beverage outlets	131.13%	-75.13%	-74.74%	-64.34%	1208.53%	-83.04%
7	Hotels and Accommodations	143.55%	28.71%	-18.22%	125.40%	53.50%	-27.36%
8	Road transport	174.13%	-32.78%	-41.47%	118.34%	58791.92%	-68.10%
9	Other transportation and Warehousing	150.50%	-15.06%	-26.09%	148.91%	136.67%	-44.16%
10	Tourist information service, Travel and Delivery service	50.31%	0.41%	-15.46%	43.80%	17.92%	-25.56%
11	Postal and Communication	21.61%	8.73%	-4.89%	-34.95%	-32.11%	-16.03%
12	Banking and Insurance services	32.91%	3.94%	-14.26%	25.69%	87.76%	-31.47%
13	Real estate	62.12%	-2.12%	-27.62%	-44.46%	-23.06%	-26.85%
14	Business, Technical and Professional services	51.59%	1.48%	-10.25%	-32.19%	-1.20%	-22.39%
15	Health, Environmental, Waste and Related services	55.47%	16.19%	23.27%	39.85%	242.47%	6.30%
16	Public Administration - Education - Research	32.26%	-0.61%	17.34%	130.60%	16.36%	2.84%
17	Hospital	92.03%	-20.29%	-7.83%	-19.76%	-17.53%	-23.69%
18	Arts - Entertainment and Leisure	35.86%	59.37%	-10.25%	192.55%	79.08%	-23.94%
19	Other services	152.37%	99.78%	102.64%	46.65%	94.99%	137.29%
	Total	82.54%	-9.26%	-26.62%	22.26%	13.29%	-8.18%

Table 7: Sectoral Economic Impact – Scenario B

No.	Economic sector	Domestic price	Domestic Production	Domestic Consumption	Export	Import	Government Consumption
1	Agriculture	71.15%	-81.72%	-59.19%	-76.10%	45.20%	-44.87%
2	Manufacturing Industry	155.24%	76.72%	-77.06%	-52.40%	68.14%	-80.63%
3	Construction	227.35%	440.01%	-66.03%	1608.75%	1827.56%	-45.78%
4	Wholesale	8.20%	51.59%	-95.46%	2359.06%	2359.06%	-41.78%
5	Retail	12.98%	25.51%	-70.44%	17.88%	16.75%	-45.09%
6	Restaurants and Beverage outlets	137.22%	-78.96%	-80.80%	-69.42%	1187.19%	-84.91%
7	Hotels and Accommodations	126.05%	188.61%	-5.54%	1.44%	107.77%	12.85%
8	Road transport	157.31%	184.70%	-44.47%	980.24%	549557.97%	-62.43%
9	Other transportation and Warehousing	111.16%	4.39%	-34.77%	1203.45%	1057.85%	-39.18%
10	Tourist information service, Travel and Delivery service	59.96%	28.96%	2.44%	-84.16%	-49.55%	22.26%
11	Postal and Communication	40.74%	-49.74%	-30.52%	66.73%	50.93%	-17.41%
12	Banking and Insurance services	57.73%	-1.82%	-4.24%	-69.00%	-97.96%	11.35%
13	Real estate	69.97%	-4.68%	-70.52%	234.46%	62.49%	-33.05%
14	Business, Technical and Professional services	61.44%	54.06%	-43.78%	104.36%	56.97%	-42.57%
15	Health, Environmental, Waste and Related services	56.57%	-48.48%	-67.57%	-37.81%	54.55%	-51.20%
16	Public Administration - Education - Research	58.97%	30.85%	8.99%	5004.11%	159.85%	29.46%
17	Hospital	93.23%	14.15%	-37.60%	173.40%	9923.82%	-58.70%
18	Arts - Entertainment and Leisure	41.53%	157.33%	-31.20%	412.02%	193.65%	-31.13%
19	Other services	116.17%	1100.56%	4.52%	-84.01%	755.45%	28.16%
	Total	80.04%	91.81%	-52.30%	16.13%	305.64%	-1.74%

Table 8: Sectoral Economic Impact – Scenario C

No.	Economic sector	Domestic price	Domestic Production	Domestic Consumption	Export	Import	Government Consumption
1	Agriculture	54.71%	-38.25%	-57.98%	-42.85%	-66.07%	-48.30%
2	Manufacturing Industry	126.29%	73.75%	-74.06%	-71.75%	62.17%	-78.68%
3	Construction	180.77%	427.94%	-54.98%	963.23%	1044.02%	-40.34%
4	Wholesale	9.11%	67.24%	-93.77%	2301.55%	2301.55%	-45.67%
5	Retail	11.66%	13.09%	-62.87%	6.22%	5.20%	-43.35%
6	Restaurants and Beverage outlets	107.15%	-80.00%	-81.51%	-70.22%	1496.79%	-87.01%
7	Hotels and Accommodations	100.92%	94.75%	-10.86%	13.24%	64.23%	-2.27%
8	Road transport	124.58%	92.00%	-38.69%	823.65%	1413306.20%	-55.85%
9	Other transportation and Warehousing	91.56%	-9.40%	-32.50%	587.92%	525.51%	-40.78%
10	Tourist information service, Travel and Delivery service	55.08%	12.60%	-4.31%	-71.59%	-39.21%	4.51%
11	Postal and Communication	35.26%	-28.83%	-20.86%	6.63%	3.11%	-13.69%
12	Banking and Insurance services	52.91%	-8.05%	-15.66%	-59.44%	-91.84%	-17.61%
13	Real estate	48.97%	-7.17%	-67.28%	100.51%	28.76%	-36.46%
14	Business, Technical and Professional services	54.66%	43.52%	-43.02%	257.72%	52.47%	-46.41%
15	Health, Environmental, Waste and Related services	39.64%	-24.75%	-61.95%	-13.41%	70.58%	-49.91%
16	Public Administration - Education - Research	46.71%	23.71%	10.13%	1305.69%	95.00%	19.79%
17	Hospital	68.89%	-7.34%	-33.47%	83.82%	2998.31%	-54.32%
18	Arts - Entertainment and Leisure	34.70%	91.31%	-29.13%	245.34%	114.27%	-33.84%
19	Other services	94.74%	798.93%	-2.63%	-89.28%	534.97%	4.58%
	Total	64.35%	79.81%	-53.11%	-9.22%	222.59%	-9.92%

Table 9: Sectoral Economic Impact – Scenario D

No.	Economic sector	Domestic price	Domestic Production	Domestic Consumption	Export	Import	Government Consumption
1	Agriculture	63.22%	-90.61%	-72.40%	-86.59%	47.76%	-56.77%
2	Manufacturing Industry	135.38%	-22.07%	-77.10%	-40.18%	-22.85%	-79.53%
3	Construction	188.68%	154.54%	367.54%	422.50%	463.32%	410.09%
4	Wholesale	17.45%	317.03%	-99.57%	3913.82%	3913.82%	-41.11%
5	Retail	17.31%	21.80%	-94.03%	324.36%	414.92%	-64.66%
6	Restaurants and Beverage outlets	81.32%	-82.16%	-85.11%	-70.40%	4589.62%	-89.90%
7	Hotels and Accommodations	83.68%	-5.58%	-21.26%	-56.96%	-26.24%	0.20%
8	Road transport	116.56%	50.79%	-41.77%	444.27%	215837.06%	-54.94%
9	Other transportation and Warehousing	88.41%	-3.26%	-25.33%	-30.40%	-29.32%	-18.74%
10	Tourist information service, Travel and Delivery service	51.14%	13.44%	-11.69%	-85.98%	-55.50%	11.36%
11	Postal and Communication	39.34%	-31.44%	-42.15%	178.69%	148.05%	-27.33%
12	Banking and Insurance services	57.64%	10.69%	11.44%	-69.37%	-97.96%	49.10%
13	Real estate	41.81%	-2.35%	-77.81%	68.77%	23.21%	-34.81%
14	Business, Technical and Professional services	67.06%	77.53%	-52.94%	1718.98%	107.14%	-52.88%
15	Health, Environmental, Waste and Related services	41.02%	-52.86%	-74.98%	-45.53%	9.50%	-56.49%
16	Public Administration - Education - Research	68.13%	0.33%	-60.65%	9334.27%	134.92%	-46.25%
17	Hospital	67.90%	-12.88%	-30.75%	35.36%	732.77%	-41.19%
18	Arts - Entertainment and Leisure	51.63%	-74.80%	-40.61%	-42.50%	-70.47%	-43.15%
19	Other services	103.85%	21.56%	-45.52%	-99.15%	-17.63%	-68.15%
	Total	66.89%	-9.69%	-61.27%	-11.29%	-18.11%	-56.95%

Table 10: Sectoral Economic Impact – Scenario E

No.	Economic sector	Domestic price	Domestic Production	Domestic Consumption	Export	Import	Government Consumption
1	Agriculture	69.77%	20.28%	63.46%	15.67%	-11.05%	38.81%
2	Manufacturing Industry	164.62%	-31.52%	-80.00%	-61.91%	-33.03%	-88.52%
3	Construction	287.39%	-47.46%	-32.04%	117.86%	152.80%	-35.26%
4	Wholesale	11.20%	-27.14%	-47.02%	39.18%	39.18%	-34.16%
5	Retail	20.43%	1.35%	3519.48%	-3.88%	-4.67%	2361.90%
6	Restaurants and Beverage outlets	124.11%	-81.07%	-80.93%	-72.37%	1112.84%	-88.99%
7	Hotels and Accommodations	135.92%	28.72%	-16.77%	53.04%	35.92%	-26.35%
8	Road transport	163.52%	-33.27%	-40.95%	104.47%	39161.28%	-67.51%
9	Other transportation and Warehousing	141.77%	-15.71%	-27.09%	148.38%	136.10%	-45.58%
10	Tourist information service, Travel and Delivery service	45.23%	3.35%	-17.01%	43.25%	19.61%	-27.19%
11	Postal and Communication	18.43%	9.17%	-6.85%	-34.95%	-32.09%	-18.05%
12	Banking and Insurance services	29.36%	4.25%	-12.82%	29.19%	102.04%	-29.70%
13	Real estate	57.21%	-1.76%	-29.25%	-44.51%	-22.93%	-27.98%
14	Business, Technical and Professional services	43.22%	0.08%	-11.84%	-31.50%	-2.40%	-24.31%
15	Health, Environmental, Waste and Related services	51.97%	15.50%	24.80%	37.70%	222.10%	7.13%
16	Public Administration - Education - Research	29.42%	0.87%	19.42%	69.72%	11.19%	4.24%
17	Hospital	84.17%	-21.63%	-8.90%	-21.11%	-18.92%	-25.58%
18	Arts - Entertainment and Leisure	33.61%	57.19%	-11.62%	179.29%	75.53%	-25.82%
19	Other services	143.65%	93.17%	94.98%	45.85%	88.96%	125.43%
	Total	76.71%	-10.37%	-28.84%	18.77%	10.08%	-9.57%

6. Conclusion and policy implications

From the research findings, it can be concluded that the COVID-19 pandemic has significantly impacted the Thai economy. Despite the government's efforts to stimulate the economy, recovery has been slow, with consumption and investment sectors decreasing while the export and import sectors increase. It is important to note that this analysis is comparative, and scenarios with a significant expansion of e-commerce transactions in five sectors of the economy would have had a different impact on the economy. In scenarios B and C, the economy has recovered rapidly, with real GDP growing at 91.81% and 79.81%, respectively, and a significant increase in investment. Scenario C has seen a contraction, but there has been an increase in exports, with overall household income and consumption increasing and government tax collection increasing significantly. Also, the study indicates that expanding e-commerce transactions could positively impact the economy, but only if it reaches a certain threshold of at least 25% of the predicted growth rate. Sectors with a low export base, such as construction, transportation, and technical and professional services, would benefit the most. So that, in Thai's economy, e-commerce transactions are becoming increasingly significant,

particularly in the production sector, and can contribute to the growth of several sectors. Therefore, e-commerce plays a crucial role in driving the economy towards a more agile and faster recovery than the pre-pandemic period.

Policymakers must review and analyze the economic system's impact on each sector, considering the uncertainties of the current situation. The policy implications should be initiated are 1). Enhance the accessibility of e-commerce transactions to low-income households. 2). Promote more investment in digital infrastructure to expand e-commerce transactions across sectors. 3). Encourage businesses to adopt e-commerce by providing incentives such as tax breaks and subsidies for investments. and 4). Provide training and support to improve people's digital capabilities.

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