Economic impact of agro-industrial sector on nationwide economy of Thailand: A general equilibrium approach

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ABSTRACT

This study uses the computable general equilibrium model, KS-CGE version 2012 Type III, with the social accounting matrix of Thailand in 2010 to investigate the economic impact of the agro-industrial sector on the economy of Thailand. It simulates three scenarios: the expansionary household consumption on specific sectors, the expansionary government subsidy and the expansionary government spending into specific sectors. In the first scenario, the agro-industrial sector yields the second highest economic impact after the service sector. This is because the large backward linkages of the agro-industrial sector to other sectors. For the second scenario, the expansionary government subsidy into the agro-industrial sector in terms of cash creates the second highest economic impact after the sector of metal, metal products and industries. For the third scenario, the expansionary government spending into the agro-industrial sector yields only small economic impact. The government spending into the service sector produces much more economic impact because the trading value between the service sector and the government is much higher than that of agro-industrial sector.

Keywords: Agro-industrial sector, economic impact, general equilibrium model, household consumption, government subsidy and spending

JEL Classification: C68, O13, O53

1. Introduction

Thailand aims to be kitchen of the world. Agro-industrial sector is a hope for Thailand for her economic growth. An idea of *Food Valley* is a national agenda to construct a complete cluster and network of agricultural production and leads to quality food production. However, there is no quantitative study on the impact of the agro-industrial sector on the nationwide economy of Thailand. This study will use the latest social accounting matrix (SAM) of Thailand in 2010 and the computable general equilibrium model (CGE) to quantify the economic impact of the sector on the Thai economy. It will investigate the impacts of three scenarios including the expansionary household consumption, the expansionary government subsidy and the expansionary government spending into the sector.

2. Methodology

This study uses the KS-CGE model version 2012 Type III. The model was developed by Komsan Suriya in 2012. The structure of the model in briefly described as follows:

The model is a system of linear equations. It forms three matrices: **XP**=**Y.** Matrix **X** represents the domestic economy, **P** represents the endogenous price, and **Y** represents the external trade. It solves the system for **P** with Gauss-Seidel iteration method. It implies CES (constant elasticity of substitution) technology. Input ratios change according to the change of price ratios. It applies Shephard's lemma to calculate optimal **X** after the price changes. The routine repeats itself until **P** is converged.

The social accounting matrix (SAM) of Thailand in 2010 which is the latest SAM of the country is the database of the CGE model. The study chooses to use the SAM16 which includes 16 by 16 sectors of major economic activities. In these 16 sectors, they are as follows:

Sector 1: Agriculture
Sector 2: Mining and quarrying
Sector 3: Food manufacturing
Sector 4: Textile industry
Sector 5: Saw mills and food products
Sector 6: Paper industries and printing
Sector 7: Rubber, chemical and petroleum industries
Sector 8: Non-metallic products
Sector 9: Metal, metal products and industries
Sector 10: Other manufacturing
Sector 11: Public utilities
Sector 12: Construction
Sector 13: Trade
Sector 14: Transportation and communication
Sector 15: Services
Sector 16: Others

Moreover, the SAM includes the importers, the institution, the government, margin (transaction costs) and taxation. However, the model finds difficulties in solving the system under counterfactual scenarios when sector 12 (construction) may cause some problems. This is because sector 12 relies heavily on external capital inflow. When the model treats the capital flow as a fixed number, the sector cannot finance it increasing costs and go bankrupt. To relax this problem, the model combines sector 12 with the margin (transaction costs including wholesale, retail trade and transportation cost). The motivation is that the domestic income of the margin is high enough to cover the increasing costs of sector 12, if any. Moreover, this modification will not touch other major sectors (sector 1 to sector 16). Therefore, the interpretation of the results will still be able to refer to those sectors accurately.

There are three major scenarios in this study. First, it will investigate the economic impact of the expansionary household consumption on each sector. It hypothesizes that the agro-industrial sector (Sector 3) will produce the highest impact over other economic sectors. Second, it will find the economic impact of the government subsidy into each sector. It also hypothesizes that the subsidy into the agro-industrial sector will yield the highest impact. Last, it will figure out the economic impact of the government spending into each sector. It expects that the government spending into the agro-industrial sector will create much economic impact even though not the highest one.

3. Results

This section presents the results in three parts. Part 1 presents the first scenario of the expansionary household consumption. Then, part 2 shows the second scenario of the expansionary government subsidy by cash. Last, part 3 presents the third scenario of the expansionary government spending into each sector. The study measures the economic impact in terms of the GDP growth.

3.1 The expansionary household consumption

The results of this scenario presents in table 1 as follows:

TABLE 1. GDP growth caused by the expansionary household consumption on the specific sector.

Sectors	Expansion rate of household consumption on the specific sector		
	10%	20%	30%
Sector 1: Agriculture	1.33%	2.67%	4.04%
Sector 2: Mining and quarrying	0.01%	0.02%	0.02%
Sector 3: Food manufacturing (Agro-industrial sector)	3.04%	6.26%	9.68%
Sector 4: Textile industry	1.82%	3.71%	5.69%
Sector 5: Saw mills and food products	0.21%	0.43%	0.64%
Sector 6: Paper industries and printing	0.22%	0.44%	0.66%

Sectors	Expansion rate of household consumption on the specific sector		
	10%	20%	30%
Sector 7: Rubber, chemical and petroleum industries	1.26%	2.54%	3.83%
Sector 8: Non-metallic products	0.03%	0.06%	0.09%
Sector 9: Metal, metal products and industries	1.31%	2.66%	4.04%
Sector 10: Other manufacturing	0.96%	1.94%	2.95%
Sector 11: Public utilities	0.52%	1.05%	1.58%
Sector 12: Construction	0.02%	0.03%	0.05%
Sector 13: Trade	2.69%	5.47%	8.35%
Sector 14: Transportation and communication	1.40%	2.84%	4.34%
Sector 15: Services	6.11%	12.78%	20.07%
Sector 16: Others	0.04%	0.08%	0.11%

Source: Calculation using KS-CGE model version 2012 Type III

Sector that creates the highest economic impact in terms of GDP growth is the service sector (sector 15). The second is the agro-industrial sector (sector 3). The third is the trading sector (sector 13).

3.2 The government subsidy

The results of the second scenario presents in table 2 as follows:

TABLE 2. GDP growth caused by the expansionary government subsidy into the specific sector.

Sectors	Expansion rate of government subsidy into the specific sector		
	10%	20%	30%
Sector 1: Agriculture	2.02%	3.97%	5.86%
Sector 2: Mining and quarrying	0.45%	0.88%	1.28%
Sector 3: Food manufacturing (Agro-industrial sector)	8.29%	15.38%	21.55%
Sector 4: Textile industry	5.13%	9.56%	13.46%
Sector 5: Saw mills and food products	1.04%	1.93%	2.72%
Sector 6: Paper industries and printing	0.92%	1.73%	2.46%
Sector 7: Rubber, chemical and petroleum industries	3.43%	6.50%	9.30%
Sector 8: Non-metallic products	0.93%	1.73%	2.43%
Sector 9: Metal, metal products and industries	21.37%	39.87%	56.20%
Sector 10: Other manufacturing	5.75%	10.67%	14.94%
Sector 11: Public utilities	0.32%	0.61%	0.88%
Sector 12: Construction	5.07%	9.32%	12.94%

	Expansion rate of government subsidy into the specific sector		
Sectors	10%	20%	30%
Sector 13: Trade	0.18%	0.36%	0.54%
Sector 14: Transportation and communication	3.92%	7.21%	10.02%
Sector 15: Services	3.20%	6.08%	8.74%
Sector 16: Others	0.12%	0.21%	0.29%

Source: Calculation using KS-CGE model version 2012 Type III

It is surprised that the sector of metal, metal products and industries (sector 9) yields the most economic impact under the expansionary government subsidy. The agro-industrial sector (sector 3) comes second in the creation of GDP growth. The third and fourth sector is other manufacturing (sector 10) and textile industry (sector 4). It seems that the manufacturing sectors all create high economic impact in this scenario.

3.3 The government spending

The results of the third scenario presents in table 3 as follows:

TABLE 3. GDP growth caused by the expansionary government spending into the specific sector.

	Expansion rate of government spending into the specific sector		
Sectors	50%	75%	100%
Sector 1: Agriculture	0.13%	0.19%	0.25%
Sector 2: Mining and quarrying	0.01%	0.01%	0.01%
Sector 3: Food manufacturing (Agro-industrial sector)	0.13%	0.20%	0.27%
Sector 4: Textile industry	0.04%	0.06%	0.08%
Sector 5: Saw mills and food products	0.01%	0.01%	0.01%
Sector 6: Paper industries and printing	1.57%	2.37%	3.17%
Sector 7: Rubber, chemical and petroleum industries	1.31%	1.97%	2.63%
Sector 8: Non-metallic products	0.02%	0.03%	0.04%
Sector 9: Metal, metal products and industries	0.67%	1.01%	1.35%
Sector 10: Other manufacturing	0.66%	0.99%	1.33%
Sector 11: Public utilities	0.95%	1.43%	1.91%
Sector 12: Construction	0.12%	0.18%	0.25%
Sector 13: Trade	0.01%	0.01%	0.01%
Sector 14: Transportation and communication	0.75%	1.13%	1.52%
Sector 15: Services	38.56%	63.75%	93.69%
Sector 16: Others	0.08%	0.11%	0.15%

Source: Calculation using KS-CGE model version 2012 Type III

The service sector (sector 15) is the first again in this scenario. It creates an extremely high economic impact when the government spends more into the sector. The second is the paper industries and printing (sector 6) whereas the third is the sector of rubber, chemical and petroleum industries (sector 7). The agro-industrial sector (sector 3) yields only a small economic impact in this scenario.

4. Conclusions

Almost as hypothesized in the first scenario, the expansionary household consumption on the agro-industrial sector yields the second highest economic impact after the service sector. These are because of the largest backward linkages of the sector to other sectors. For the second scenario, the agro-industrial sector creates the second highest economic impact after the sector of metal, metal products and industries when the government increases the subsidy into the sector by cash. The findings highly support the *Food Valley* project in terms of the economic impact to the nationwide economy when the government would promote innovation, production and consumption in the sector. It has been also proven by this study that the government subsidy by cash into the sector is a good idea and worth for the nationwide economy. However, the expansionary government spending into the agro-industrial sector does not create much economic impact. In this case, the government spending into the service sector yields much more economic impact. This is because the smaller trading volume between the agro-industrial sector and the government cannot be compared to the larger trading volume between the service sector and the government.

REFERENCES

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