

The economic efficiency of forestry in Southeast Asia and symbiosis with nature conservation

Abstract

In terms of coexistence between economy and nature, this paper aims to clarify the actual state of forestry in the Philippines, Thailand, and Vietnam in Southeast Asia based on economic theory. We take Cristensen's economies of scale as an indicator of forestry efficiency. If it is 1, the profit is zero, if it is less than 1, the profit is negative, and if it is greater than 1, the profit is positive. Regarding the economy of scale of forestry, all countries were close to 1: 0.9449 for the Philippines, 1.0270 for Thailand, and 0.9175 for Vietnam. 1 means linear homogeneous, so all of them were in such a state. It was found that each country was not obsessed with profits, and that profits were not significantly negative. It can be said that the forestry industry has been operating smoothly economically since the 1990s. On the other hand, all three countries, which were once in crisis due to advanced logging, have been working to regenerate their forests. Judging from these two aspects, it can be said that each country in Southeast Asia has achieved a balance between economy and nature conservation.

1. Effect

The objective is to clarify the actual state of forestry in Southeast Asian countries. In both countries, forests were damaged in the 20th century due to over-logging. For this reason, all countries put effort into forest protection. In the 1980s, public opinion for forest restoration grew in Thailand, and the country gradually shifted its direction toward forest protection. Vietnam, which has a large demand for products such as furniture, implemented a forest protection policy in 2007 and is making efforts to restore its forests. In the Philippines, a forest management policy was implemented in 1995 by presidential decree. In this way, all Southeast Asian countries are putting effort into forest protection.

Although such protection policies have been strengthened, we must also place emphasis on economic efficiency. The economic theoretical feature of this paper is to observe the situation in Southeast Asian countries using several indicators. The first is the Divisia quantity index. This allows us to explore the dynamic situation. Second, we calculate the economies of scale of forestry to explore economic efficiency. The economy of scale indicator was developed by Cristensen. (Note 1) Calculate them using H. THEIL's system-wide approach production theory method.

From these calculation results, forests are an economic resource and should be economically efficient, but on the other hand, the aforementioned forest protection is also important. Verify whether economic efficiency is maintained under forest protection.

2. Method

The authors have been studying econometrician H. Theil's system-wide approach. It can calculate economies of scale. Specifically, we create and estimate an input demand equation under profit maximization. Utilizing this model, we conduct an econometric analysis of forestry in Southeast Asia. The model is included in the appendix.

Additionally, since there is no published data regarding forestry capital stock in each country, we used the same estimation method as MIZUNO etc (2018). (Note 2)

Let's explain the system-wide approach introduced at the beginning. The input demand equation is expressed by the following equation.

$$f_1 d \log q_1 = \sigma \theta_1 d \log Y + \pi_{11} d \log p_1 + \pi_{12} d \log p_2 \quad (1)$$

$$f_2 d \log q_2 = \sigma \theta_2 d \log Y + \pi_{21} d \log p_1 + \pi_{22} d \log p_2 \quad (2)$$

Here, q_1 is the capital stock, q_2 is the labor, Y is the production volume, p_1 is the price of the capital stock (real interest rate), and p_2 is the variable of the price of labor (wage). As a secondary variable calculated from these variables, f_1 is the "share of capital costs in costs" and f_2 is "share of labor costs in total costs." The variables obtained from the estimation of the above equation are: θ_1 is the marginal share (the ratio of capital cost to the marginal cost), θ_2 is the marginal share (the ratio of labor cost to the marginal cost), and π_{11} , π_{12} , π_{21} , and π_{22} are the Slutsky It is a coefficient. σ is Cristensen's economy of scale.

The total marginal share is 1, and the Slutsky coefficient is constrained by Slutsky symmetry, but in this paper, the constraint was ignored and estimated. The estimated period is 1991–2013. For Vietnam, the estimated period is from 1994 to 2013. The estimation results are provided in Appendix 1.

3. result

1) Calculation of basic statistics

We calculated the Divisia quantity index $d \log Q$, which is a basic statistic related to the system-wide approach.

$$d\log Q = \sigma d\log Y \quad (3)$$

Table 1 shows the results of calculating this Divisia quantity index from statistical values.

	Thailand	Vietnam	Philippines
1991	0.373543		0.362471
1992	0.121125		-0.280471
1993	-0.54426		-0.015785
1994	-0.35772	0.353851	-0.684198
1995	-1.23412	-0.21028	-0.733935
1996	0.010435	0.097012	-0.213252
1997	0.351853	-0.89238	-0.137537
1998	0.276864	0.117141	0.1078903
1999	-0.09916	0.258367	-0.329436
2000	0.348148	0.076243	1.9316712
2001	0.209192	0.184773	-1.282405
2002	0.85085	0.023926	0.069503
2003	0.560244	-0.1991	1.2723021
2004	-1.74917	0.574953	-1.131052
2005	1.426985	-0.02289	0.5545264
2006	0.101013	-0.76492	-0.052128
2007	0.05626	0.862427	0.5422744
2008	-0.66648	-0.17196	0.2087285
2009	0.027416	-1.01168	0.329092
2010	-0.13891	0.496145	-0.632525
2011	-0.01058	1.119182	-0.157055
2012	0.353943	-0.03684	0.6410621
2013	0.238566	0.223602	-0.396331

Table 1 Divisia quantity index

The following can be said about the interpretation of the Divisia index. In the Philippines, the Divisia index was negative for a total of 12 years. This means that the forestry industry has been maintained by reducing capital and labor. Since there are

some negative figures in Thailand and Vietnam, it can be said that forestry has not necessarily become a growth industry, but has been maintained despite a decline in capital and labor in some cases. This is a phenomenon consistent with the fact of coexistence with nature.

2) Estimation results of system-wide approach

1) Estimation results

These are the estimation results of equations (1) and (2) for each country. (Note 3)

Parameter estimates of equations

	Right-hand side	1st term	2nd term	3rd term
Thai (1)	0.0988		-0.0274	-0.1294
(2)	0.8947		0.0167	-0.8599
Vietnam (1)	0.0227		0.00223	0.0152
(2)	0.9597		-0.0009	-0.0108
Philippines (1)	0.0059		-0.0055	-0.1035
(2)	0.9281		-0.0069	-1.0569

The coefficients of determination were as follows in order:

0.6821 0.9949 0.4279 0.9879 0.1694 0.9943

2) Economy of scale

The results of calculating Cristensen's economy of scale σ are as follows.

Thailand 1.0540 Vietnam 1.0207 Philippines 0.9929

Both were almost linear homogeneous. Linear homogeneous means profit is zero. Economically, the company is operating smoothly, as it is not running into profits, and its profits are not negative. On the other hand, all three countries have been working to regenerate their forests due to a sense of crisis due to the progress of logging. Looking at both of these aspects, it can be said that each country in Southeast Asia has achieved a balance between economy and nature conservation.

4. discussion

According to the analysis in this paper, it appears that Southeast Asian countries have been successful in protecting their forests and advancing their forestry industry, despite the experience of putting their forests in danger due to over-logging. It would be a good idea for other countries to follow the example of Southeast Asian countries and promote a balance between the economic aspects and nature conservation aspects of forestry. Challenges remain. First, the economic success is only a calculation of Cristensen's economies of scale in forestry. Other indicators of the economy also need to be calculated. We would like to be able to introduce more indicators. Second, even if we say we have succeeded in terms of nature conservation, the state of the forests has only slightly improved. There is no guarantee that forest conservation will continue in the future. I would like to continue to pay close attention to the forest policies of each country. Although these issues remain, the forestry industry in Southeast Asia can be said to be a model case for forestry.

Appendix DATA

Reference(Government)

FAO(b). Global forest resources assessment 2010 country report: Philippines
Forest Partnership Platform, World forest and conservation method, Philippines
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Senate Economic Planning Office, 2015, Philippine Forests At A Glance, Senate of the
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(Note 1) This paper is based on MIZUNO etc (2018). The data set is similar, but here we focused on Cristensen's concept of economies of scale and the Divisia quantity index, which were not covered there. This paper is an extension of MIZUNO etc (2018).

(Note 2) Please refer to MIZUNO etc (2018).

(Note 3) Utilized the results of MIZUNO etc (2018).

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