Chapter V

Results and Implication

In the previous chapter, total cost functions of the Thai FDA were constructed in order to test hypothesis about the relationship between costs and outputs. The estimated parameters are illustrated, with a discussion of implications, in this chapter.

5.1 Estimation results

The following statistics exhibit the estimation results of the total cost functions. The descriptive statistics of the dependent and independent variables are presented in table5.1. By using Ordinary Least Square (OLS) estimation method to find the appropriate model, the estimated parameter values and t-statistics for all possible variables in the models appear in table 5.2.

Table 5.1 Descriptive statistics of variables

	Mean	Standard deviation
ln TC	18.33496	0.997
ln C_1	17.31010	1.322
ln C_2	16.50593	0.615
ln Q_1	9.46637	0.196
ln Q_2	9.40769	0.312
ln Q_{11}	9.38922	0.193
ln Q_{12}	9.24952	0.348
ln Q_{13}	10.06960	0.512
ln Q_{21}	9.12199	0.748
ln Q_{22}	8.78268	0.588
ln Q_{23}	10.63147	0.374
ln Q_3	10.15361	0.128
ln P_L	11.39261	0.558

Table 5.2 Total cost elasticities (first-order coefficients)

Parameters	Estimate from equation				
	(4.1)	(4.2)	(4.3)	(4.4)	(4.5)
Output quantities					
Q_3	0.202				
	(0.564)				
Q_1		-0.500			
		(-1.380)			
Q_2		0.087			
		(0.556)			
Q_{11}			0.135	-0.156	
			(0.548)	(-0.169)	
Q_{12}			-0.372*	-1.373*	
			(-2.837)	(-2.383)	
Q_{13}			0.052	0.413	
			(0.269)	(0.753)	
Q_{21}			-0.076		-0.560**
			(-0.738)		(-1.873)
Q_{22}			0.011		0.072
			(0.108)		(0.320)
Q_{23}			0.366**		-0.357
			(1.953)		(-0.859)
Wage rates (P_L)	1.718*	1.887*	1.482*	1.932*	1.834*
	(20.278)	(15.599)	(7.993)	(2.862)	(4.508)
Control variables					
dummy	0.202	0.172	0.194		
	(0.968)	(0.862)	(0.946)		
dummy1				0.093	-1.628*
				(0.123)	(-2.463)
Constant	-3.298	0.742	-0.215	5.272	4.540
Statistic					
R^2	0.970	0.975	0.988	0.858	0.741
$\bar{R}^2$	0.964	0.968	0.978	0.808	0.649

( ) = t-statistic

* = significant level of 5%

** = significant level of 10%

5.1.1 Total cost functions of the Thai FDA

From table 5.2, the parameter estimate of the total cost functions appear to be different from a.priori expectation. In this study, the critical values of t-stat and other estimated statistics are based on the significant level of 5%. The models for total cost function are from equation (4.1), (4.2) and (4.3) in chapter IV.

The insignificantly positive coefficient of Q_3 parameter is obtained from equation (4.1), using Q_3 as the sum amounts of pre-marketing output (Q_1) and post-marketing output (Q_2). It implies that there is no statistically significant relationship between outputs and total cost. Total cost elasticity with respect to wage rate is 1.718. The coefficient of dummy variable shows the insignificantly positive which confirms that the sudden increase of public education expenditure in 1998 did not affect total cost. However, R^2 value at 0.97 indicates that total cost can be explained by outputs and wage rate well.

The estimated parameters from equation (4.2) indicate the relationship among total cost, pre-marketing output (Q_1), post-marketing output (Q_2) and wage rate. The coefficient of pre-marketing output denotes the insignificantly negative sign as the coefficient of post-marketing output appears to be insignificantly positive. Also, the total cost elasticity with respect to wage rate is statistically significant at 1.887. Dummy variable coefficient presents the insignificantly positive value. R^2 value shows that 97.5% of total cost variation can be explained by pre-marketing output, post-marketing output and wage rate.

The econometric results from equation (4.3) reveal total cost elasticities with respect to subsets of pre-marketing output and subsets of post-marketing output. Unexpectedly, the coefficient of product registration (Q_{12}) is negative and statistically significant with the magnitude of 0.372. This implies that total cost will reduce by 0.372 percent if the volume of product registrations increase by one percent. It should be noted that total cost elasticity with respect to Q_{23} (information on label or advertisement inspection including inspection at custom) is 0.366 at 90% level of significance. No other parameter estimates are statistically significant. However, both parameter sign of premise licentiousness (Q_{11}) and the remaining pre-marketing activities (Q_{13}) are positive. At the same time, the coefficient of premise inspection (Q_{21}) is negative, while the coefficient of product inspection (Q_{22}) is positive. The wage elasticity is 1.482, while dummy variable coefficient of public education expenditure is insignificantly positive. R^2 value is also high (0.988) and significant.

In summary, there are no statistically significant empirical relationship between total cost and outputs. The estimated parameter of product registration (Q_{12}) is surprisingly negative. The wage elasticities are significantly positive with high magnitude.

5.1.2 Cost functions of pre and post-marketing activities

The models for cost function of pre and post-marketing activity are from equation (4.4) and (4.5) in chapter IV. The results in table 5.2 reveal pre-marketing cost elasticities with respect to subsets of pre-marketing output. The estimated coefficient of product registration (Q_{12}) appears at the magnitude of -1.373. It should

be remarked that the signs of the estimated parameter of product registration category either from equation (4.3) or equation (4.4) is negative. The coefficient of premise licentiousness (Q_{11}) is negative but insignificant. The estimated parameter of another output category of pre-marketing activities (Q_{13}) is positive but statistically insignificant. Pre-marketing cost elasticity with respect to wage rate is 1.932. Dummy1 variable coefficient is positive but insignificant, implies that the administrative structural changes during 1992-1999 had no statistically significant effect on costs of pre-marketing activities. R^2 value is also high at 0.85.

The findings in table 5.2 also display post-marketing cost elasticities with respect to subsets of post-marketing output. It is observed that the coefficient of premise inspection category (Q_{21}) is negative at significant level of 10%. Sign of the coefficient is the same as its estimated parameter in total cost function (equation 4.3). Post-marketing cost elasticity with respect to product inspection output (Q_{22}) is still positive but insignificant, while coefficient of the remaining output category (Q_{23}) is negative but insignificant which opposed to its coefficient in total cost function. The wage elasticity is 1.834. Dummy 1 coefficient is significantly negative, indicated that the rise in administrative structural changes since 1992 would lower the cost level of post-marketing activities. R^2 value for this model is quite high (0.741).

5.2 Discussion

In principle, it is expected that increasing in output volume will lead to higher level of total cost, but this study demonstrated that relationship can be missed a priori. The regression results show that there is no statistically significant relationship

between costs and any output category, except product registration (Q_{12}). Most of the t-statistic for the output variables are statistically insignificant at the 95 percent confidence level. As one might not expect, it was found that the volume of product registration had significantly negative effects on total cost with the magnitude of 0.37 and also on the cost of pre-marketing activities with the magnitude of 1.37. These results at first glance seem inconsistent with the positive-sign expectation. These consequences, however, might be explained from the structural changes in the tasks of FDA. Product registration, defined as Q_{12}, is one of the most important outputs of the Thai FDA due to the sharply increasing of new products launched in the market. With regard to deconcentration some jobs to other agencies as well as the establishment of medical device control division in 1992, these made FDA be able to concentrate on this task and it might bring the growth levels of product registration even when the levels of cost did not change so much. However, more detailed examination and discussion of cost characteristics by each output category would provide some possible explanations for these findings.

The only variable with either a large or a significant effect on cost is the level of unit price of labor input. It was found that cost elasticities with respect to wage rate ranged from 1.5 to 1.9, demonstrating a labor intensive characteristic of FDA. The models also include dummy and dummy1 variables. For dummy variable that used for the total cost estimation, it had insignificantly positive effects on the cost levels, implies that an increase in public education expenditure in 1998 had no effect on total cost. Dummy1 variable also had positive but insignificant effects on the cost levels of pre-marketing activities, but it had significantly negative effects on the cost levels of post-marketing activities. This implies that the task-structural changes such as the job

deconcentration to provincial health offices tend to decline the cost of post-marketing activities. The most obvious reason for this conflicting finding is that when FDA released some jobs, particularly post-marketing monitoring, to other agencies, the expenditures used to produce these outputs should be reduced due to the shifting-down of tasks. To maintain the levels of the whole outputs produced, FDA might allocate its own budgets to do other tasks and allocate some budgets to provincial health offices for support its works. FDA could add up the quality of works to improve the effectiveness when some authorities were released.

Though R^2 and adjusted R^2 are high and significant, most of the t-statistic for output variables are statistically insignificant. The values of R^2 indicate that it is more than 97% which total cost could be explained by outputs and wage rate. R^2 statistics also indicate the strength of explanation for pre-marketing and post-marketing cost functions as 86% and 74% respectively. It means that the variables on the right-hand side of equation are very good determinants of costs.

Eventhough managerial capability is not measurable, it is such an important factor that influences the volume of expenditures spent and outputs produced. It is worth noting that the inconsistent relationship between outputs and costs might occur from doubtful administrative capability. In addition to the explanatory variables employed in this study, other available variables that may affect cost levels, such as new operational procedures, might be included in order to precisely describe cost and production characteristics of FDA.