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ESTIMATION OF CUSTOMERS PARTICIPATION TO PROFIT SHARING PROGRAM BY HECKMAN TWO-STEP ESTIMATOR

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***Abstract*— Most of the studies done on the profit sharing topic focused on workers effect. Whereas, in some business, particularly service business, customers factor greatly influence the growth of profit. This paper investigates customers' participation to profit sharing program by using Heckman two-step estimator. The selectivity is used in order to face the possibility of biasness in the estimation. The analysis is based on the data of door to door service business in Malaysia. The empirical result reveal a significantly effect of customers' participation to the profit sharing program.**

***Index Terms*— profit sharing, customers participation, Heckman two-step estimator**

I. INTRODUCTION

Profit sharing concept have long been practiced. The concept fascinates various point of views since the paper works published by Weitzman [14], [15]. The study claims the introduction of profit sharing system to its workers increase the productivity which is directly proportional to the company's profit growth. Other than that, the concept creates an incentive benefit that move the economy to full employment. Many researches investigate these claims in various fields (see Von Lanzenauer [12]; Anderson and Devereux [1]; OECD [10]; Hainaut [4]; Jensen and Meckling [6]; Wadhwani and Wall [13]; Kruse [9]; Kraft and Ugarkovic [8]).

Koskela and Stenbacka [7] analyzed the relationship between profit sharing, worker effort and wage formation when firms face uncertainty generated by a stochastic revenue shock. The analysis focused on the implications of the relative timing of profit sharing and wage bargaining for the optimal profit sharing. Further, the study demonstrated that the optimal profit sharing under commitment exceeds under flexibility.

The operation continuity of the service business relies heavily on customers. A company that gives better treatment to its customers has a greater possibility of success. Customer loyalty has a positive correlation with the business performances. Other than that it can attract new customers (Beerli et al, [2]). Maintenance of customer loyalty brings profit on the sale. Because of that the company keeps investing huge amount of money in customer loyalty programs (see Wright and Sparks [16]; Smith et al [11]).

The introduction of profit sharing system to its customers by the company is a good way to maintain the loyalty of customers. This is an efficient method to make the customers feel like they own the company. The sentiment increases their loyalty toward the company. However, most of the studies done on the issue of profit sharing dominated by workers factors. The purpose of this study is to investigate the effects of the implementation of profit sharing system to the customers. Real data from door to door service business in Malaysia is used in this estimation.

II. MATHEMATICAL MODEL OF PROFIT SHARING

Suppose that a company want to share the profit to its workers as well as customers in order to maintain their loyalty to the company's products. Suppose that the model of profit sharing uses by the company is as follows:

$$y = \omega(L_i) + C_i \tag{1}$$

Equation (1) represents a model that describes the amount of company's profit will be distributed to both of the workers and the customers. The portion of profit given to its workers based on mutual agreement between the company and the labour through a process of negotiation over wages and employment while the portion of profit sharing to its customers is absolutely determined by the policy of the company, where $\omega(L_i)$ is a linear function represents the monthly salary of the workers under profit sharing system while C_i represents the amount of company's profit to be share to the customers. Basically, profit sharing model proposed by Weitzman ([14], [15]) is very simple and under stable. Suppose that the formulation uses by the company given the monthly salary to its workers through profit sharing process is a linear function as follows:

$$\omega(L_i) = \omega_{i0} + \frac{\lambda_i}{L_i}(R_i(L_i) - \omega_{i0} L_i) \tag{2}$$

where $\omega(L_i)$ indicates the earnings of each worker includes the portion of profit sharing, $R_i(L_i)$ represents labour function differentiated from demand function and production function and ω_{i0} represents the basic wage of each worker, while $\lambda_i > 0$ shows the coefficient of profit sharing, which is agreed by both of the company and labour. Equation (2) clearly shows that if $\lambda_i = 0$ then $\omega(L_i) = \omega_{i0}$, which means that the wage of each worker after profit sharing process is never below ω_{i0}.

Based on the above analogy, the model of profit sharing in the context of customers can be describes as follows: Assume that γ is the coefficient of profit sharing to customers. Let the value of customer transaction defines as P_i. The profit sharing does not distribute equally for each customer but the portion of profits is based on the total of transaction individually. Based on Weitzman analogy (1985), the amount of company's profits distribute to its customers are

$$C_i = \gamma_i P_i \frac{(R_i(L_i) - \omega_{i0} L_i)}{N} \tag{3}$$

where N represents the number customers who have the right to company's profit. Parameter P_i greatly affects the amount of profit sharing portion received by customers. The value of individual transaction is in line with the amount of share profit. Other than that, equation (3) shows that the parameter is directly proportional to the company's revenue. As well as in the context of workers, there are terms and conditions must be met by the customers in order to get a share of company's profits. Equation (3) shows that if $P_i = 0$ then $C_i = 0$ means that the customers do not have the rights to get profit portion because of the company's requirements are not fulfilled.

From equation (2.2) and equation (2.3) then the net profits earned by the company after the implementation of profit sharing system to both of the workers and the customers is as follows:

$$\pi(\omega_0, L, \lambda, N) = (1 - \lambda_i - \gamma_i P_i)(R_i(L_i) - \omega_{i0} L_i) \quad (4)$$

III. HECKMAN TWO-STEP ESTIMATOR

The Heckman sample selection model has the form:

$$d_i^* = z_i'\gamma + u_i \quad (5)$$

$$d_i = \begin{cases} 1 & if\ d_i^* > 0 \\ 0 & \text{otherwise} \end{cases}$$

$$y_{1i}^* = x_{1i}'\beta_1 + \varepsilon_{1i} \quad \text{if } d_i = 1 \quad (6)$$

$$y_{2i}^* = x_{2i}'\beta_2 + \varepsilon_{2i} \quad \text{if } d_i = 0 \quad (7)$$

$$y_i = y_{1i}^* d_i + y_{2i}^*(1 - d_i)$$

Where y_i^* is an observable random variable, d_i^* is a latent variable, x_i and z_i are vectors of exogenous variables, β_1, β_2, and γ are vectors of unknown parameters; and $\varepsilon_{1i,}\varepsilon_{2i}$ and u_i are zero mean error terms. A selectivity problem arises when y_i^* is observed only when d_i =1, and if $\rho \neq 0$.

In a regression equation format, the two-step procedure proposed by Heckman is as follows:

$$y_i = x_i'\beta + \rho\sigma_\varepsilon\left(\frac{\varphi(z_i'\gamma)}{\Phi(z_i'\gamma)}\right) + v_i \quad \text{if } d_i = 1 \quad (8)$$

$$y_i = x_i'\beta - \rho\sigma_\varepsilon\left(\frac{\varphi(z_i'\gamma)}{1-\Phi(z_i'\gamma)}\right) + e_i \quad \text{if } d_i = 0 \quad (9)$$

Where $\lambda_i = \frac{\varphi(z_i'\gamma)}{\Phi(z_i'\gamma)}$ is the inverse Mill's ratio, $\varphi(\cdot)$ and $\Phi(\cdot)$ are the normal density and cumulative distribution functions, respectively. The inverse Mills ratio is sometimes called a "control function" – literally a function that controls for selection bias.

IV. EMPIRICAL RESULT

In order to investigate the effect of customers' participation to the profit sharing system, this paper uses the data from cargo business which is delivering some goods from Malaysia to Indonesia in 2011. Sample in this paper is limited to companies that implement the system of profit sharing to both of the workers and the customers. The numbers of samples use in this paper as many as 2,673 customer. Selectivity model applies to the original data in order to obtain the relevant data to this study. After analyzing the original data by removing irrelevant data, then obtained as many as 1,052 (39.36%) customers get profit sharing portion. The rest, as many as 1,621 (60.64%) are the customers do not get the portion of share. The descriptive data states that the average of customers' age is 24.04 years old. The empirical results are given in Table 1 below:

TABLE 1. Participation Model of Profit Sharing

Variables	Coefficients	Std Errors	P> |z|
Age	0.160046	0.1513033	0.290
Age2	-0.003775	0.0029643	0.203
Sex	0.010879	0.0118576	0.359
Education	0.023591	0.0109588	0.031
Constants	1.974715	0.1897256	0.000
IMR	0.062313	0.448975	0.890
Rho	0.087790	-	-
Sigma	0.709834	-	-
Lambda	0.062313	0.448975	-

Table 1 show that Age variable have positive impact on participation rate of the customers in profit sharing system, as well as sex variable and education variable. The next step of Heckman two-step estimator is to estimate the outcome model of customers under profit sharing system. STATA analysis results are shown in Table 2 below

TABLE 2. Outcome Model of Profit Sharing

Variables	Coefficients	Std Errors	P> |z|
Education	-0.0144735	0.0107703	0.179
Status	0.4109698	0.2358296	0.081
Age	-11.18311	5.092228	0.082
Constant	0.6144886	1.004372	0.541

Table 2 shows that the quantity of shipping by customers has negative effect to both Education and Age variables. The results also indicate that marital status of customers positively affects the quantity of shipping.

V. COUNCLUSION

This paper considers estimation of customers' participation on profit sharing program by Heckman two-step estimator. Mathematical formulation of profit sharing in the context of workers and customers are presented. The empirical results indicate variables of age and sex as well as education variable have positive impact on customers' participation to the profit sharing program. Further, marital status positively affects the quantity of goods delivers by customers.

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