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Evaluation of Performance Efficiency of Stipend Programmes of Primary and Secondary Education in Bangladesh through Application of Stochastic Frontier Models

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Abstract

The Government of Bangladesh has instituted several safety nets programmes not only to reduce the poverty and but also to improve the human capital development. This paper presents an approach for evaluating performance efficiency of stipend programmes at primary and secondary education level through applying stochastic frontier models. The data for this study has been collected through a research project from 130 rural clusters (PSUs of BBS) of Bangladesh. The analysis is performed based on the primary data of 428 beneficiary households for Primary Education Stipend Project (PESP) and 200 beneficiary households for Secondary Education Stipend Project (SESP). The analysis indicates that among the 2045 surveyed safety nets beneficiary households, about 21% and 10% were received benefits with annual average amount of Tk.1200.37 and Tk.1732.80 from PESP and SESP respectively. The analysis of expenditure pattern of benefits indicate that about two-thirds and three-quarters of the received amount has been spent for human resource development purpose (education, skills development training) from PESP and SESP respectively.

The study utilized expenditure on human resource development (education, training, private tuition fee, etc.) at household level as outcome variable for carrying out analysis with several frontier models. The findings indicate that the unconstrained trans-log production function was appropriate frontier model to evaluate the efficiency for PESP.

Besides, the Cobb-Douglas production function is found ideal frontier model for evaluating the efficiency of SESP. The mean technical efficiency for PESP and SESP is estimated at 52.87% and 57.64%, respectively. The findings indicate that there is a huge scope to increase the efficiency of the stipend programmes by reducing the inefficiency coefficients found in the study.

Keywords: Stochastic Frontier Model; Technical Efficiency; Stipend Programme; Primary Education Stipend Project; Secondary Education Stipend Project.

AMS Classification: 91B70.

1. Introduction

Bangladesh has been implementing a good number of social welfare programmes and initiatives since its independence with the aim of reducing inequality and raising the standard of living of its people (Barakat et al., 2013; Devereux, 2002; Hossain et al., 2018; Khuda, 2011; Rahman et al., 2011; Slater, 2011). The government of Bangladesh has given priority on education in its development agenda considering its importance for human resource development. The primary education received the topmost priority with special focus on girls' education. Consequently, the country runs one of the largest primary education system in the world, with around 20 million primary school students, around 482 thousand teachers and around 109 thousand schools (BANBEIS, 2015). The Government of Bangladesh has begun the operation of Primary Education Stipend Project (PESP) in January 2003, with the goal of supporting about 5.5 million pupils from the poorest households enrolled in eligible primary schools of rural areas Bangladesh (GoB, 2017). The PESP aims to increase the educational participation - enrolment, attendance, persistence, and performance of primary students from poor families throughout Bangladesh by providing cash payments to targeted households (Delb et al, 2019; Tietjen, 2003). The PESP has been expanded in 2015-2016 and made universal for all enrolled students with conditions of 85% monthly attendance, take up all the school examinations and attain a minimum of 33% marks in examinations to receive the benefits (GoB, 2017). The benefit amount of PESP is Tk.100 per month for a single beneficiary, Tk.200 for two beneficiaries; Tk.250 and Tk300 for three and four beneficiaries respectively from a family. The GCD study has documented that the recently introduced cash transfer through mobile banking has improved the transparency and efficiency of the PESP payments (Delb et al, 2019). Yunus and Shahana (2016) studied the impact of PESP on

household and school-level outcomes in Bangladesh by gathering the data from 2500 households covering 25 districts. The study compared different indicators between beneficiary and control households to evaluate the impact of the PESP and found that the PESP households are lag behind in land ownership, non-land assets, food security status, poverty status etc. However, the study did not find any significant difference in household expenditure and women empowerment. In addition, the study found higher attendance and promotion rate for PESP recipient students (Yunus and Shahana, 2016). In Bangladesh, the net enrolment rate at primary level has increased to 98% in 2015, while it was 80% in 2000. However, the real threat in Bangladesh education system is to achieve quality primary education. According to the APSC report (2016), the dropout rate persists at 19.2% in primary education. The remarkable progress over the past decades in achieving net enrolment rate at primary level are due to the multi-dimensional interventions of the government, of which the contribution through PESP are obviously notable.

In secondary level, the Female Secondary Stipend Program began as an experiment in 1982 by a local NGO in a single upazila to observe the increment of girls' enrolment rate. The government of Bangladesh implemented several nation-wide stipend programmes for girls in secondary school since 1994 with support from different donors to retain poor student into school and built them as prospective work force of development. Reviewing the success of several programmes at secondary level including Female Secondary School Assistance Program (FSSAP) and the Food for Education (FFE), the Secondary Education Sector Investment Program (SESIP) has started its operation in 2013 to support the government's reforms of secondary education (Khan, 2014). In addition to the teacher development, examination reforms, improvements of teaching-learning outcomes, the SESIP program is implementing the gender-equitable and pro-poor stipends for students through Secondary Education Stipend Project (SESP). Under the SESP, 30% of the unmarried girls and 10% of the boys belongs to poor family (guardian own less than 7-decimal land) would receive stipends. To qualify for the stipends, each of the students have to attend at least 75% classes and to secure a certain percentage of marks in examinations (students of Class 6 and 7 have to acquire minimum 33% marks and students of class 8 and 9 have to obtain 40% marks in the final examination). Student of sixth or seventh grade would receive Tk.100 stipend a month, an eighth grade student Tk.120, and those in ninth and

tenth Tk.150 a month in addition to the monthly tuition fees (Tk.15 for sixth-eighth levels and Tk.20 for ninth-tenth levels) for the education institutes. Besides, each student would receive Tk.750 as Secondary School Certificate examination fees.

In a study, it is documented that the FSSAP and the FFE programs influencing sustainable development plan by harnessing skilled labour force formation by increasing the primary enrolment rate, promoting school retention, and reducing dropout rates (BIDS, 2003). Ahmed and Sharmeen (2004) also show the evidence that girls' dropout rates are lower than boys' though on an average, the latter are found to perform better. Regarding the performance of the FFE program, it is reported that the overall enrolment rate rose by 34% (27% for boys and 41% for girls) following the introduction of the program against a rise of only 2.5% for non-FFE schools (Ahmed and delNinno, 2002). Consequently, the study has documented that the dropout rates were remarkably lower for FFE beneficiaries in comparison to that of non-beneficiaries. In Bangladesh, the prime reason for girls' dropouts are due to early marriage practices in the society. It is reported that 22% of girls are married by the age of 15 years and 59% girls in Bangladesh are married before the age of 18 years (BDHS, 2014). In recent years, this scenario has been changed remarkably might be due to the introduction of stipend programmes for girls. According to the recent UNFPA report, the enrolment rate for secondary education in the country was 57% for boys and 67% for girls in 2017 (UNFPA, 2019: State of World Population Report). Fuwa (2001) investigated the impact of female secondary education stipend programme through comparing the enrolment of nation-wide and project area data. The study concluded that the female stipend programme had a positive impact on mitigating the gander gap. In a study, Shamsuddin (2015) has evaluated the labour market effects of female secondary education stipend programmes using several rounds of cross-sectional data in a diff-in-diff structure. Aligning with the findings of Hong and Sarr (2012), the study concludes that the stipend programmes increases labour force participation among females. The study of Khan (2014) intended to identify the factors influencing selection process of stipend and analyse the relationship between the factors.

The review of literature suggests that there have been many research studies on the effects of stipend programmes on enrolment, attendance and learning outcomes, empowerment, labour market effects; however the evaluation of the

performance of the programmes with respect to the human capital investment are completely absent in the existing literature. In addition, the application of stochastic frontier model is not found to evaluate the effectiveness of the stipend programmes. This study aims to evaluate the performance efficiency of the PESP and SESP with respect to the key outcome variable by applying the stochastic frontier model.

2. Materials and Methodology

2.1. Data Source

The data for this study has been extracted from the data collected through a research project "Targeting Effectiveness and Productive Outcomes of the Social Safety Net Programs in Rural Bangladesh: An Evaluation", sponsored by the Ministry of Education of the Government of Bangladesh through Grants for Advanced Research in Education program (Hossain and Ahmed, 2017). The study has adopted cluster-sampling methods where Primary Sampling Units (PSUs) of BBS have been considered as clusters, and collected information from 3322 households covering 130 rural clusters and top 14 budgeted safety nets programmes (Hossain and Ahmed, 2017). Among the surveyed households, 428 were found beneficiary households for PESP and 200 were found beneficiary households for SESP. Hence, the analysis of the study has been performed considering different household attributes along with income from safety nets programmes and expenditure on different heads including investment in human resource development.

2.2. Model Specification

The performance efficiency of the PESP and SESP has been evaluated through stochastic frontier models considering the outcome variable investment expenditure in human resource development for the beneficiary households. The brief introduction of the stochastic frontier model along with model specification for this study is given below.

To evaluate the efficiency level of stipend programmes, the stochastic frontier model along with inefficiency effects model used can be expressed as:

$$Y_i = f(X_i,\beta)\exp(v_i - u_i) \qquad i = 1, 2, ..., n \tag{1}$$

where, Y_i represent the output of the i-th households, X_i is a vector of input quantities, β is a vector of unknown parameters. V_i is distributed as NID $(0, \sigma_v^2)$ and independent of U_i. The U_i represents technical inefficiencies in output and are assumed to be distributed as NID (μ, σ_v^2) with truncation at zero. The relationship between U_i and the output-oriented technical efficiency is TE =exp (- U_i).

For a clear understanding of the model (1), we may show the different components of (1) as

$$Y_i = \underbrace{f(X_i, \beta)}_{\text{deterministic part}} \times \underbrace{\exp(v_i)}_{\text{noise component}} \times \underbrace{\exp(-u_i)}_{\text{inefficiency component}} \quad (2)$$

The study adopted the technical inefficiency model proposed by Battese and Coelli (1995) as

$$U_i = \delta_0 + \sum Z_{ji}\delta_j + W_i, \quad (3)$$

where, Z_i is a vector of explanatory variables which may influence the inefficiency of programs and δ is a vector of parameters to be estimated. The random variable W_i follows truncated normal distribution with mean zero and variance σ^2, such that the point of truncation is $-Z_i\delta$. Finally, the technical efficiency of the *i-th* programme can be expressed by

$$TE_i = \exp(U_i) = \exp(-Z_i\delta - W_i) \quad (4)$$

The study applied both Cobb-Douglas and Trans-log functions as stochastic frontier model, which are expressed as:

$$\text{Ln}(y_i) = \beta_o + \sum_{j=1}^{n} \beta_j \ln(x_{ji}) + \varepsilon_i \quad (5)$$

$$\text{Ln}(y_i) = \beta_o + \sum_{j=1}^{n} \beta_j \ln(x_{ji}) + \frac{1}{2}\sum_{j=1}^{n}\sum_{k=1}^{n} \beta_{jk} \ln(x_{ji}) \ln(x_{ki}) + \varepsilon_i \quad (6)$$

2.3. Estimation of Parameters and Required Tests

For identifying the functional form of the stochastic frontier model, statistical test based on generalized likelihood ratio was conducted considering two types of function – homothetic (Cobb-Douglas) and non-homothetic (Trans-log). The null hypothesis is that the *performance* of stipend programmes exhibited Cobb-Douglas type of production function, i.e., all the effects of square and interaction terms in the trans-log function are zero (H_0: $\beta_{ij} = 0$; i, j = 1, 2, …, n). The test statistic is $\lambda = -2\,[\ln(L_c) - \ln(L_t)] \sim \chi^2_{(0.05)}$ (j), where $\ln(L_c)$ and $\ln(L_t)$ denote the

log likelihood value of the Cobb-Douglas and Trans-log models respectively and J stands for degrees of freedom. After confirmation that the frontier model is non-homothetic (Trans-log), another test based on generalized likelihood ratio has also performed to verify whether the trans-log stochastic frontier model have constant returns to scale. The test statistic is $\lambda = -2\ [\ln(L_R) - \ln(L_{UR})] \sim \chi^2_{(0.05)}$ (j), where $\ln(L_R)$ and $\ln(L_{UR})$ denote restricted and unrestricted log-likelihood values and J is the number of restrictions.

Finally, another three hypotheses have been tested using generalized likelihood ratio following Battese and Coelli (1995) for identifying the necessity technical inefficiency effect model: (i) Beneficiary households are completely efficient for targeted outcome variable, i.e. inefficiency effect model is dropped from the production function (H_0: $\gamma = \delta_0 = \delta_1 = ... = \delta_j = 0$); (ii) the inefficiency effects are not stochastic (H_0: $\gamma = 0$; indicates $\sigma_u^2 = 0$ and $\delta_0 = 0$); and (iii) the inefficiency effects are not a linear function of the covariates (H_0: $\gamma = \delta_1 = ... = \delta_j = 0$), where j represents the number of variables included in the inefficiency effect model.

The β and δ-coefficients of the equations (3), (5) and (6) are estimated together with the variance parameter (Υ) using maximum likelihood method. The estimated equation for variance parameter can be expressed as $\gamma = \sigma_u^2 / \sigma^2$, where $\sigma^2 = \sigma_u^2 / \sigma_v^2$. The study used econometric computer software package *Frontier 4.1* (Coelli, 1996) to estimate the parameters along with required tests regarding functional form as well as necessity of inefficiency effect model.

3. Result and Discussions

The findings of the study is categorically described in two sections: (i) profile of benefits from the stipend programmes and the expenditure pattern, (ii) Performance efficiency of PESP and SESP.

3.1. Profile of Benefits from the Stipend Programmes and the Expenditure Pattern

The findings on profile of benefits from the stipend programmes and the expenditure pattern of the received benefits is described for an overview of the benefits and its utilization. Table 1 shows the findings of the benefits received from PESP and SESP along with the expenditure pattern of the benefits. Among the 2045 beneficiary households, a very significant proportion (20.93%) of the

households were found to receive benefits from PESP in the year prior to the survey. Out of 428 currently beneficiary households of PESP, 63% of the households received the benefits as 1st source (households received safety nets benefits from PESP only), 30% received as 2nd source (households received benefits from another safety nets programme and PESP) and about 7% received as 3rd source (households received benefits from another two safety nets programmes along with PESP). On the other hand, a little less than 10% of the surveyed households were found to receive benefits from SESP, of which 75% of the households received the benefits as 1st source. It is observed that a significant number of households received the benefits as 2nd or 3rd sources, that is these households received safety nets benefits from other programmes too. The average annual amount of received benefits has been estimated at Tk.1200.37 and Tk.1732.80 for PESP and SESP respectively.

Table 1: Profile of the annual benefits of stipend programmes (PESP and SESP) and expenditure pattern

Profile of Benefits	**PESP**	**SESP**
Number of households received benefits 1st source	271	150
Number of households received benefits 2nd source	129	48
Number of households received benefits 3rd source	28	2
Total number of households received benefits (with %)	428 (20.93%)	200 (9.78%)
Average amount received in a year (in Taka)	1200.37	1732.80
Expenditure of the Benefits on major heads (in Taka)		
Consumption on food (in Taka)	124.00	159.00
Consumption on non-food items (in Taka)	183.00	252.00
Health care (in Taka)	32.00	61.00
Human resource development (Education/Training) (in Taka)	792.00	1179.00
Saving (in Taka)	7.00	17.00
Favourite things (in Taka)	31.00	80.00
Others (in Taka)	50.00	58.00

The expenditure pattern of the received benefits from PESP indicate that about two-thirds of the benefit amount has been spent for human resource development (education, skills development training). That is, one-third amount of benefits was not spent for which it has been allocated (Table 1) and this amount has been spent for food and non-food expenditure of the households. This amount is mainly spent to meet the food and non-food expenditure of the households. The expenditure

pattern of the benefits from SESP is found slightly different to that of PESP. It is found that three-quarters amount of the benefits of SESP spent for human resource development (education, skills development training) purpose, and the rest has been utilized for household's essential purposes, mainly to maintaining food and non-food expenditure.

3.2. Performance Efficiency of PESP and SESP

The study considered the amount spent for human resources development (expenditure on education and training, called here human resources investment) of a household as the outcome variable to evaluate the performance efficiency of the two safety nets programmes, viz., Primary Education Stipend Project (PESP) and Secondary Education Stipend Project (SESP). A number of household attributes viz., family size, years of schooling of the household head, land size, SSNP income, asset score, dependency ratio, donation received has been considered as covariates of the production frontier model. In addition, female headship, income regularity status, poverty score food security status, and currently working status of the households have been considered as covariates for technical inefficiency effect model. The measurement of the variables along with their descriptive statistics is not provided here; however, these have been categorically described by Hossain and Ahmed (2017).

3.2.1. Testing the functional form and necessity of technical inefficiency effect model

Following the steps described in methodology, the tests of hypotheses regarding the functional form of the production frontier and tests of hypotheses on the technical inefficiency effect model is carried out first and the results are shown in Table 2 for both PESP and SESP. The findings indicate that the unconstrained trans-log stochastic production frontier model is an ideal choice to evaluate the performance efficiency for PESP for the outcome variable human resources investment. On the other hand, Cobb-Douglas production frontier model was found suitable to evaluate the performance efficiency for SESP considering human resources investment as outcome variable (Table 2). In addition, the results of the bottom panel of Table 2 confirms that Technical inefficiency effect model is essential for evaluating the performance efficiency of both PESP and SESP for the outcome variable human resources investment.

Table 2: Testing the functional form of the production frontier and technical inefficiency effect model for the outcome human resources investment for *PESP* and *SESP*

Null Hypothesis	DF	Critical value	Value of Test Statistic and Inference for Human Resources Investment			
			PESP		SESP	
			λ*	Inference	λ*	Inference
Testing the functional form of the production frontier						
H_0: The production frontier is Cobb-Douglas form	28	41.34	83.36	Reject H_0	37.9	Accept H_0
H_0: The trans-log stochastic frontier model exhibits constant returns to scale.	5	11.05	49.58	Reject H_0	-	-
Tests of hypotheses on the parameters of the technical inefficiency effect model						
H_0: $\gamma=\delta_1=\ldots=\delta_5=0$	8	15.51	140.6	Reject H_0	41.4	Reject H_0
*H_0: $\gamma= 0$***	3	7.81	127.4	Reject H_0	24.0	Reject H_0
H_0: $\delta_1= \delta_2=\ldots=\delta_5=0$	5	11.07	106.4	Reject H_0	13.7	Reject H_0

*$\lambda = -2\ [\ln \{L(H_0)\} - \ln \{L(H_1)\}]$

**$\gamma = 0$ indicates that σ_u Squared = 0 and $\delta_0 = 0$, so degrees of freedom corresponding to this hypothesis is 3.

3.2.2. Estimated value of the parameters for *Trans-log production frontier model* and inefficiency effect model for PESP

Table 3 shows the estimates of the parameters of the *unconstrained trans-log stochastic production frontier model* for the outcome variables 'human resources investment' for PESP. The findings indicate that SSNP income, asset score, dependency ratio, and donation received have had significant impact on the response variable (human resources investment). It is to be noted that the estimated coefficient of SSNP income, asset score, and donation received on human resources investment is found negative. However, the squared term of these three variables were found positive and significant. The meaning of the positive significant value of the squared of SSNP income is that if the SSNP income is increases at sufficient level, then it will have highly significant positive impact on human resources investment. The estimate for the variance parameter

(γ) is found 0.98, which indicates that the inefficiency effects are likely to be highly significant in the analysis of the value of output of the households.

The estimates of the parameters of the inefficiency model is also given in the bottom panel of Table 3. It is found that that female headship of the household, income regularity status, poverty score, food security status and currently working status have put significant effects upon the inefficiency of human resources investment for *PESP*. All the significant coefficients of the inefficiency effect model were found negative except currently working status. This means that inefficiency effects increases with the decrease in female headship, income regularity status, poverty score and food security status of the households and members.

The mean technical efficiency for *PESP* with the outcome variable human resources investment is estimated at 52.87% indicating that huge amount of inefficiencies are occurred due to impact of several covariates of inefficiency effect model. Therefore, focus should be given on the covariates of the inefficiency effect model in order to increase the efficiency of the PESP. Among the covariates of the inefficiency effect model, emphasis should be given to increase the income regularity status and food security status along with to reduce the poverty condition of the beneficiary households.

3.2.3. Estimated value of the parameters for *Cobb-Douglas frontier model* and inefficiency effect model for SESP

Table 3 shows the estimates of the parameters of the Cobb-Douglas production frontier model for SESP with human resources investment as outcome variable. The findings indicate that family size, education of the household head, dependency ratio and donation received have had significant positive impact on the human resources investment. It is to be noted that the estimated coefficient of SSNP income is found positive but insignificant. This finding indicate that the amount SSNP income is not adequate to put significant effect on the amount spent by the households for education and training purposes (Table 3). The estimated value of the variance parameter (γ) is obtained 0.96, which indicates that the inefficiency effects are likely to be highly significant in the model for the outcome variable.

The results of the inefficiency effect model indicates that female headship of the household, income regularity status, poverty score, food security status and

currently working status have put significant effects upon the inefficiency of human resources investment for *SESP*. The estimated coefficients indicate that the inefficiency effects increases with the decrease in female headship, income regularity status, and poverty score of the households. However, the inefficiency effects increases with the increase of food security status and currently working status of household heads/members.

The mean technical efficiency for *SESP* with the outcome variable human resources investment is estimated at 57.64% indicating that enormous amount of inefficiencies are occurred due to impact of several covariates of inefficiency effect model, particularly female headship, income regularity status and poverty score.

Table 3: Estimates of the parameters of the Trans-log stochastic model for PESP and Cobb-Douglas model for SESP with the outcome variable human resources investment

Variable	**Model Parameter**	**PESP (Trans-log)**		**SESP (CD Model)**	
		Coefficient	**S.E.**	**Coefficient**	**S.E.**
Intercept	B_0	14.280***	1.410	6.330***	0.812
Family Size	B_1	1.561	1.734	0.786***	0.229
Education of the household head	B_2	1.215	1.162	0.630**	0.283
Land Size	B_3	-0.048	0.401	-0.053	0.044
SSNP Income	B_4	-1.983***	0.567	0.098	0.079
Asset Score	B_5	-2.817**	1.318	0.118	0.157
Dependency Ratio	B_6	1.381**	0.663	0.078*	0.049
Donation received	B_7	-0.418**	0.191	0.054***	0.019
Family Size Squared	B_8	-0.105	0.363	-	-
Education Squared	B_9	-0.075	0.205	-	-
Land Size Squared	B_{10}	0.056***	0.024	-	-
SSNP Income Squared	B_{11}	0.133***	0.034	-	-
Asset Score Squared	B_{12}	0.547***	0.206	-	-
Dependency Ratio Squared	B_{13}	-0.041	0.046	-	-
Donation Squared	B_{14}	0.040***	0.009	-	-
Family Size × Education	B_{12}	0.107**	0.466	-	-
Family Size × Land Size	B_{13}	-0.170	0.118	-	-
Family Size × SSNP Income	B_{14}	-0.187	0.152	-	-
Family Size × Asset Score	B_{15}	0.268	0.402	-	-
Family Size × Dependency Ratio	B_{16}	0.211	0.276	-	-
Family Size × Donation	B_{17}	0.064	0.051	-	-
Education × Land Size	B_{23}	-0.060	0.082	-	-
Education × SSNP Income	B_{24}	-0.096	0.123	-	-

Education × Asset Score	B_{25}	0.128	0.293	-	-
Education × Dependency Ratio	B_{26}	-0.083	0.148	-	-
Education × Donation	B_{27}	0.003	0.034	-	-
Land Size × SSNP Income	B_{34}	0.064**	0.036	-	-
Land Size × Asset Score	B_{35}	-0.086	0.080	-	-
Land Size × Dependency Ratio	B_{36}	-0.005	0.057	-	-
Land Size × Donation	B_{37}	0.001	0.009	-	-
SSNP Income × Asset Score	B_{45}	0.119	0.123	-	-
SSNP Income × Dependency Ratio	B_{46}	-0.050	0.075	-	-
SSNP Income × Donation	B_{47}	-0.010	0.014	-	-
Asset Score × Dependency Ratio	B_{56}	-0.310**	0.181	-	-
Asset Score × Donation	B_{57}	0.023	0.035	-	-
Dependency Ratio × Donation	B_{67}	0.014	0.020	-	-
Inefficiency Effect Model:					
Intercept	δ_0	10.477	8.192	-4.374	3.032
Female headship	δ_1	-5.107*	3.361	-3.332*	2.059
Income regularity status	δ_2	-8.413***	1.710	-3.126***	1.423
Poverty Score	δ_3	-0.362***	0.078	-0.264***	0.081
Food security status	δ_4	-2.801*	2.017	3.787**	1.821
Currently working status	δ_5	6.013**	2.507	4.386**	2.356
Variance parameters	σ^2	22.209***	4.127	12.017***	3.352
	γ	0.985***	0.004	0.963***	0.012
Log-likelihood value		-549.99		-152.30	
Mean technical efficiency (%)		**52.87**		**57.64**	
**** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level*					

4. Conclusion

The analysis indicates that one-third benefits amount of PESP and one-quarter benefits amount of SESP has not been spent for human resource development (education, skills development training). These benefit amounts is mainly spent for food and non-food consumption expenditure of the beneficiary households. Considering human resource development expenditure as main outcome variable, the findings indicate that the unconstrained trans-log production function and Cobb-Douglas production function was appropriate frontier model to evaluate the efficiency for PESP and SESP. Besides, the technical inefficiency model was found essential for evaluating the performance efficiency of both PESP and SESP.

The mean technical efficiency for PESP and SESP is estimated at 52.87% and 57.64% respectively, indicating that there is an ample scope to increase the efficiency of the stipend programmes by addressing the variables associated with inefficiency effect model.

The results of the study lead to some important policy recommendations that could potentially increase the performance efficiency of stipend programmes. As the study revealed significant inefficiencies in performance of programmes, hence, improving the efficiency of programmes may necessitate taking into account the factors associated with inefficiency. Poverty and income regularity status of the households needs to the addressed properly. To reduce the poverty and improve the income regularity condition of the households, appropriate measures could be under taken along with achievement the quality education of the household members in the long-run perspective. Considering the importance of education, attention should be given for sufficient amount of allocation for PESP and SESP in order to achieve development goals of Bangladesh aligning with concerned SDGs.

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