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RETURNS TO FORMAL EDUCATION AND VOCATIONAL TRAINING IN SRI LANKA

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Abstract

The Mincer earnings function is the cornerstone of a large literature in empirical economics. This paper discusses the theoretical foundations of the Mincer model and examines the empirical support for it using data from National Labour Survey 2019. Inferences about trends in rates of return to formal education and vocational training obtained from our more general model differ substantially from inferences drawn from estimates based on a Mincer earnings regression. In this scenario to estimate econometrics model the multiple regression model was applied with the support Stata data analyzing software according statistical results shows that Formal education and Vocational training are high significance to determine the Income. Descriptive statistics was done to study the characteristics of sample population. As per the descriptive statistics the mean value of log hourly income was LKR 6.21. The average years of education, average years of labour market experience and vocational training were 10.09, 2.45 and 2.61 respectively. The regression analysis revealed that there is a positive relationship between income and formal education and vocational training.

Keywords: *Return, Formal education, Vocational training*

INTRODUCTION

Sri Lanka's workforce is better educated than that of other countries in the South Asia region. However, the high education outcomes are not translated into competitiveness of the economy. According to the 2013 Global Competitiveness Index, Sri Lanka is now transitioning from the factor-driven to the efficiency-driven stage of development.

Higher value-added production, increased productivity, technology usage, and efficient work organization are key factors affecting competitiveness and crucial in supporting the move beyond current production processes. Increasing the competitiveness of the economy requires an efficient technical and vocational education and training (TVET) sector to support skills formation linked with movement up the value chain.

The concept of human capital recognizes that not all labour is equal. But employers can improve the quality of that capital by investing in employees the education, experience, and abilities of employees all have economic value for employers and for the economy as a whole. Earnings functions are the most widely used empirical equations in labour economics and the economics of education. In Mincer's original model, the variation in individuals' wages is explained by variations in years spent in education and years of labour market experience, with a linear relationship between schooling and wages. Therefor the study has done according to the Mincer's Human Capital Theory.

LITERATURE REVIEW

Human Capital Theory

Based on the Human Capital Theory this study has done. Human Capital Theory can be classified as the economic value of a worker's experience and skills. This includes assets like education, training, intelligence, skills, health, and other things employers value such as loyalty and punctuality (Becker, 2008).

Mincer's model

Mincer's model is explained the linear relationship between the education and wages. Where the wages are explained by the variations in number of years spent in formal education, vocational training and number of years of experience in labour market.

$\ln Y_t = \beta_0+\beta_1X+\beta_2Z+\beta_3Z^2+\mu$

Yt – Hourly wage at time t

β0 - Initial earning capacity

β1 - Rate of Returns to Education

β2,β3 - Rate of Returns to experience

X - Years of Education Z - Years of Experience

μ- Random error term (Mincer,1974)

RETURNS OF FORMAL EDUCATION AND VOCATIONAL TRAINING

Lonescu and Cuza (2012) state that, education is frequently seen as a crucial policy instrument on the fight against poverty as it may help individuals to access better jobs that raise their labour earnings and thus contribute to the improvement of their lives. On the labour market, education provides both productive capacities to individuals and their signals to potential employs hence attained qualifications are a main asset in worker competition for jobs available on the labour market **(Gangl, 2000)**. Educational systems still remain the fundamental employment determinants. **Colclough, Kingdon & Patrinos (2010)** claimed that the returns to primary education are decreasing whereas returns to secondary and tertiary education are increasing. Therefore, the study is analyzed the returns to formal education and vocational training.

SCOPE OF THE STUDY

Main Objective

- To identify impact of formal education and vocational training on returns to education.

Specific Objectives

- To find out relationship between Income and Formal education.
- To identify relationship between Income and Vocational training.

METHODOLOGY OF THE STUDY

Multiple Linear Regression

$\ln Yt = \beta0 + \beta1A + \beta2B + \beta3B^2 + \beta4CD + \mu$

Where,

Yt :Income per hour at the time t
β0 :Initial capacity of earning
β1 :Rate of Returns of Education Years
β2 :Rate of Returns to Experience
β3 :Rate of Returns to Experience
β4 :Rate of Returns of Vocational Training
A :Years of Education at time t
B :Years of Experience at the time t
C :Vocational Training at time t
D :Years of Vocational Training at time t
μ :Error Term

Log value of Income per hour is dependent variable and Years of Schooling, Years of Experience, Square of Years of Experience, Vocational Training and Years of Vocational Training are independent variables.

Econometric issues associated with the model, such as heteroscedasticity and multicolinearity, Further Breusch-Pagan test, correlation matrix, Variance Inflation Factor and Shapiro-Wilk test were performed to detect them. To correct the detected econometric issues encountered within the model, White Correction and Principal Component Analysis were performed.

RESULTS AND DISCUSSIONS

Descriptive Statistics

Summarize Log Incomephour edu Experience ExprncSquare VOCTraining

Variable	Obs	Mean	Std. Dev.	Min.	Max
log income	3000	6.217894	.5865296	4.199705	9.21034
Edu	3000	10.09433	3.514952	0	17
Experience	3000	2.4536	1.410746	0	7.1
ExprncSquare	3000	8.009693	8.00328	0	50.41
VOCTraining0	3000	2.609333	8.08813	0	84

Table 1 : Summary Statistics of variables

Source: national labour Survey data 2019

.correlate edu Experience ExprncSquare VOCTraining
(Obs=3000)

Variables	edu	Experi~e	Exprnc~e	VOCTra~g
edu	1000	-	-	-
Experience	-0.5194	1.0000	-	-
ExprncSquare	-0.5497	0.9614	1.0000	-
VOCTraining	0.2577	-0.1334	-0.1346	1.0000

Table 2: Correlation between independent variables

Based on this analysis table 1 result shows that total observations are 3000 and Minimum income is 4.2 as well as 9.2 is maximum income. Mean of income is 6.21. Maximum experience is 74 and Minimum experience is zero.

Table 2 results shows that negative correlated between Experience and Education which is -0.5194 and Negative correlation between Experience square and Education. It has econometrics issues (Multi-collinearity) which mean that Expr2 and Experience correlated value is high 96 percentage positive correlated therefore it has multi-collinearity issues.

RESULTS OF THE STUDY

regress log_Incomephour edu Experience ExprncSquare VOCTraining							
Source	SS	df	MS	Number	of obs	=	3,000
				F(4, 2995)		=	327.30
Model	313.811139	4	78.4527847	Prob >	F	=	0.0000
Residual	717.895812	2,995	.239698101	R-squared		=	0.3042
				Adj R-squared		=	0.3032
Total	1031.70695	2,999	.344016989	Root MSE	=	.48959	
log_Income ~r	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]		
edu	.0870964	.0031258	27.86	0.000	.0809676		.0932253
Experienc e	.2710228	.0230693	11.75	0.000	.2257894		.3162562
ExprncSqu are	-.035767	.00416	-8.60	0.000	-.0439238		-.0276103
VOCTraini ng	.0104977	.0011444	9.17	0.000	.0082539		.0127415
_cons	4.932823	.0456208	108.13	0.000	4.843372		5.022274

Table 3: Multiple linear regression analysis

Mincer equation for the model is,

$$\ln Yt = \beta 0 + \beta 1A + \beta 2B + \beta 3B^2 + \beta 4CD + \mu$$

According to Multiple linear regression analysis of the model,

$\beta 0 = 4.93$
$\beta 1 = 0.087$
$\beta 2 = 0.27$
$\beta 3 = -0.36$
$\beta 4 = 0.01$

Mincer equation rewritten for the Model as,

$$\ln Yt = 4.93 + 0.087A + 027B - 0.36B^2 + 0.01CD + \mu$$

This model explain that P – Value of all independent variable are less than 0.05 p- value which means that all these variables are significant to determine the Income. If other variable is constant income will increase by 4.93 units. Negative relationship between Income and Expr2 which is -0.36 coefficient value this means that one unit increase Expr2 Income will increase by -.36 units.

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of log_Incomephour

chi2(1) = 2.65
Prob > chi2 = 0.1036

Table 4: Breusch-Pagan test for heteroskedasticity

As Heteroscedasticity presents, the null hypothesis is rejected as the chi2 value is greater than p value.

Variables	log_In~r	edu	Experi~e	Exprnc~e
log_Income~r	1000	-	-	-
edu	0.4890	1.0000	-	-

Experience	-0.1078	-0.5194	1.0000	-
ExprncSquare	-0.1677	-0.5497	0.9614	1.0000

Table 5: Correlation matrix test for multicollinearity

Value of 'experience' and 'experience square' is near to 1.0000 (0.9570). Therefore, there is a heteroscedasticity.

variable	skewness	kurtosis
residual	.2931713	3.390408

Table 6: Normality test for residuals

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	Z	Prob>Z
Residual	3000	0.99003	17.071	7.322	0.00000

Table 7: Shapiro-Wilk W test for normality of residuals

Linear Regression			Number of Obs		=	3000
F(3,2996)					=	375.88
Prob > F					=	0.0000
R-squared					=	0.2846
Root MSE					=	.49634
ROBUST						
log_Income~r	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
edu	.0934847	.0031395	29.78	0.000	.087329	.0996404
Experience	.2658994	.0244716	10.87	0.000	.2179166	.3138822
ExprncSquare	-.034784	.0045931	-7.57	0.000	-.04379	-.0257779
_cons	4.900427	.0458233	106.94	0.000	4.810578	4.990275

Table 8: Multiple regression analysis

This results indicate that P– Value which is less than 0.05 therefore all these variables explain above jointly significance as well as this model shows that value of R Squared and Adjusted R Squared is 0.28 this means that 28 percentage of variation in Income could be jointly explain by these independent variables but 72 percentage of variation in Income could be explain by other variables this means that all independent variables are cumulatively determine 28 percentage of Income.

Number of observation: 3000. This is the number of observation used in regression analysis. F (3, 2996): 375.88: F stat for overall significance. It is a joint test of all the slope coefficient. If Pro. > F: is less than 0.05 there is model fit is statistically significance. Therefore this model fit statistically significance so that. Null hypothesis Rejected (H_0) so Alternative Hypothesis Accept. Which mean that there is an impact of formal education and vocational training on returns to education.

R square & Adjusted R square: Coefficient of determination and its adjusted value. These explain in proportion of total variation of Income explained by the regression. Adj. R^2, Adj. R^2 = 0.28 means that 28% of variation of Income is explained by the regression. Root MSE: Square Root of Mean Standard Error of the regression.

TEST THE HYPOTHESIS

Source	SS	df	MS
Model	313.811139	4	78.4527847
Residual	717.895812	2,995	.239698101
Total	1031.70695	2,999	.344016989

H0:

Numbr of obs	=	3,000
F(4, 2995)	=	327.30
Prob > F	=	0.0000
R-squared	=	0.3042
Adj R-squared	=	0.3032
Root MSE	=	.48959

Source	SS	dF	MS
Model	313.811139	4	78.4527847
Residual	717.895812	2995	..239698101
TOTAL	1031.70695	2999	.344016989

log_Income~r	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
edu	.0870964	.0031258	27.86	0.000	.0809676	.0932253
Experience	.2710228	.0230693	11.75	0.000	.2257894	.3162562
ExprncSquare	-.035767	.00416	-8.60	0.000	-.0439238	-.0276103
VOCTraining	.0104977	.0011444	9.17	0.000	.0082539	.0127415
_cons	4.932823	.0456208	108.13	0.000	4.843372	5.022274

There is no impact of formal education and
vocational training on returns to education

H1: There is an impact of formal education and vocational training on returns to education

F value is 327.30

P value is almost 0.000

F value is greater than P value. Therefore, reject the null hypothesis.

The null hypothesis can be rejected, as the z value for the test is greater than that of p-value.

There is an impact of formal education and vocational training on returns to education. And log Value of returns is positively related to the formal education and vocational training. Value of returns is positively related with the formal education and vocational training

Source	SS	df	MS	Number	of obs	=	3,000
				F(4, 2995)		=	327.30
Model	313.811139	4	78.4527847	Prob	> F	=	0.0000
Residual	717.895812	2,995	.239698101	R-squared		=	0.3042
				Adj	R-squared	=	0.3032
Total	1031.70695	2,999	.344016989	Root MSE		=	.48959
log_Income~r	Coef.	Std. Err.	t	P>|t|		[95% Conf. Interval]	
edu	.0870964	.0031258	27.86	0.000		.0809676	.0932253
Experience	.2710228	.0230693	11.75	0.000		.2257894	.3162562
ExprncSquare	-.035767	.00416	-8.60	0.000		-.0439238	-.0276103
VOCTraining	.0104977	.0011444	9.17	0.000		.0082539	.0127415
_cons	4.932823	.0456208	108.13	0.000		4.843372	5.022274

Source	SS	df	MS	Number	of obs	=	3,000
				F(3, 2996)		=	397.32
Model	293.640525	3	97.880175	Prob	> F	=	0.0000
Residual	738.066426	2,996	.246350609	R-squared		=	0.2846
				Adj	R-squared	=	0.2839

Total	1031.70695	2,999	.344016989	Root MSE	=	.49634
log_Income~r	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
edu	.0934847	.0030892	30.26	0.000	.0874275	.0995419
Experience	.2658994	.0233804	11.37	0.000	.2200561	.3117427
p1	-.2783858	.0337414	-8.25	0.000	-.3445444	-.2122272
_cons	4.621818	.0648323	71.29	0.000	4.494697	4.748938

Table 2: Multiple linear regression after correction for Multicolinearity

TEST TO IDENTIFY HETEROSCEDASTICITY

. hottest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity Ho: Constant variance

Variables: fitted values of log_Incomephour

chi2(1) = 2.65

Prob > chi2 = 0.1036

. pwcorr log_Incomephour edu Experience ExprncSquare

log_In~r edu Experi~e Exprnc~e

Source	SS	df	MS	Number of obs	=	3,000
				F(4, 2995)	=	327.30
Model	313.811139	4	78.4527847	Prob > F	=	0.0000
Residual	717.895812	2,995	.239698101	R-squared	=	0.3042
				Adj R-squared	=	0.3032
Total	1031.70695	2,999	.344016989	Root MSE	=	.48959
log_Income~r	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
edu	.0870964	.0031258	27.86	0.000	.0809676	.0932253
Experience	.2710228	.0230693	11.75	0.000	.2257894	.3162562
ExprncSquare	-.035767	.00416	-8.60	0.000	-.0439238	-.0276103
VOCTraining	.0104977	.0011444	9.17	0.000	.0082539	.0127415
_cons	4.932823	.0456208	108.13	0.000	4.843372	5.022274

Table 9: White correction for Heteroscedasticity

Source	SS	df	MS	Number of obs	=	3,000
				F(3, 2996)	=	397.32
Model	293.640525	3	97.880175	Prob > F	=	0.0000
Residual	738.066426	2,996	.246350609	R-squared	=	0.2846
				Adj R-squared	=	0.2839
Total	1031.70695	2,999	.344016989	Root MSE	=	.49634
log_Income~r	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
edu	.0934847	.0030892	30.26	0.000	.0874275	.0995419
Experience	.2658994	.0233804	11.37	0.000	.2200561	.3117427
p1	-.2783858	.0337414	-8.25	0.000	-.3445444	-.2122272
_cons	4.621818	.0648323	71.29	0.000	4.494697	4.748938

As Heteroscedasticity presents, the null hypothesis is rejected as the chi2 value is greater than p value.

Value of 'experience' and 'experience square' is near to 1.0000 (0.9614). Therefore, there is a heteroscedasticity.

TEST TO IDENTIFY MULTICOLINEARITY

. pwcorr log_Incomephour edu Experience ExprncSquare

log_Income~r	1.0000			
edu	0.4890	1.0000		
Experience	-0.1078	0.5194	1.0000	
ExprncSquare	-0.1677	-0.549	0.9614	1.0000

log_Income~r	log_In~r	edu Experi~e	Exprnc~e	
edu	1.0000			
Experience	0.4890	1.0000		
ExprncSquare	-0.1078	-0.5194	1.0000	
vif	-0.1677	-0.5497	0.9614	1.0000

Variable	VIF	1/VIF
ExprncSquare	13.87	0.072105
Experience	13.25	0.075461
EDU	1.51	0.662121
VOCTraining	1.07	0.932952
Mean VIF	7.43	

Mean VIF (7.43) is greater than 5, therefore there is a multicollinearity.
VIF of 'experience' and 'experience square' is greater than 10. It means there is concrete multi/collinearity between 'experience' and 'experience square'.

To overcome econometric problems, correct the model wherever necessary.

Heteroscedasticity Correction

Linear regression				Number of Obs	=	3,000
F(3, 2996)					=	375.88
Prob > F					=	0.0000
R-squared					=	0.2846
Root MSE					=	.49634
Robust						
log_Income~r	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
edu	.0934847	.0031395	29.78	0.000	.087329	.0996404
Experience	.2658994	.0244716	10.87	0.000	.2179166	.3138822
ExprncSquare	-.034784	.0045931	-7.57	0.000	-.04379	-.0257779
_cons	4.900427	.0458233	106.94	0.000	4.810578	4.990275

PRINCIPAL COMPONENT ANALYSIS TO FIX MULTICOLLINEARITY

Principal components/correlation			Number of obs	=	3,000
			Number of comp.	=	2
			Trace	=	2
Rotation: (unrotated = principal)			Rho	=	1.0000
Component	Eigenvalue	Difference	Proportion	Cumulative	
Comp1	1.96144	1.92289	0.9807		0.9807
Comp2	.0385554	.	0.0193		1.0000

Principal components	(eigenvectors)		
Variable	Comp1	Comp2	Unexplained
Experience	0.7071	0.7071	0
ExprncSquare	0.7071	-0.7071	0

Principal components/correlation	Number of obs	=	3,000
	Number of comp.	=	2
	Trace	=	2
Rotation: orthogonal varimax (Kaiser off)	Rho	=	1.0000

Component	Variance	Difference	Proportion	Cumulative
Comp 1	1	4.44089e-16	0.5000	0.5000
Comp 2	1		0.5000	1.0000

Rotated Components

Vairables	Comp 1	Comp 2	Unexplained
Experience	0.0000	1.0000	0
ExperncSquare	1.0000	-0.0000	0

Component rotation matrix

		Comp 1	Comp 2
Comp 1		0.7071	0.7071
Comp 2		-0.7071	0.7071

Source	SS	dF	MS	Number of Obs	=	3000
Model	293.640525	3	97.880175	Prob > F	=	0.0000
Residual	738.066426	2,996	.246350609	R-squared	=	0.2846
Total	1.31.70695	2999	.344016989	Root MSE	=	.49634
log_Income~r	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
Edu	.0934847	.0030892	30.26	0.000	.0874275	.0995419
Experience	.2658994	.0233804	11.37	0.000	.2200561	.3117427
P1	-.2783858	.0337414	-8.25	0.000	-.3445444	-.2122272
_cons	4.621818	.0648323	71.29	0.000	4.494697	4.748938

Using the Principal Components Analysis can be correct multi-colinearity issue.

ANALYSIS

The multiple regression analysis revealed that there is a positive relationship between returns to education and labour market experience in Sri Lanka. The null hypothesis can be rejected, as the z value for the test is greater than that of p-value. There is an impact of formal education and vocational training on returns to education. And log value of returns is positively related with the formal education and vocational training.

Rejection of null hypothesis in the Breusch – Pagan test revealed that heteroskadesticity was there in the model. Multic-ollinearity within the model we identified through correlation matrix and variation influence factor tests. According to them corrections were made in the model.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The Mincer earnings function is the cornerstone of a large literature in empirical economics. Accordingly, a multiple regression analysis was performed to explore the relationship between returns to education and vocational training. The analysis revealed that there is a positive impact on income to the returns to education and vocational training. As there are several influencing factor in the returns to formal education and vocational training, Mincer's original

earnings function doesn't give clear idea as those factors were not considered in the model.

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