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Does Education Pay off in Turkey? An Ordered Logit Approach

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Abstract: This paper investigates the effect of education on individual income in Turkey. To this end, Mincerian (1974) earning equation is estimated in which income as a function of education, age, square of age and sex. Since all of the variables are in the form discrete choices, an ordered logit model is employed. This model lets to calculate probabilities of achieving higher income given education levels that are not provided by the earlier studies of Tansel (1994), Dayıoglu and Kasnakoglu (1997) and Ozcan etc. (2003). The empirical findings show that as education level increases, the probability of achieving higher income raises notably. The finding of highest return for university education for both sexes supports the following view; education should be considered as an investment and individuals should bear the cost of it to some extend.

Keywords: Education, Income, ordered logit

JEL Classification: I20, C25, C35

1. Introduction

Who should bear cost of education? Government, individuals or both? Recently, this question - especially for university education- has become one of the highly debatable issues in Turkey. If education pays off, it could be considered as an investment and individuals should bear the cost of it to some extent. Although the positive relation between education and earnings is one of the well-established facts in economics¹, it is still an empirical matter for Turkey due to a common belief that education does not well pay off. To make a contribution to this issue, this paper investigates the individual returns to education in Turkey. To this end, Mincerian (1974) earning equation is estimated in which income as a function of education, age, square of age and sex. The data set and estimation method is quite different than earlier studies of Tansel (1994), Dayıoglu and Kasnakoglu (1997), Ozcan etc. (2003). In this study, all of the variables are in the form discrete choices that make using an ordered logit model appropriate. This method also allows calculating the probabilities of achieving higher income for each given level of education. These probabilities are not provided by the earlier studies. These are the contribution of the paper to the literature.

The remainder of this paper is as follows. The literature review is in section 2. The data and methodology is presented in section 3. The model and findings are reported in section 4. The final section draws conclusions.

2. Literature Review

The literature for Turkey is limited but suggests that private payoff to education is positive. The empirical studies for Turkey are reported at Table 1. The studies of Tansel (1994), Dayıoglu and Kasnakoglu (1997) use TUIK (Turkey Statistics Institution) data for 1987 and 1994 respectively. Using a probit model both studies found that education affects income positively. Tansel (1994) found that elementary and secondary school appeared to pay off more for women than men. This result is supported by the study of Dayıoglu and Kasnakoglu (1997). They found that education increases female participation in labor force and also it pays off more for women. In a similar vein, Ozcan etc. (2003) examined the education income relation in terms wage earners and owner of their business for the city of Istanbul. They found that returns to education are higher for those who run their own business compare to wage earners. Sarı (2002) estimated the Mincerian earnings equation using a data set for the city of Bolu, in Turkey. He found that returns to education for one year are 12.1 percent and returns to experience are 9.3 percent. He also estimated that a return to education of a year in elementary school is highest and it is lowest for high school.

¹ The most of the empirical studies uses Mincerian (1974) earnings equation in which income is a function of education and experience and square of experience. The studies in 1990's indicate that Mincer's (1974) formulation of the log-linear earnings education relationship fits the data well. Each additional year of schooling increases earnings by 5 to 15 percent. It may change from country to country as well as it changes over time. The United States appeared to be on the high and Sweden on the low end of the distribution (Angrist and Krueger 1991, Krueger and Lindahl, 1999; Harmon and Walker, 1995)

Table 1. Summary of Literature on Education Returns in Turkey.

Author(s)	Data , Methodology and Results
DAYIOĞLU KASNAKOG LU (1997)	DATA: Income and consumption Survey 1987 conducted by TÜİK (Statistic Institute of Turkey).
	METHOD: OLS with Heckman Correction, Mincerian wage equation. Depen. Variable: Log of earnings Independent Variables: Education, Education Dummy, Experience, Location Dummy, Professional dummy, Job performance, Inverse mills ratio
	RESULTS: (i) Return for one year education for women is %12.4 for man %9.98 (when sector dummies added, %8.3 and %7.7 respectively) (ii) For low level of education - no diploma, elementary, and secondary school- return is higher for man than women. For high levels of education returns are more for women. (iii) Return to education changes by region. (more developed markets high rate (%14.1) and less developed market low return (%7.1))
TANSEL 1999	DATA: 1987 Household Budget Survey Conducted by TÜİK.
	METHOD: Multinomial Logit Estimates
	RESULTS: (i) Positive effect from education to income (ii) Highest return to education is women secondary school (%17.8) (iii) For both sex, highest return to education is university degree (Man: %13, Women: %15)(iv) For both sex, lowest return to education is for elementary school (man: %1.9 women: %3.2)
UCDOGRUK 2000	DATA: 1994 Household Income Survey by TÜİK
	METHOD: OLS and EGLS with Heckman (1979) correction with Mincerian Wage Equation Depen. Variable: Log of earnings Independent Variables: Education Time, Age, Age Square
	RESULTS: (i) Return to education varies between man :%6-8 to women %7-12 (High developed areas high return) (ii) Education brings higher return for women in less developed provinces compared to more developed ones (explanation: traditions prohibit women to work therefore less participation of women in labor market gets higher return) (iii) Married earn more income than unmarried
SARI 2002	DATA: 2000 Survey of Households Income Distribution of City of Bolu
	MODEL: Mincerian Wage Equation Depen. Variable: Log of earnings Independent Variables: Education Time, Experience, Location Dummy, Elementary School Dummy, Secondary School dummy, High School Dummy, University Dummy, Sex Dummy
	RESULT: (i) Return to one year education is 12.1% (ii) Return to experience of one year %9.3 and %8.9 support idea of education is the most important factor that explains the income

3. The Data and Methodology

The data for this study is taken from the World Value Survey (WVS)². The survey conducted in Turkey is organized by Boushrup University in Istanbul. The variables that are used in this study are shown in Table A1 at the appendix. In many economic applications, the dependent variable is discrete and represents an outcome of a choice between a finite set of alternatives. A number of qualitative response models deal with this characteristic of the dependent variable (Amemiya, 1981; Greene, 1997). Further, in some applications, there are multinomial choice variables that are naturally ordered. In this application, naturally ordered income variable is used as the dependent variable. Even though the underlying dependent variable is continuous, only the discrete responses are observed. Therefore, it is appropriate to employ an ordered logit modeling framework to examine the effect of education, age and sex on income. The model employed by Zavoina and McElvey (1975), as discussed by Greene (1997), is also used in this study.

² WVS: World Value Survey. This survey is organized by Ronald Inglehart. First survey was conducted in 1981 among the 24 industrialized countries. Second is repeated 1990-91 by adding 21 new countries. Third one was conducted in 1995 and 1996 among the 42 countries. The survey of 2000 and 2001 included many developing countries (Hjerpe, 2003:7).

The ordered logit model is built around a latent regression, where y_i^* is the unobserved dependent variable, x a vector of explanatory variables, β an unknown parameter, vector and ε the error term.

$$y_i^* = \beta' x_i + \varepsilon_i \quad (1)$$

Instead of y_i^* , the following is observed.

$$\begin{aligned} y = 1 & \quad \text{if} \quad \mu_0 \leq y^* < \mu_1 \\ y = 2 & \quad \text{if} \quad \mu_1 \leq y^* < \mu_2 \\ y = 3 & \quad \text{if} \quad \mu_2 \leq y^* < \mu_3 \\ & \quad \cdot \\ & \quad \cdot \\ y = J & \quad \text{if} \quad \mu_{j-1} \leq y^* \end{aligned}$$

Where y is the category of income per month ranked into 6 categories, u is the vector of unknown threshold parameters, estimated with the β vector, ε is assumed to have a standard logistic distribution. Consequently;

$$\Pr[y_i = j] = \Pr[y^* \text{ is in the } j \text{ th range}]$$

Hence the probability of observing an outcome may be written:

$$\Pr[y_i = j] = F[\mu_j - \beta' x_i] - F[\mu_{j-1} - \beta' x_i] \quad (2)$$

Where $F(\cdot) = \exp(\cdot) / [1 + \exp(\cdot)]$. This implies that:

$$\Pr[y_i = j] = \frac{1}{1 + e^{-u_j + \beta' x_i}} - \frac{1}{1 + e^{-u_{j-1} + \beta' x_i}} \quad (3)$$

The above equation can be used to derive a likelihood function and, subsequently, maximum likelihood estimates of μ and β . Income equation is estimated in this way.

4. Model and Results

Following to the relevant literature, Mincerian (1974) earning equation is used in this study. The model that is to be estimated is as follows.

$$Income_i = \alpha_1 Education_i + \alpha_3 Age_i + \alpha_4 Age_i^2 + \alpha_5 Sex_i + \varepsilon \quad i = 1, 2, \dots, n \quad (4)$$

According to this model individual income is expected to be positively affected by individual's education level. Experience is measured by age and represented by a linear and a quadratic term to capture the nonlinearity in the earnings profile. Age is used as a proxy for experience. Sex variable is used to determine to gender effect on income. ε is the random error term. Besides education and experience, there may be other factors that could affect individual's income such as inheritance, personal abilities, luck etc. However, the data set does not include these factors. In order to compare the returns for different education levels education variable is splitted into dummy variables and the following model is developed.

$$Income_i = \alpha_0 No-Diploma_i + \alpha_1 Elementary_i + \alpha_2 Secondary_i + \alpha_3 HighSchool_i + \alpha_4 University_i + \alpha_5 Age_i + \alpha_6 Age_i^2 + \alpha_7 Sex_i + \varepsilon_i \quad (5)$$

Table 1 displays the results of ordered logit model estimation for equation 4 and 5 respectively. In terms of explanatory power both models are satisfactory, χ^2 and likelihood diagnostic statistics are similarly acceptable. A certain amount of care is necessary for the interpretation of coefficients of ordered logit equations. A positively signed coefficient implies an increase in the log of the odds ratio or higher values of explanatory variables imply greater income level.

The results confirm the basic prediction of Mincerian earning equation. Linear and quadratic terms in experience have the expected positive and negative signs respectively. All education variables have positively signed and statistically significant at 1% significance level. As the education level goes from elementary school to university education, the coefficients increases markedly. A rise in education will increase individual's income and it is lowest for elementary school graduates and highest for university graduates. This result is consistent with Tansel (1999:462). A negatively signed sex variables indicates that for woman makes more money than man who have same education level and age.

Table 1. Achieved Income: Ordered Logit Analysis

Dependent Variable: Level of Income Achieved(y=1,2,3,4,5 6)					
Model 1			Model 2		
Variables	Coeffi.	P value	Variables	Coeffi.	P value
Education	.84639	0.000	Elementary S.	.9405604	0.000
Age	.04352	0.000	Secondary S.	1.691313	0.000
Age ²	-.00042	0.003	High School	2.483608	0.000
Sex	-.30551	0.000	University	3.557864	0.000
Education			Age	.0376546	0.002
			Age ²	-.0003586	0.013
			Sex	-.3042002	0.000
Num.of Obser.	4161			4161	
Log Likelihood	-4545.44			-4642.21	
Pseudo R ²	0.1000			0.1005	
LR chi2	1031.86			1037.91	

Note. Due to multicollinearity, *no diploma* variable is omitted.

The probability distributions of achieved income for males and females, making use of equation 5 are shown in Table 2. The results show that no diploma and elementary school education have the highest probability of fit in the very low income category. The probability of earning high and very high income is less than 1 % for males and females at the age of 36 that is a quite low probability. On the other hand University graduates have highest probability of earning high and very high income comparing to other education levels. For university graduates of males and females, the probability of earning upper middle, high and very high income is becoming higher and higher as it is compared with lower education levels. For example, University graduates of females have 28.6 percent probability of fit in the middle income category whereas no diploma females only have 2.95 percent probability of having the same income level. All these results are obvious indication of positive effect of education on income. If the results are analyzed in terms of gender differences it is clear that educated females have more probability of earning

middle income and above than the reference males. This result is supported by the findings of Dayıoglu and Kasnakoglu (1997:347).

Table 2. Predicted Probabilities of Achieved Income

	Pr[Y= 1]	Pr[Y= 2]	Pr[Y= 3]	Pr[Y= 4]	Pr[Y= 5]	Pr[Y=6]
<i>Predicted Probabilities (%)</i>	Very Low Inc.	Low Inc.	Middle Inc.	Upp. Midd. In.	High Inc.	Very High In.
Male, Age: 36						
If No Diploma	74,3	22,4	2,21	0,46	0,31	0,23
If Elementary	53,0	0,03	5,31	1,16	0,79	0,59
If Secondary	34,8	4,98	10,0	2,35	1,65	1,25
If High School	19,4	51,9	17,6	4,72	3,47	2,72
If University	7,62	38,4	2,75	10,2	8,62	7,58
Female Age 36						
If No Diploma	68,1	27,5	2,95	0,62	0,42	0,31
If Elementary	45,4	44,1	6,94	0,15	1,07	0,80
If Secondary	28,2	52,0	1,27	3,10	2,20	1,69
If High School	15,1	49,7	20,8	6,03	4,55	3,65
If University	5,74	32,9	28,6	11,9	10,7	10,0

Note: Probabilities changed into percentages. Every probability row has to add up to 100. These probabilities are calculated for people who are 36 years old since it's the sample mean.

5. Conclusion

This paper investigated the effect of education on individual's income in Turkey. Income is defined as a function of education, experience and sex by following the Mincerian (1974) earning equation. The data set and estimation technique used in this study is quite different than the earlier studies of Tansel (1994), Dayıoglu and Kasnakoğlu (1997), Ucdogruk etc (2000) and Sarı (2002). Nevertheless, ordered logit results supports the findings of the relevant literature. Returns for education appear to be high in Turkey. This result supports the idea of liberal view on education. That is, individuals should bear the cost of education to some extent. It should also be stated that education does not only affect individual's income. Education also provides better working conditions, educated people's kids also more likely to have more education, more educated people can make rational choices related health, environment, and neighborhood issues. All these factors could also be seen non-money benefits of education that positively affects living standards.

The weaknesses of the study are as follows. First, the quality of schools may generate some differences that couldn't be measured due to available data set. Second, working conditions could affect employment choices. Educated people may accept working in public sector because of better working conditions where earning are lower than private sector. These issues are left for further research.

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Appendix A

Table A1. Variables and Descriptive Statistics

VARIABLE		N	MIN	MAX	MEAN	
S	Measurement				N	
INCOME	Categorical:	Total	7251	1	10	3,58
	1. 'Monthly 0-200 NTL' (Very Low)	Man	3607	1	10	3,56
	2. '201 -500 NTL' (Low)	Women	3644	1	10	3,60
	3. '501-750 NTL' (Middle)					
EDUCATION	4. '751 -1000 NTL' (Upper Middle)	Total	7197	1	5	2,59
	5. '1001-1500 NTL' (High)	Man	3630	1	5	2,80
	6. '1500and more' (Very High)	Women	3644	1	5	2,38
AGE	Contininuous Varibale 17 to 91	Total	7521	17	91	36,49
		Man	3630	17	88	36,84
		Women	3769	17	91	36,14
SEX	DUMMY 1: Man 0: Women	3769	3775			

Note: NTL is New Turkish Lira. In Turkish education system, Elementary School is five years and compulsory. Secondary school is 3 years, High school is 3-4 years and University 4-5 years. Since 1997 Turkish education sytem mandates 8 years, elementart plus secondary.