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# WAGE EMPLOYMENT, EARNINGS AND RETURNS TO SCHOOLING FOR MEN AND WOMEN IN TURKEY

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## Abstract

This study estimates an earnings function for urban wage earners in Turkey together with a wage earner choice equation. Male and female wage earners are treated separately so as to identify the differential returns to these groups. Individual and household unearned incomes are used to identify the model which is estimated by maximum likelihood estimation providing consistent and efficient parameter estimates. Returns to education are found to increase with the level of schooling for both men and women wage earners. Returns to women are somewhat smaller than those to men. The highest returns are observed for the younger cohort of men which may be an indication of recent higher demand for educated personnel. Vocational and technical high school graduate men have not only a higher probability of working as wage earners but also significantly higher returns than general high school graduates. This suggests a policy of expansion of such educational opportunities.



Key Words: Wage Earners, Returns to Schooling, Gender

# I. INTRODUCTION

The recent literature on development views human capital investment not only as a means for increasing labor productivity and growth but also for improving income and earnings distribution. This study provides additional evidence on the importance of education in determining the individual's productivity. Earnings functions for urban men and women wage earners in Turkey are estimated along with the wage earner choice equations using 1987 household income and expenditure survey. The potential selection bias is treated by identifying the selection equation with individual and household unearned income variables. The system is estimated by the method of maximum likelihood providing consistent and efficient parameter estimates. The wage earner participation probabilities and the returns to education for men and women at different levels of education are evaluated and compared. Education is found to be an important determinant of participation into wage employment and wage earnings. Returns to education are observed to increase with level of schooling for both men and women suggesting an expansion of educational opportunities at the university level. Returns to women are somewhat smaller than those to men at all levels of education. The returns are highest for the younger cohort of men, which may be an indication of recent higher demand for the educated workers. An important finding is that the returns are significantly higher for vocational and technical high school education than for general high school education for men wage earners. This suggests an expansion of vocational and technical educational opportunities.

The paper is organized as follows. The structure of education in Turkey is discussed in the next section. Section III presents specification of the wage earner choice equation and the logarithmic earnings equation along with comments on the estimation strategy. The various characteristics of the data used are discussed in Section IV. Estimation results appear in Section V. Section VI concludes.

## II. STRUCTURE OF EDUCATION

The formal educational system of Turkey consists of primary school, middle school, high school and university. The primary school is the only compulsory education and gives five years of training. Middle school provides an additional three years of education. High school could be a general high school with an additional three years of education, or a vocational and technical high school (henceforth referred to as vocational high school) with three or four years of additional training, depending on the program of study.[1] University education requires, in general, an additional four years of study. Formal education is provided by the government free of charge at all levels, although at all levels private schools exist. Public schools function under the ministry of education. Some of the vocational high schools are under a related ministry. There are also privately operated, but ministry of education approved, centers which provide curricula in secretarial skills and computers. General high schools offer a curriculum preparing students for university education. On the other hand, vocational high schools offer technical education as well as general education providing a general high school equivalent diploma. A system of private tutorial centers operate all over the country and prepare high school students explicitly for university entrance examination.

Enrollments in vocational high schools constituted about 50 percent of the total enrollments at high school level throughout the 1970's and 1980's.[2] Entry into some of the vocational high school programs such as electronics is restricted via examination. There is excess demand for free university education, and vocational and general high school graduates take part in competitive examination to enter the university. Out of about 900 thousand participants of the two tier examination in 1990 about 22 percent were admitted to a university.

There was an expansion of educational opportunities in the early 1960's. In the early 1970's a number of private, university equivalent, four-year institutions called an "academy" were established. Tertiary level enrollments increased by 17 percent annually during that period, and declined by 4 percent annually due to political instability in the late 1970's. The university system was consolidated in the public hands in 1982. Since then the annual rate of

increase of enrollments has been about 14 percent.[3] According to the World Bank (1991) current primary school enrollments as percentage of the respective age group (the enrollment ratio) is a hundred for both men and women. The overall secondary school (middle and high schools) enrollment ratio increased from 16 percent in 1965 to 46 percent in 1987, while for women they were 9 and 36, respectively. The tertiary level enrollment ratio went up from 4 percent in 1965 to 10 percent in 1987. Has the increased supply of educated labor lowered the returns from education?

## III. THE MODEL

For the earnings equation the conceptual framework used is the human capital model of earnings determination developed by Becker (1964) and Mincer (1958, 1974). According to this model observed wage differences among individuals are the result of labor productivity differences due to the human capital they possess and their work experience. Human capital is summarized by education and training. The following relationship is postulated:

(1) $\log \text{wage} = \beta' X + \varepsilon$

where $X$ includes education, post schooling experience, training and other exogenous socio-economic factors, and $\varepsilon$ is the random error term. Logarithmic wage function provides a better fit than linear wage function as demonstrated by Polacheck and Heckman (1974). Since hours of work is not observed (natural logarithm of the) monthly earnings of wage earners is used as the dependent variable in this study although, theoretically, hourly wage rate is the preferred dependent variable. Self employed and other groups are excluded due to the difficulty in obtaining comparable earnings measures for them.[4]

Above relationship is observed only for wage earners which is a subpopulation rather than a random sample. Biases are likely to result if it is treated as a random sample. Thus the process generating the observations on wage earners is needed. People become wage earners when their expected wage exceeds the opportunity cost of alternative activities. The difference between the market wage offer and productivity in alternative nonwage activities

determines the probability of participating in wage employment (Heckman (1974)). This is represented by the following wage earner choice relationship:

$$W^* = \alpha' V + u$$

where $W^*$ is an unobserved variable reflecting a person's occupational choice into wage employment. $V$ is a vector of individual, family or community characteristics that influence this choice and $u$ is a random error term. The observed counterpart of $W^*$ is a binary variable, $W$ which is equal to 1 if $W^*$ is positive and consequently the person is a wage earner and zero otherwise. $\varepsilon$ and $u$ have a bivariate normal distribution with respective variances of $\sigma_\varepsilon^2$ and $\sigma_u^2$ where the latter is normalized to one. The correlation coefficient between $\varepsilon$ and $u$ is denoted by rho. Then, we have the following probit specification:

$$(2) \qquad \text{Prob}(W = 1) = \text{Prob}(u > -\alpha' V) = F(\alpha' V)$$

where $F$ is the cumulative density function of $u$. The maximum likelihood estimate of the system of equations (1) and (2) provides consistent and efficient parameter estimates. Schultz (1990, 1991) suggests use of unearned income or property income as identifying variables in the probit equation. They are assumed to rise the shadow value of a person's time in nonmarket and self-employment activities and as a result reduce their probability of participation as a wage earner. The two such variables used in this study are individual unearned income, and unearned income of other household members. The other explanatory variables that are common to both equations are as follows.

The experience variable is represented by a linear and a quadratic term to capture the nonlinearity in the earnings profile. Experience is computed as age minus the number of years of schooling minus the age of entry into school (Mincer (1974)). To examine the differential impact of the type of schooling, six levels of schooling are distinguished including general and vocational curricula at the high school level. These categories are: primary school non-graduates, primary school graduates, middle school graduates, high school graduates, vocational high school graduates, and finally the university graduates. These levels are repre-

sented by five dummy variables, where the excluded category is nongraduates. The experience and education coefficients are expected to be positive except the coefficient on the quadratic experience term.

Dummy variables for regions of residence are included to allow for differences in labor market opportunities such as local market wages and prices. Dummy variables representing the months in which the individuals were interviewed are also included because of seasonal variation in wage and nonwage employment opportunities. Cohort dummy variables for the age groups of under 25, 25-44 and over 44 are additional controls included in the equations. Interaction terms between age, education and experience are included to account for the fact that additional schooling increases post schooling participation although with a delay. The effects of innate ability, post schooling training and quality differences in education received are not taken into account due to data limitations.

## IV. DATA

The data used in this study comes from a nationwide household income and expenditures survey of Turkey conducted by the State Institute of Statistics in 1987. A ten percent random sample is acquired from this survey. Since it included only a few rural wage earners, the sample is further restricted to urban individuals, aged 15-64, who reside in locations of 20,000 or more population. The households were interviewed three times a week for four weeks. The enumerators then moved on to a different series of households in the following month, in each month throughout 1987. Only those wage earners who were not secondarily employed are included in the final analysis so as to obtain a presumably more homogenous group in terms of the number of hours worked. Table 1 shows the distribution by education, age and gender. There are wide differences in the educational attainments of men and women favoring men. Persons who did not graduate from primary school are three times more women than men, 33 compared with 11 percent, respectively. The percents of persons with at least a high school diploma also differ widely for men and women: 25 and 14 respec-

tively. While 6 percent of men aged 15-24 did not graduate from primary school, the same figure is 28 percent in the men of the 45-64 group. Similarly, women who did not graduate from primary school are 14 percent in the 15-24 age group and 63 percent in the 45-64 age group.[5] On average, women have a third fewer years of schooling than men. The mean years of education are 6.72 and 4.53 years for men and women, respectively.

TABLE 1
Distribution by Education, Age and Gender (%)

| | 15-24 | 25-44 | 45-64 | All Ages |
|---|---|---|---|---|
| Men: | | | | |
| Non-graduate | 6 | 5 | 28 | 11 |
| Primary School | 43 | 49 | 53 | 48 |
| Middle School | 28 | 13 | 7 | 16 |
| High School | 19 | 15 | 4 | 14 |
| Vocational High | 3 | 4 | 2 | 3 |
| University | 1 | 13 | 6 | 8 |
| Total | 100 | 100 | 100 | 100 |
| Total Observations | 701 | 1102 | 587 | 2390 |
| Women: | | | | |
| Non-graduate | 14 | 31 | 63 | 33 |
| Primary School | 54 | 47 | 29 | 45 |
| Middle School | 15 | 5 | 4 | 8 |
| High School | 15 | 10 | 2 | 10 |
| Vocational High | 1 | 3 | 2 | 2 |
| University | 2 | 4 | 0 | 2 |
| Total | 100 | 100 | 100 | 100 |
| Total Observations | 865 | 1109 | 619 | 2593 |

Table 2 pertains to the subsample of wage earners and shows their distribution by education, age-group and gender. Contrary to what is observed in Table 1, the differences in educational attainments of men and women wage earners favor women. Clearly, women's participation in wage employment increases more with their education than it does for men. In general, women wage earners have higher educational levels than their male counterparts. While only 20 percent of men wage earners have a high school or equivalent diploma, the

TABLE 2

Distribution by Education, Age and Gender for the Subsample of Wage Earners (%)

| | 15-24 | 25-34 | 45-64 | All Ages |
|---|---|---|---|---|
| Men: | | | | |
| Non-graduate | 5 | 3 | 26 | 6 |
| Primary School | 60 | 47 | 50 | 50 |
| Middle School | 16 | 12 | 4 | 12 |
| High School | 14 | 17 | 5 | 15 |
| Vocational High | 4 | 5 | 6 | 5 |
| University | 2 | 16 | 9 | 12 |
| Total | 100 | 100 | 100 | 100 |
| Total Observations | 195 | 572 | 117 | 884 |
| Women: | | | | |
| Non-graduate | 2 | 8 | 53 | 10 |
| Primary School | 40 | 23 | 26 | 28 |
| Middle School | 5 | 10 | 5 | 8 |
| High School | 40 | 29 | 5 | 30 |
| Vocational High | 2 | 11 | 11 | 8 |
| University | 12 | 20 | 0 | 16 |
| Total | 100 | 100 | 100 | 100 |
| Total Observations | 58 | 130 | 19 | 207 |

same percentage for women wage earners is 38. The university graduates make up 12 percent of men wage earners and 16 percent of women wage earners. The differences are more pronounced in the youngest age group of 15-24 where high school or equivalent graduates make up 18 and 42 percent of men and women wage earners, respectively, although at this young age schooling may not be completed yet. On average, a woman wage earner has 8.6 years of education which is higher than that for her male counterpart who has 7.4 years.

## EARNINGS AND UNEARNED INCOMES

Earnings include both cash and in-kind payments for wage employment. Since the households were interviewed at different months throughout 1987, during which the annual national rate of inflation was about 50 percent, the earnings (and other monetary figures) are

deflated by the local monthly consumer price index (CPI). Households in 14 major cities are assigned the monthly CPI's for those cities, and households in other locations are assigned the urban CPI for one of the five regions in which they are located.[6] Table 3 provides mean monthly earnings in Turkish Liras (henceforth referred to as Liras) by education, age and gender for wage earners. In general, mean earnings increase with education at all age groups. Mean earnings also increase with age at all education levels. A comparison between earnings of men and women wage earners shows that mean earnings of women are substantially lower than those of men at all educational levels.

TABLE 3

Mean Monthly Earnings by Education, Age and Gender for Wage Earners in Liras, Turkey, 1987*

| | 15-24 | 25-44 | 45-64 | All Ages |
|---|---|---|---|---|
| Men: | | | | |
| Non-graduate | 30.57 | 45.76 | 41.73 | 40.89 |
| Primary School | 27.86 | 46.77 | 51.65 | 42.47 |
| Middle School | 28.03 | 51.06 | 64.19 | 44.94 |
| High School | 33.14 | 59.16 | 145.13 | 57.71 |
| Vocational High | 50.85 | 66.01 | 85.20 | 66.30 |
| University | 61.95 | 106.01 | 163.03 | 110.77 |
| All Levels | 30.23 | 59.68 | 66.91 | 54.13 |
| Women: | | | | |
| Non-graduate | 6.84 | 30.21 | 24.40 | 26.33 |
| Primary School | 20.73 | 24.56 | 48.35 | 25.09 |
| Middle School | 16.95 | 41.69 | 54.58 | 38.08 |
| High School | 26.72 | 54.67 | 138.50 | 45.50 |
| Vocational High | 34.21 | 43.90 | 44.53 | 43.40 |
| University | 48.21 | 74.09 | -- | 68.60 |
| All Levels | 26.22 | 47.27 | 40.41 | 40.73 |

*1978-79 is the base. See text for details.
-- no observation.

Unearned income includes rental and interest incomes. The nominal figures are deflated by the city and regional monthly CPI's, as with wages. In the probit equation specification, the unearned income of the individual and unearned income of the other household

TABLE 4
Means and Standard Deviations of Variables by Gender, Turkey, 1987

| | Men | | Women | |
|---|---|---|---|---|
| | Mean | St. Deviation | Mean | St. Deviation |
| Dependent Variables: | | | | |
| Wage Earner | .371 | .483 | .080 | .271 |
| Log Wage | 1.805 | 1.930 | .340 | 1.050 |
| Explanatory Variables: | | | | |
| Experience | 20.285 | 14.631 | 21.382 | 15.244 |
| Experience Square | 625.280 | 739.260 | 689.520 | 803.090 |
| Education: | | | | |
| Non-graduate | .111 | .314 | .330 | .470 |
| Primary School | .483 | .500 | .449 | .498 |
| Middle School | .160 | .366 | .084 | .277 |
| High School | .135 | .342 | .095 | .293 |
| Vocational High | .034 | .180 | .019 | .138 |
| University | .079 | .269 | .023 | .151 |
| Unearned Income | 9.640 | 24.543 | 1.349 | 8.850 |
| Unearned Household Income | 7.281 | 21.165 | 16.191 | 31.397 |
| Age under 25 | .293 | .455 | .334 | .472 |
| Age 25-44 | .462 | .500 | .428 | .495 |
| Age over 44 | .245 | .430 | .239 | .427 |
| Interaction Terms: | | | | |
| Experience*Age 25-44 | 8.631 | 10.418 | 8.897 | 11.413 |
| Experience*Age over 44 | 10.124 | 18.095 | 10.372 | 18.803 |
| Primary*Age 25-44 | .226 | .418 | .201 | .401 |
| Middle*Age 25-44 | .062 | .241 | .023 | .151 |
| High*Age 25-44 | .070 | .255 | .048 | .200 |
| Vocational High*Age 25-44 | .020 | .141 | .014 | .117 |
| University*Age 25-44 | .061 | .239 | .017 | .129 |
| Primary*Age over 44 | .131 | .338 | .070 | .255 |
| Middle*Age over 44 | .016 | .125 | .009 | .096 |
| High*Age over 44 | .008 | .091 | .005 | .068 |
| Vocational High*Age over 44 | .006 | .077 | .004 | .062 |
| University*Age over 44 | .014 | .119 | .001 | .028 |
| Cities: | | | | |
| Ankara | .068 | .251 | .060 | .237 |
| Istanbul | .096 | .294 | .091 | .288 |
| Izmir | .051 | .221 | .045 | .206 |
| Regions: | | | | |
| Aegean-Marmara | .336 | .473 | .329 | .470 |
| Mediterranean | .123 | .329 | .127 | .331 |
| Central-Anatolia | .211 | .408 | .209 | .407 |
| East-South-East | .232 | .422 | .235 | .424 |
| Black Sea | .097 | .300 | .101 | .301 |
| Sample Size | 2382 | | 2587 | |

members are used as identifying variables to correct for the sample selection bias that could be introduced by analyzing productivity of labor functions only for wage earners. Among all the respondents, 38 percent of men and 5 percent of women had unearned income. The mean unearned income was 9.64 Liras for men and 1.35 Liras for women as shown in Table 4. On the other hand, 24 percent of men and 64 percent of women reported unearned income for the other household members where the mean magnitudes were 7.28 Liras for men and 16.19 Liras for women. Similar figures hold for the subsample of wage earners as can be observed in the Appendix Table 1.

## V. ESTIMATION RESULTS

This section presents the empirical results for the choice of wage earner status and logarithmic earnings model. The joint maximum likelihood estimation (MLE) of these equations is reported for men and women separately. We then compare the choice corrected MLE of the log earnings equations with their ordinary least squares (OLS) estimates to ascertain the bias in the estimates which results from analyzing productivity only for wage earners. Cohort effects are examined by including dummy variables for ages and the appropriate interaction terms.

Table 4 shows the means and standard deviations of variables used in the analysis, by gender. Table 5 displays the joint MLE of a probit for wage earner and log earnings equations for men. The implied marginal effect of each variable on the probability of becoming a wage earner evaluated at the mean values of the variables are given in column 3 of the same table. The results indicate that the years of experience (measured as age − schooling − seven) enter the probit wage earner equation with highly significant linear and quadratic terms as well as the highly significant interaction terms with cohort variables. An additional year of experience increases the probability of being a wage earner by 8-9 percent in all cohorts. This probability peaks at age 33 for the 25-44 cohort and rises to the limits of the cohort group for the other cohorts. The education variables and their interaction with cohort variables are

TABLE 5
Joint Maximum Likelihood Estimates of a Probit for Wage Earner and Logarithmic Earnings Equations for Men, Turkey, 1987

| Variable | Probit Wage Earner | | | Logarithmic Monthly Earnings | |
|---|---|---|---|---|---|
| | Coefficient | *t*-Ratio[a] | Marginal Effect | Coefficient | *t*-Ratio[a] |
| Intercept | -1.501 | 4.382 | -.543 | 1.185 | 3.489 |
| Experience | .224 | 3.833 | .081 | .208 | 4.453 |
| Experience Square | -.011 | 2.729 | -.004 | -.005 | 1.551 |
| Primary School | .599 | 2.170 | .186 | .428 | 2.734 |
| Middle School | .315 | 1.004 | .088 | .835 | 4.747 |
| High School | .433 | 1.346 | .127 | 1.176 | 6.247 |
| Vocational High | 1.169 | 2.523 | .409 | 1.944 | 6.681 |
| University | 1.074 | 2.040 | .372 | 2.072 | 7.367 |
| Unearned Income | -.006 | 4.596 | -.002 | | |
| Unearned Household Income | -.006 | 3.847 | -.002 | | |
| Age 25-44 | .931 | 1.899 | .123 | 1.132 | 3.484 |
| Age over 44 | 4.082 | 1.711 | .958 | -1.053 | .702 |
| Experience*Age 25-44 | -.189 | 2.810 | -.068 | -.128 | 2.606 |
| Experience*Age over 44 | .287 | 2.174 | -.104 | -.009 | .102 |
| Experience 2*Age 25-44 | .010 | 2.450 | .004 | .003 | 1.104 |
| Experience 2*Age over 44 | .011 | 2.521 | .004 | .002 | .563 |
| Primary*Age 25-44 | -.023 | .066 | -.008 | -.231 | .976 |
| Middle*Age 25-44 | .273 | .690 | .105 | -.407 | 1.563 |
| High*Age 25-44 | .373 | .921 | .144 | -.518 | 1.941 |
| Vocational*Age 25-44 | -.119 | .218 | -.043 | -1.176 | 3.464 |
| University*Age 25-44 | -.141 | .242 | -.050 | -.772 | 2.341 |
| Primary*Age over 44 | -.904 | 2.797 | -.246 | -.372 | 1.763 |
| Middle*Age over 44 | -.942 | 2.115 | -.252 | -.624 | .877 |
| High*Age over 44 | -.558 | 1.056 | -.174 | -.490 | 1.818 |
| Vocational*Age over 44 | -1.076 | 1.693 | -.272 | -1.296 | 3.397 |
| University*Age over 44 | -1.502 | 2.376 | -.312 | -.755 | 2.085 |
| Ankara | .427 | 3.330 | .157 | .113 | 1.729 |
| Istanbul | .123 | 1.168 | .042 | .205 | 3.400 |
| Izmir | .355 | 2.596 | .129 | .107 | 1.365 |
| Sigma/Rho | .502 | 12.824 | | .496 | 2.405 |
| -Log Likelihood | | | 1833 | | |
| Sample Size | 2383 | | | 884 | |

[a]Absolute value of the asymptotic *t*-ratio.

TABLE 6

Joint Maximum Likelihood Estimates of a Probit for Wage Earner and Logarithmic Earnings Equations for Women, Turkey, 1987

| | Probit Wage Earner | | | Logarithmic Monthly Earnings | |
|---|---|---|---|---|---|
| Variable | Coefficient | *t*-Ratio[a] | Marginal Effect | Coefficient | *t*-Ratio[a] |
| Intercept | -2.408 | 8.164 | -.205 | 2.820 | 2.477 |
| Experience | .026 | 1.351 | .002 | .057 | 2.387 |
| Experience Square | -.001 | 1.429 | -.4E-3 | -.001 | 2.192 |
| Education: | | | | | |
| Primary School | .329 | 2.031 | .017 | .157 | .784 |
| Middle School | .722 | 3.259 | .507 | .690 | 1.943 |
| High School | 1.522 | 7.108 | .238 | .881 | 1.686 |
| Vocational High | 1.583 | 6.174 | .258 | .750 | 1.468 |
| University | 2.226 | 8.409 | .500 | 1.351 | 1.853 |
| Unearned Income | -.003 | .672 | -.000 | | |
| Unearned Household Income | -.009 | 3.836 | -.001 | | |
| Age 25-44 | .187 | 1.008 | .016 | .069 | .367 |
| Age over 44 | .022 | .068 | .002 | .322 | 1.005 |
| Cities: | | | | | |
| Ankara | .018 | .084 | .001 | -.183 | .830 |
| Istanbul | .236 | 1.552 | .023 | .467 | 3.253 |
| Izmir | .437 | 2.864 | .051 | -.130 | .633 |
| Sigma/Rho | .564 | 7.332 | | -.208 | .295 |
| -Log Likelihood | | | 718 | | |
| Sample Size | 2587 | | | 207 | |

[a]Absolute value of the asymptotic *t*-ratio.

jointly significant although several individual terms are insignificant. The omitted education category of non-graduates consists of those who may be illiterate or literate but, do not have a primary school diploma. A primary school graduate under 25 has about 19 percent higher probability of being a wage earner as compared to a non-graduate, while the same probabilities are 13, 37 and 41 percent, respectively, for the high school, vocational high school and university graduates. Thus, a vocational high school graduate is more than three times as

likely to be a wage earner as compared to a high school graduate. For the older cohorts the contribution of each level of education to the probability of being a wage earner are somewhat lower.

The individual unearned income and the household unearned income both have the expected signs and reduce the likelihood of being a wage earner. Although the coefficient estimates are small, both variables are significant and aid in the identification of the model. The estimated coefficients indicate that one standard deviation increase in the unearned income of the individual reduces the probability of wage employment by about 14 percent, while the same effect of the household unearned income is 11 percent, somewhat smaller.[7]

The dummy variables for place of residence are included to allow for local differences in labor markets, local wages, or prices. The estimated coefficients are jointly significant at 1 percent level. Men in Ankara have about 16 percent higher probability of being wage earner as compared to men in the rest of the country, while the same probabilities are about 4 and 13 percent, respectively, for the residents of Istanbul and Izmir.[8]

## THE LOGARITHMIC EARNINGS EQUATION

The joint MLE of the logarithmic monthly earnings equation for men is shown in Table 5. The years of experience variable enters with linear and quadratic terms which are significant with expected signs. An additional year of experience increases earnings by about 21 percent for the under 25 cohort. For the older cohorts the effects of experience on earnings decline. Earnings increase by 8 and 20 percent, respectively, for the 25-44 and over 44 cohorts with an additional year of experience. For the under 25 cohort earnings peak at 22 years of experience or 36 years of age. For the 25-44 cohort earnings reach a peak at 30 years of experience or 45 years of age, while for the over 44 cohort peak earnings occur at 34 years of experience which corresponds to 47 years of age.

The education variables and their interactions with cohort variables are jointly significant. The effect on earnings of different education levels are all positive as compared to a

TABLE 7

Ordinary Least Squares Estimates of Logarithmic Monthly Earnings Equations for Men and Women Wage Earners, Turkey, 1987

| | Men | | Men | | Women | |
|---|---|---|---|---|---|---|
| | Coefficient | *t*-Ratio[a] | Coefficient | *t*-Ratio[a] | Coefficient | *t*-Ratio[a] |
| Intercept | 1.626 | 7.357 | 2.439 | 23.243 | 2.499 | 8.641 |
| Experience | .172 | 4.844 | .090 | 12.069 | .061 | 3.263 |
| Experience Square | -.003 | 1.182 | -.001 | 8.796 | -.001 | 2.808 |
| Education: | | | | | | |
| Primary School | .364 | 1.973 | .091 | 1.175 | .185 | 0.996 |
| Middle School | .816 | 3.899 | .356 | 3.849 | .754 | 3.091 |
| High School | 1.133 | 5.258 | .601 | 6.405 | 1.018 | 4.636 |
| Vocational High | 1.768 | 6.814 | .727 | 6.661 | .882 | 3.664 |
| University | 2.017 | 5.878 | 1.242 | 12.377 | 1.552 | 6.128 |
| Age 25-44 | .981 | 3.451 | -.054 | .808 | .070 | .417 |
| Age over 44 | -1.017 | .744 | -.128 | 1.065 | .281 | .869 |
| Interaction Terms: | | | | | | |
| Experience*Age 25-44 | -.098 | 2.372 | | | | |
| Experience*Age 45 | -.002 | .019 | | | | |
| Experience 2*Age 25-44 | .002 | .733 | | | | |
| Experience 2*Age over 44 | .001 | .287 | | | | |
| Primary*Age 25-44 | -.250 | 1.095 | | | | |
| Middle*Age 25-44 | -.472 | 1.842 | | | | |
| High*Age 25-44 | -.587 | 2.251 | | | | |
| Vocational*Age 25-44 | -1.142 | 3.728 | | | | |
| University*Age 25-44 | .836 | 2.235 | | | | |
| Primary*Age over 44 | -.268 | 1.222 | | | | |
| Middle*Age over 44 | -.471 | 1.484 | | | | |
| High*Age over 44 | -.415 | 1.273 | | | | |
| Vocational*Age over 44 | -1.124 | 3.243 | | | | |
| University*Age over 44 | -.680 | 1.659 | | | | |
| Ankara | .063 | 1.121 | .088 | 1.549 | -.170 | 1.080 |
| Istanbul | .213 | 3.811 | .232 | 4.114 | .466 | 3.558 |
| Izmir | .071 | 1.035 | .097 | 1.389 | -.100 | .682 |
| $R^2$ | .512 | | .486 | | .483 | |
| $F(K, N-K)$ | 23.951 | | 35.704 | | 7.426 | |
| Durbin Watson | 1.924 | | 1.924 | | 2.122 | |
| Dependent Variable | 3.766 | | 3.766 | | 3.428 | |
| Sample Size | 884 | | 884 | | 207 | |

[a]Absolute value of the *t*-ratio.

non-graduate and increase with the level of education. The percentage differential effects per year of schooling for the three cohorts are given in Table 8. For the under 25 cohort the proportionate returns to an additional year of schooling at the primary level is about 9 percent. It is 14 percent at the middle and 12 percent at the high school levels and 22 percent at the university level. Thus, returns to an additional year of schooling are high at the primary level and increase with the level of schooling contrary to what is usually found in the early literature on this topic. Psacharopoulos (1985) reports returns of 31, 15 and 18 percent for primary, secondary and higher education levels, respectively, in Asian countries.

The returns to an additional year of schooling for the cohort of 25-44 at all educational levels are somewhat lower than those of the younger cohort. The same is true for the over 44 cohort, except at the high school level where the returns are higher than those of under 25 cohort. As a result of this comparison of the returns to different cohorts we can not conclude that increased levels of education has lowered returns for younger workers. In fact, returns are highest for the youngest cohort. This may be an indication of improving quality of secondary schooling or a recent increase in the demand for the educated workers as compared to the past, with a preference for younger, more educated, workers.[9]

### Returns to Vocational High School Education

The returns to vocational high school may vary with the program of study. Some programs take three and other four years for graduation. It is not possible to obtain information on study program in the analysis. The returns to a vocational high school education (over a middle school) and to a university education after completing vocational high school are given in the last two rows of Table 8. A test of the hypothesis of equal coefficients for vocational and general high school educations is rejected at the 4 percent level of significance. The return to vocational high school education is about 36-42 percent assuming four or three years of vocational high school training, respectively and this is about 10 percentage points higher than the return to a general high school education. Demand for vocational trained workers confirms the government's recent emphasis on vocational and technical education in Turkey.

In the face of the growing numbers of high school graduates who would like to have a university education but are denied admission via nationwide competitive entrance examination, the government has expanded vocational and technical high schools. The number of vocational and technical high schools increased by 52 percent, during the 1987-1988 period, whereas the number of general high schools increased 45 percent during the same period. The relatively large number of general high school graduates may also explain the lower returns to general high school education.

The city coefficients are jointly significant and indicate that men wage earners earn about 21 percent more in Istanbul and about 11 percent more in Ankara and Izmir as compared to men wage earners in the rest of the country.[10] Also included in the probit and log earnings equations are the dummy variables for the months in which the households were interviewed. These coefficients, which were jointly significant, are not reported in the table for brevity.

The positive sign of rho, the correlation coefficient between error terms of the probit wage earner and log earnings equations, suggests that less productive men are working more often as wage earners. The estimated rho is significantly different from zero implying that estimating the log earnings function on a selective sample of wage earners would produce biased estimates. To ascertain the bias, the OLS estimates of the log earnings equation on the sample of wage earners is presented in Table 7. The estimated equation has a rather high coefficient of determination. The same pattern is observed in the significance of experience and education variables as in Table 6. The corresponding implied proportionate returns to a year of education are given in Table 8. The OLS estimates of the returns seem somewhat smaller than those of the ML estimates that are corrected for sample selection bias. In particular, selection correction raises returns to vocational high school.

TABLE 8

Proportionate Returns to Different Levels of Education
by Gender and Cohort

| | Men | | | Men | Women |
|---|---|---|---|---|---|
| | Under 25 | 25-44 | Over 44 | All | All |
| Maximum Likelihood Estimates: | | | | | |
| Education | | | | | |
| Primary School | 8.6 | 4.0 | 1.1 | 1.9 | 3.2 |
| Middle School | 13.6 | 7.7 | 5.2 | 8.6 | 17.8 |
| High School | 11.5 | 7.7 | 15.8 | 8.6 | 6.5 |
| University[a] | 22.4 | 16.1 | 15.8 | 16.2 | 11.8 |
| Vocational High[b] | 28-37 | 9-11 | 11-15 | 10-13 | 1-2 |
| University[c] | 3.2 | 13.3 | 16.7 | 13.0 | 15.0 |
| OLS Estimates: | | | | | |
| Education | | | | | |
| Primary School | 7.3 | 2.3 | 1.9 | 1.8 | 3.7 |
| Middle School | 15.1 | 7.7 | 8.3 | 8.8 | 18.9 |
| High School | 10.6 | 6.8 | 12.4 | 8.2 | 8.8 |
| University[a] | 22.1 | 15.9 | 15.5 | 16.0 | 13.4 |
| Vocational High[b] | 24-32 | 7-9 | 8-10 | 9-12 | 3-4 |
| University[c] | 6.2 | 13.9 | 17.3 | 12-9 | 16.8 |

All columns are computed using the estimates in Tables 5, 6 and 7, except for column 4 for which Appendix Table 2 is used.

[a]Computed above a general high school education.

[b]The two figures correspond to assuming 4 years and 3 years of vocational high school training, respectively.

[c]Computed above a vocational high school education.

ESTIMATES FOR WOMEN WAGE EARNERS

The joint MLE of probit for wage earner and log earnings equations for women are shown in Table 6 together with the implied marginal effects of the variables evaluated at their means. Due to the small number of wage earning women the interaction terms of experience, education and cohort variables cannot be included in the specification, and therefore cohort differences are not estimated for women. The linear and quadratic experience variables are

jointly significant with the expected signs. An additional year of experience increases the probability of wage employment by .2 percent. Education variables are jointly significant at 5 percent level. The probability of wage employment increases with the levels of education. A general or a vocational high school diploma increases the probability of wage employment by about a quarter and a university diploma by almost 50 percent.

As before, individual and household unearned incomes are included to allow identification of the model. While the unearned income variables are jointly significant with the expected negative signs, reducing the chance of being a wage earner, only the household unearned income is significant in this equation. One standard deviation increase in the household unearned income reduces probability of wage employment by 3 percent. A woman who resides in Ankara, Istanbul or Izmir is more likely to be a wage earner as compared to women in the rest of the country.[11]

The MLE of the logarithmic monthly earnings equation for women is given in Table 6. The linear and quadratic terms of the years of experience variable are both significant with the expected signs. An additional year of experience adds to earnings by about 6 percent. Earnings reach a peak at 29 years of experience or at an average age of 44 years. Being a primary school graduate has no significant effect on earnings for women. The effects of higher levels of schooling are significant and increase with the level of education. The education variables are jointly significant at the 1 percent level. The proportionate returns to an additional year of schooling are given in Table 8. The highest return is for middle school graduates which is about 18 percent. The returns to additional years of high school and university educations are about 7 and 12 percents, respectively. As for the vocational high school, the return is about 1-2 percent and much lower than the return to a year of general high school. However, a test of the hypothesis of equal coefficients for vocational and general high school educations is not rejected. The city coefficients are jointly significant and indicate that women wage earners in Istanbul earn about 47 percent higher than those in the rest of the country.[12] The estimate of the correlation coefficient between the error terms of the two equations (rho) is positive but, insignificant suggesting that the selectivity corrected MLE of the log earnings

equation should not be statistically different from the OLS earnings function estimate in Table 7. We observe in Table 8 that the OLS estimates of the returns to education are about the same as the corresponding selectivity corrected MLE's.

In order to allow a comparison of the returns to education for men and women, the specification corresponding to the women's probit and log earnings equations are estimated for men and shown in Appendix Table 2. The corresponding return estimates are in column four in Table 8. A comparison of the columns 4 and 5 indicate that returns are higher for women at primary and middle schools but, somewhat lower at other school levels. In particular, we note the low returns to vocational high school for women as compared to men. This may partly be due to the nature of vocational high schools attended exclusively by women. Such schools emphasize training in home economics which apparently are skills not in demand in the wage labor force, whereas there are seven times as many males as females in the industrial and technical vocational high school.[13] Finally, a test of whether male and female wage earners can be combined rejects the null hypothesis that the gender specific coefficients are the same.

## VI. CONCLUSION

This paper examined the entry of persons into wage employment and the reward structure to human capital for urban men and women wage earners in Turkey. The standard human capital variables of experience and education play substantial roles in determining who is a wage earner and wage earnings of both men and women.

Experience has significant linear and quadratic impact on wage earnings for both men and women. The impact is stronger for men than for women. The individual and household unearned incomes reduce the probability of being wage earner for both men and women. Their effect is stronger for men than for women. Education increases wage earner participation of both men and women. This effect is nonlinear, being larger at the higher levels of

schooling. The effect of education is stronger for women than for men. A university diploma increases by 50 percent the probability of wage employment for women.

The returns to education are found to increase with the level of schooling for both men and women. The returns are highest for the university level education suggesting a policy of expansion of educational opportunities at this level. The returns to women are somewhat smaller than those to men at all levels of education except primary and middle schools. The highest returns are observed for the younger cohort of men which may be an indication of increasing demand for educated workers or increasing quality of schooling.

One of the main findings is that the return to vocational high school education is significantly higher than the returns to general high school education for male wage earners. Vocational high school graduates also have a greater likelihood of working as a wage earner. For women, vocational and general high school educations contribute equally to the probability of wage employment, but the return to a vocational high school is smaller than attending general high school. The high returns to vocational schooling for men suggest an expansion of such opportunities for men as well as opening up some of these exclusive male vocations for women while expanding the general secondary enrollments of women.

# NOTES

1. There is also the vocational middle school category which could be operating within a vocational high school. The vocational middle school graduates represent about 0.03 percent of the population (urban and rural) according to the 1985 population census. State Institute of Statistics (1989). There were very few such observations in our sample and they are included in the middle school category.

2. Based on figures from State Institute of Statistics (1990). In these figures the vocational high school category also includes military high school, police training school, finance and meteorological high schools, musical and other conservatories. Excluding these, the enrollments in the vocational and technical high schools were about 400 thousand; 40 percent of the total high school level enrollments during the 1985-86 school year according to Ministry of Education (1987), while the general high school enrollments were about 600 thousand; 60 percent of the total high school level enrollments. Further, women constituted 44 percent of the general and 25 percent of the vocational high school enrollments during that year.

3. Based on figures from State Institute of Statistics (1990).

4. Occupational status distribution of the male and female labor force (economically active rural and urban population 12 years of age and older) according to the 1985 population census is as follows (%):

| | Men | Women |
|---|---|---|
| Wage Earner | 45 | 14 |
| Self-employed | 33 | 5 |
| Other (including unpaid family workers) | 22 | 81 |
| Total | 100 | 100 |
| Total Number in Thousands | 13,064 | 7,493 |

State Institute of Statistics (1989).

5. The distribution of the male and female labor force (economically active rural and urban population 12 years of age and older) by schools graduated and by gender according to the 1985 population census is as follows (%):

| | Men | Women |
|---|---|---|
| Non-graduates | 18 | 47 |
| Primary School | 60 | 44 |
| Middle School | 8 | 2 |
| High School | 6 | 3 |
| Vocational High | 4 | 2 |
| University | 5 | 2 |
| Total | 100 | 100 |
| Total Number in Thousands | 13,064 | 7,493 |

State Institute of Statistics (1989).

6. The year 1978-1979 is the base for the CPI figures which are obtained from State Institute of Statistics (1978).

7. Another specification of the model, included unearned incomes interacted with cohort variables. The coefficients were significant at the 5 percent level. The effect of household unearned income was somewhat smaller than the effect of the individual unearned income in reducing probability of wage employment. Further, for one standard deviation increase, the effect of individual unearned income was about 30 percent for the under 25 cohort and declined with age to 5 and 2 percent, for the older cohorts, while the effect of household unearned income remained about the same in the 3-4 percent range. Thus, the effect of individual unearned income is larger than that of the household unearned income, and it is largest for the youngest cohort.

8. In the specification which included four regional dummy variables in place of the city dummy variables in the probit and log earnings equations, the familiar regional division, although not administrative, is used. The coefficients estimates which were jointly significant at the 10 percent level in the probit equation indicated that men who live in the Aegean-Marmara, Central Anatolia or the Black Sea regions have 7-8 percent higher probability of being a wage earner than those who live in the East-South East region. This is in conformity

with the observation that a higher proportion of individuals are either self-employed or unpaid family workers in the least developed East-South East region. Although jointly significant at the 11 percent level, the estimated region coefficients in the log earnings equation were not individually significant indicating that the wage earnings in each of the regions are not significantly different from those in the East-South East region.

9. The recent favorable performance of the economy may be behind the observed pattern of higher returns for the younger cohort. After two consecutive years of decline in 1979 and 1980, GNP grew by an average annual rate of 6 percent during 1981-1988. The growth rate was 9 percent in industry compared to 5 percent in agriculture and 6 percent in services. Foreign trade boomed, exports increasing by 400 percent and imports by 200 percent. Accordingly, the civilian employment increased annually by 1.3 percent in agriculture, 4 percent in each of industry and services and by 3 percent in construction. State Institute of Statistics (1989) and Organization for Economic Cooperation and Development (1989).

10. See footnote 8.

11. As was done for men, a specification which included regional dummy variables in place of city dummy variables in the probit and log earnings equations is also estimated for women. The results were similar to the case of men which are summarized in footnote 8. In the probit equation for women the region variables were jointly significant at 1 percent level, indicating estimates, women who live in Aegean-Marmara and Central-Anatolia regions have higher probabilities of being a wage earner as compared to women who reside in the East-South East region. This probability was somewhat higher for women who reside in the more developed Aegean-Marmara region than in the Central-Anatolia. Mediterranean and Black Sea regions were not significantly different from the East-South East region in terms of the probability of women participating in the labor force as wage earners. The region variables in the log earnings equation were neither individually nor jointly significant at the 5 percent level, indicating no significant difference in the earnings of women wage earners among regions.

12. See footnote 11.

13. During the 1985-86 school year the distribution of vocational high school enrollments by gender were as follows (%):

| | Men | Women |
|---|---|---|
| Boy's Industrial Vocation and Technical High School | 58 | 8 |
| Girl's Domestic Science High School | 0.1 | 38 |
| Commercial and Tourism High School | 17 | 40 |
| Religious Vocation High School | 24 | 14 |
| Total | 100 | 100 |
| Total Number in Thousands | 292 | 98 |

Ministry of Education, Youth and Sports (1987).

APPENDIX TABLE 1
Means and Standard Deviations of Variables by Gender for the Subsample of Wage Earners, Turkey, 1987

| | Men | | Women | |
|---|---|---|---|---|
| | Mean | St. Deviation | Mean | St. Deviation |
| Dependent Variables: | | | | |
| Wage Earner | 1.000 | .000 | 1.000 | .000 |
| Log Wage | 3.766 | .665 | 3.428 | .774 |
| Explanatory Variables: | | | | |
| Experience | 18.158 | 10.957 | 14.860 | 11.226 |
| Experience Square | 449.649 | 510.258 | 346.222 | 499.652 |
| Education: | | | | |
| Non-graduate | .063 | .244 | .101 | .303 |
| Primary School | .502 | .500 | .280 | .450 |
| Middle School | .120 | .325 | .082 | .275 |
| High School | .146 | .353 | .295 | .457 |
| Vocational High | .051 | .220 | .082 | .275 |
| University | .118 | .322 | .159 | .367 |
| Unearned Income | 7.596 | 18.680 | 1.937 | 10.859 |
| Unearned Household Income | 5.227 | 18.933 | 12.776 | 22.789 |
| Age under 25 | .221 | .415 | .280 | .450 |
| Age 25-44 | .647 | .478 | .628 | .485 |
| Age over 44 | .132 | .339 | .092 | .289 |
| Interaction Terms: | | | | |
| Experience*Age 25-44 | 11.680 | 10.156 | 9.889 | 9.636 |
| Experience*Age over 44 | 5.039 | 13.138 | 3.580 | 11.523 |
| Primary*Age 25-44 | .305 | .461 | .145 | .353 |
| Middle*Age 25-44 | .079 | .270 | .063 | .243 |
| High*Age 25-44 | .109 | .311 | .179 | .384 |
| Vocational High*Age 25-44 | .334 | .181 | .068 | .252 |
| University*Age 25-44 | .102 | .303 | .126 | .332 |
| Primary*Age over 44 | .066 | .248 | .024 | .154 |
| Middle*Age over 44 | .006 | .075 | .005 | .070 |
| High*Age over 44 | .007 | .082 | .005 | .070 |
| Vocational High*Age over 44 | .008 | .089 | .010 | .098 |
| University*Age over 44 | .012 | .111 | .000 | .000 |
| Cities: | | | | |
| Ankara | .095 | .293 | .087 | .282 |
| Istanbul | .097 | .297 | .130 | .338 |
| Izmir | .060 | .238 | .106 | .309 |
| Regions: | | | | |
| Aegean-Marmara | .353 | .478 | .493 | .501 |
| Mediterranean | .123 | .329 | .082 | .275 |
| Central-Anatolia | .229 | .420 | .237 | .426 |
| East-South-East | .190 | .393 | .106 | .309 |
| Black Sea | .106 | .308 | .082 | .275 |
| Sample Size | 884 | | 207 | |

## Appendix Table 2

### Joint Maximum Likelihood Estimates of a Probit for Wage Earner and Logarithmic Earnings Equations for Men, Turkey, 1987

| Variable | Probit Wage Earner | | | Logarithmic Monthly Wage | |
|---|---|---|---|---|---|
| | Coefficient | *t*-Ratio[a] | Marginal Effect | Coefficient | *t*-Ratio[a] |
| Intercept | -.667 | 3.809 | -.244 | 2.343 | 8.317 |
| Experience | .061 | 4.666 | .022 | .096 | 7.982 |
| Experience Square | -.002 | 6.737 | -.001 | -.002 | 4.983 |
| Education: | | | | | |
| Primary School | .156 | 1.428 | .054 | .096 | 1.174 |
| Middle School | -.055 | .394 | -.018 | .354 | 3.702 |
| High School | .204 | 1.375 | .072 | .611 | 6.532 |
| Vocational High | .565 | 2.843 | .212 | .747 | 5.911 |
| University | .403 | 2.422 | .148 | 1.259 | 11.962 |
| Unearned Income | -.007 | 4.801 | -.002 | | |
| Unearned Household Income | -.006 | 3.996 | -.002 | | |
| Age 25-44 | .373 | 3.015 | .129 | -.051 | .594 |
| Age over 44 | .335 | 1.565 | .115 | -.111 | .804 |
| Cities: | | | | | |
| Ankara | .435 | 3.516 | .165 | .101 | 1.437 |
| Istanbul | .114 | 1.106 | .041 | .228 | 3.972 |
| Izmir | .346 | 2.573 | .130 | .106 | 1.304 |
| Sigma/Rho | .477 | 23.383 | | .135 | .317 |
| -Log Likelihood | | | 1877 | | |
| Sample Size | 2382 | | | 883 | |

[a]Absolute value of the asymptotic *t*-ratio.

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