THE EFFECTS OF EDUCATION-JOB MISMATCH ON WAGES: A PANEL ANALYSIS OF THE TURKISH LABOR MARKET

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ABSTRACT

The literature on education-job mismatch has consistently reported a negative effect of education-job mismatch, particularly overeducation, on earnings. Yet, most studies are criticized for not accounting for unobservable individual heterogeneity and measurement error in their analyses. This paper examines the impact of educational mismatch on earnings in the Turkish labor market, using the Income and Living Conditions panel data set from 2006-2010. The two potential sources of bias are addressed using panel data and instrumental variable approach. The consistent IV fixed effects estimation suggests that there is no statistically significant effect of overeducation or undereducation in workers' earnings. The theoretical implication of the analysis is that neither individuals' human capital nor job characteristics solely determine the level of returns, but both effects work together. Thus, at a policy making level one can argue that overeducation is a waste of resources for both the individual and society.

Keywords : Educational mismatch; Wages; Turkish labor market; Panel data.
JEL Codes : I21, J24, J31, C33

EĞİTİM-İŞ UYUŞMAZLIĞININ ÜCRETLER ÜZERİNE ETKİSİ: TÜRKİYE İŞGÜCÜ PİYASASINDA BİR PANEL VERİ ANALİZİ

ÖZ

Eğitim-iş uyuşmazlığı literatürü, eğitim-iş uyuşmazlıklarının, özellikle de aşırı eğitim durumunun, ücretler üzerinde olumsuz etkisi olduğunu tutarlı bir şekilde ortaya koymaktadır. Ancak bu alanda yapılan çoğu ampirik çalışma bireyler arasındaki gözlemlenemeyen farklılıkları ve ölçümleme hatalarını hesaba katmamakla eleştirilmektedir. Bu çalışmada, Türkiye işgücü piyasasında eğitim-iş uyuşmazlığının ücretler üzerindeki etkisi 2006-2010 Gelir ve Yaşam Koşulları Anketi Panel veri seti kullanılarak incelenmektedir. Panel veri sabit ve rassal etki modeli ve araç değişken metodu kullanılarak, söz konusu iki potensiyel tahmin hatasının etkisi kontrol edilmektedir. Elde edilen tutarlı tahmin sonuçları, aşırı ya da yetersiz eğitimin ücretler üzerinde istatistiksel olarak anlamlı bir etkisinin olmadığını göstermektedir. Bu bulgu teorik olarak değerlendirildiğinde, Türkiye işgücü piyasasında bireysel insan sermayesi ile işe ait özelliklerin salt tek başlarına değil, birlikte etki yaptığına işaret etmektedir. Bu çerçevede, aşırı eğitimin kaynakların etkin kullanımını önünde bir engel teşkil ettiği yönünde bir politika önermesi yapılabilir.

Anahtar Kelimeler : Eğitim-İş Uyuşmazlığı; Ücretler; Türkiye İşgücü Piyasası; Panel veri.
JEL Kodları : I21, J24, J31, C33

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1. Introduction

The positive effect of education on earnings and economic growth is a well-documented paradigm in the economics literature (Becker, 1964; Mincer, 1974; Lucas, 1988; Barro; 1991). The education-job matching issue, however, has only started to attract attention in the early 1970s following the publication of Freeman (1976)'s book "The Overeducated American". The considerable rise in the number of college graduates in the US and a concurrent fall in returns to education at the time spawned an extensive body of research on the economics of education mismatch, particularly overeducation. The increase in the educational level of the populations has subsequently become a global phenomenon over the past decades. In OECD countries, the share of those with at least higher secondary school have risen more than 70 percent in less than thirty years (OECD, 1995). Galasi (2008) reports that the proportion of properly educated varies between 1 percent in Turkey and 19 percent in Austria, whereas that of overeducated range from 15 percent in Netherlands to 79 percent in Estonia, and undereducated from 13 percent in Estonia to 82 percent in Netherlands.

On the other hand, the question of whether the growth of the supply of higher-educated workforce finds a demand in the labor market remains disputed. If the skills of higher-educated workers exceed the skills required for the jobs in an economy, overeducation is likely to set in. Educational mismatch, particularly overeducation, may imply an inefficient allocation of scarce resources, hence constitutes a matter of public policy. Moreover, most empirical studies to date consistently report that overeducation causes wage penalties on the individual level (Tsai, 2010). The strikingly robust negative effect over time and across countries, however, is problematic in some ways. Many papers are heavily criticized for not taking into account of two main econometric issues in their analysis: omitted variable bias and measurement error of educational mismatch. The potential omitted variable bias that stems from unobserved individual heterogeneity, is not controlled for in many studies which simply use cross-sectional data and standard OLS estimation. However, as Sicherman (1991) argues, overeducation could also be the result of insufficient or lacking human capital, in terms of experience, training or innate ability. If overeducated workers have lower ability than adequately educated workers, the estimated overeducation wage penalty may be overestimated. Leuven and Oosterbeek (2011) assert that such an omitted variable bias is substantial and may possibly explain the entire difference between returns to required schooling and over/underschooling. Yet, the limited number of studies where ability controls are included to address unobserved heterogeneity, do not seem to support this view, and still report significant overeducation wage penalties (McGuinness, 2006; Chevalier, 2003; Chevalier and Lindley, 2009; Sohn, 2010). Meanwhile, the alternative panel

data analyses mostly deliver a relatively limited or even no negative earnings consequences of overeducation (Verdugo and Verdugo, 1989; Bauer, 2002; Frenette, 2004; Tsai, 2010).

The other concern is the attenuation bias which might occur due to measurement error in educational mismatch. Required, over- and underschooling for each occupation, by its nature, varies both across and within occupation. Moreover, the existing measures in the education-occupation literature are reported to be only slightly correlated (Battu et al., 1999; Verhaest and Omey, 2012). The instrumental variable (IV) approach, particularly that of instrumenting one measure with another, is the typical approach for correction. A number of studies using the IV approach, report that indeed measurement error is likely to result in a downward bias in the overeducation penalty (Robst, 1994; Dolton and Silles, 2008).

Against this background, this paper examines the impact of education-occupation mismatch on wages of Turkish workers using an instrumental variable panel-data estimation method. The contributions are mainly threefold. First, existing theoretical and empirical literature are reviewed in the context of Turkey's labor market. As Quinn and Rubb (2006) claim, given the differences between developed and developing countries, the findings in the literature which are mostly based on developed country experiences may not apply to developing country settings. Second, identification issue is addressed using panel data, and controlling for unobservable individual heterogeneity on the wage effects of over/undereducation. Third, potential measurement error bias is accounted for applying an IV approach. The main finding is that after controlling for omitted variable bias and measurement error using a consistent fixed-effects IV estimator, the return on an additional year of schooling over the required level of schooling is very small, even statistically insignificant. Similarly, undereducated workers receive a relatively smaller wage penalty for each year of deficit schooling. As per the theoretical implication, neither individuals' human capital endowments nor job characteristics solely determine the level of returns, but both effects work together. Moreover, when unobservable heterogeneity and measurement error bias are accounted for, there is no statistically significant effect of overeducation or undereducation in workers' earnings.

The outline of the paper is as follows. Section 2 reviews the existing empirical literature in conjunction with the theoretical background. In Section 3, data and definition of required, over- and undereducation is discussed. Empirical approach and identification methodology are described in Section 4. Results are reported in Section 5. Finally, Section 6 concludes.

2. Literature Survey

The literature on the economics of educational mismatch is largely inspired by three classical theoretical frameworks of the labor markets: human capital theory, job competition and assignment models. The human capital theory (Becker, 1964)

claims that labor is paid its marginal product, which is determined by the level of human capital acquired through education, on-the-job training or experience. In other words, worker characteristics, or the supply side are assumed to determine the earnings distribution. Thus, overeducation can only occur as a temporary market disequilibrium, as wage adjustment mechanism restores any imbalance between supply and demand.

The job competition theory (Thurow, 1975), adopts instead a demand side approach. The models rests on the assumption that remuneration is job specific, and independent of worker's human capital. In this case, workers compete for high paying jobs, and ranked by their relative costs of training for the firm. Since education and on-the-job training are assumed to be complements, workers with higher levels of schooling are matched to highest level jobs. Overeducation arises if the supply of high educated workers exceed the available high paying job opportunities, and some workers accept jobs which require lower levels of schooling, hence receive wages specific to that job.

The assignment theory (Sattinger, 1993) reconciles the two extreme theoretical frameworks, asserting that wages depend on both worker's and job's characteristics. Within this framework, productivity and wages are assumed as positively but not exclusively related to human capital. Instead, the actual realized productivity level is bounded by the availability and quality of the job. Under the assignment model, overeducation occurs if workers are not efficiently distributed across jobs based on their comparative advantages.

An extensive body of empirical research developed based on these theoretical perspectives. The workhorse model in the educational mismatch literature is the extended form of the standard Mincerian earnings function:

$$\ln w_i = \delta_a S_i^a + x_i'\beta + \varepsilon_i \quad (1)$$

where w_i is the individual i's wage, S_i^a attained years of schooling, x_i a vector of control variables (sex, experience, experience squared, marital status etc.) with the corresponding coefficients β, and δ_a is the returns to attained years of schooling.

In their seminal paper, Duncan and Hoffman (1981) divide S_i^a into three components as:

$$S_i^a \equiv S_i^r + \max(0, S_i^a - S_i^r) - \max(0, S_i^r - S_i^a) \quad (2)$$

where S_i^r is the years of required schooling, $\max(0, S_i^a - S_i^r)$ the difference between attained and required years of schooling, or years of overschooling (S_i^o), and $\max(0, S_i^r - S_i^a)$ the difference between required and attained years of schooling, or underscooling (S_i^u). The wage equation would then read as follows:

$$\ln w_i = \delta_r S_i^r + \delta_o S_i^o + \delta_u S_i^u + x_i'\beta + \varepsilon_i \quad (3)$$

In this empirical specification, δ_o represents the rise in a worker's wage for each year of surplus schooling he/she has compared to a worker in the same job who has exactly the required level of schooling. In similar vein, δ_u corresponds to the fall in a worker's wage for each year of deficit schooling compared to a worker holding the same job who has exactly the required level of schooling. Thus, undereducated/overeducated workers are compared to their colleagues whose education matches that required by the job in question.

The equation reduces to the standard human capital model, when the restriction $\delta_r = \delta_o = -\delta_u$ is imposed. In most empirical studies, this restriction has been rejected, which is interpreted as evidence against wages being solely determined by attained level of schooling and independent of the job.

The Duncan Hoffman model also nests Thurow's job competition model, in which marginal productivity, hence wage is a fixed characteristic of the job not the worker. When the restriction $\delta_o = \delta_u = 0$ is imposed, wages depend only on the years of schooling required for the job (δ_r). The main findings of the relevant empirical research are twofold: (i) the estimated return to an extra year of overschooling, despite being significantly positive, is substantially less than that to an additional year of required schooling ($\delta_r > \delta_o > 0$), (ii) the return to a deficit year of schooling is significantly negative (Bauer, 2002; Cohn and Khan, 1995; Duncan and Hoffman, 1981; Rubb, 2003).

Another often-cited model in the literature was proposed by Verdugo and Verdugo (1989), in which educational surplus/deficit is coded as dummies and attained level of schooling is used rather than required level of schooling for the job. The resulting expression is as follows:

$$\ln w_i = \delta_a S_i^a + \delta_o S_i^o + \delta_u S_i^u + x_i'\beta + \varepsilon_i \quad (4)$$

where S_i^o (S_i^u) is a dummy variable equal to one if worker *i* is overeducated (undereducated). In this specification, workers with surplus/deficit years of schooling are compared to workers with the same level of schooling who hold adequately matched jobs. The majority of the studies adopting Verdugo and Verdugo model report that significant wage penalties ($\delta_o < 0$) for overeducation and wage premiums for undereducation ($\delta_u > 0$) (Bauer, 2002; Cohn and Khan, 1995; Rubb, 2003; Sicherman, 1991).

3. Data and Definitional Issues

The data used in this study are drawn from the Turkish Income and Living

Conditions Survey (SILC) for the years from 2006 to 2010. For the specific aim and methodology of the study, panel samples are modified in two ways: (i) they comprise only the full-time employees between 15-64 years of age who are present in at least two consecutive years of the survey, (ii) workers in the agricultural sector are excluded. This selection results in a sample of 22780 observations, out of which where individuals are present for two, three and four consecutive years.

The definition and measurement of the educational mismatch variables S_i^a, S_i^o and S_i^u are the key to the analysis. Broadly speaking, overeducation (undereducation) refers to the incidence of workers having more (less) years of schooling than what is required for their job. There are three commonly used methods in the empirical literature to identify educational mismatches: self-assessment, job analysis, and realized matches. Self-assessment is a subjective indicator, which could be derived either from asking a worker directly whether he/she is overeducated (undereducated) for his/her job, or to specify the minimum years of schooling required to perform the job, and compare that to his/her attained years of schooling. Job analysis, on the other hand, is based on professional job analysts' evaluations of required level of schooling for the specific job in question, such as Dictionary of Occupational Titles (DOT) in the U.S. Whereas realized matching is a statistical method, in which required years of schooling for a particular job is inferred from the mean or mode of the completed years of schooling of all workers holding the same job, then comparing the worker's attained years of schooling with it. All three methods have its advantages and limitations, and the choice is dictated by data availability.[1] For example, self-assessment measure despite being based on firsthand, up-to-date information is quite subjective by its nature. Job analysis has a head-start virtue in terms of its approach grounded on systematic evaluation, yet it is the mostly costly approach. Realized matching is the most commonly used method in the literature given the ease of collecting required data, but is typically too general and fail to account for the job-, firm- and individual-level heterogeneity in the educational requirements of jobs classified as a single category.

Leuven and Oosterbeek (2011) summarize the average estimates of returns to three schooling variables from various studies, using a weighting method as: (i) The differences in estimated returns between studies that use self-assessed measures of required schooling, and studies that base their required schooling measure on job analysis is indeed rather small, (ii) Studies that use the mean or mode method find larger returns on required schooling, and those based on the mode method also find larger absolute returns on overschooling and underschooling, (iii) Differentiating estimated returns to the three components by different estimation methods indicates that studies that use IV tend to find a much lower return to over- schooling than

[1] *For an extensive discussion, see Green, McIntosh and Vignoles (1999), Clogg and Shockey (1984), Dolton and Vignoles (2000), Hartog (2000), Leuven and Oosterbeek (2011).*

studies using OLS, (iv) Studies using fixed effects are characterized by a lower return to required years of schooling.

This paper uses the realized matching method. Following Verdugo and Verdugo (1989), the required years of schooling (*Req_educ*) is defined as a standard deviation of the mean years of schooling of workers in the same International Classification of Occupations ISCO-88 two-digit code. A worker is overeducated (undereducated) if his/her attained years of schooling is above (below) the mean. The corresponding variables are *Over_educ* and *Under-educ,* respectively. The analysis also adopts the other approach of Kiker et al. (1997) that defines required education based on the mode years of schooling in each occupation category. In a similar vein, a worker is overeducated (undereducated) if his/her attained years of schooling is above (below) the mode. Table 1 provides a list of variables and summary statistics for all variables and indices.

The dependent variable *Ln wage* refers to the natural logarithm of real hourly wages deflated by the 2006 Consumer Price Index. The variable *Educ* stands for the attained years of schooling for an individual. SILC data codes the education in a categorical format of highest educational level attained. For the following analysis, these levels are converted into number formats as follows: 0 for illiterate, 1 literate but not graduate, 5 for primary school, 8 for secondary school, 11 for high school, 15 for university graduates. The control variables are *female* which is a dummy for female workers, *married* which is a dummy for married workers, *child* which is a dummy for workers who have children, and *informal* if the worker does not have a social security due to his/her primary job. The empirical specification also includes dummy ontrols for each year between 2006-2010, each sector based on the NACE Rev.2 code, and age. SILC provides data on age in a categorical format, and do not have information on birth year. Thus, age is presented as a control rather than an explanatory variable.

Table 1: Summary statistics

	Mean	Sd (Ove-	Sd	Sd (wit-	Obs	Ind
Ln wage	1.0477	0.807	0.822	0.255	23003	10357
wage	3.852	3.381	3.201	0.948	23003	10357
Educ	9.398	4.054	4.025	0.301	23003	10357
Mean Index						
Req_educ	9.393	2.746	2.654	0.476	23003	5173
Over-educ	3.993	1.141	1.098	0.344	23003	2568
Under-educ	4.729	1.700	1.700	0.338	3352	1687

Mode Index						
Req_educ	8.952	3.937	3.805	0.920	23003	10357
Over-educ	4.559	1.621	1.565	0.457	6859	3473
Under-educ	5.139	2.067	2.042	0.469	4089	2136
female	0.214	0.410	0.418	0	23003	10357
married	0.749	0.433	0.448	0.105	23003	10357
child	0.742	0.437	0.424	0.152	23003	10357
age	7.537	2.100	2.244	0.366	23003	10357
exper	13.987	9.591	9.776	1.825	22836	10330
expersq	287.6351	347.334	350.303	71.908	22836	10330

Source: Own calculations using 2006-2010 Income and Living Conditions Panel Dataset.

Table 2 displays the educational mismatch in the sample using the mean and the mode indices. Using the mean index, 22.49 percent of panel observations are classified as overeducated, 62.94 percent as adequately educated, and 14.57 percent as undereducated. The mode index, on the other hand, produces relatively larger mismatch values of 29.82 percent overeducation and 17.78 percent undereducation. This finding is consistent with many studies which reveal that range measure is likely to yield the lowest estimate for overeducation. The remaining 52.41 percent of the observations fall into the category of adequately educated. As per compatibility of these two measures, we see that 19.62 percent of the panel observations are classified as overeducated under both indices. The mean and mode measures coincide on 48.72 percent of adequately educated workers, and 13.76 percent of undereducated workers. All-in-all, 82.1 percent of the observations in the sample fit into the same educational match/mismatch category under both of the two measures. When compared to other studies, the overestimation measures are relatively high in this analysis. More specifically, using 1980 Public Use Microdata Sample, Verdugo and Verdugo (1989) show that 11 percent of white males are overeducated. Cohn and Kahn (1995), employing data from 1985 Panel Study of Income Dynamics data, report that 13 percent of workers are overeducated.

Table 2: Educational mismatch according to the mean and mode indices (%)

	Mode Index			
(All observations)	Overeducated	Adeq.educated	Undereducated	Row Total
Mean Index				
Overeducated	19.62	2.87	0.00	22.49
Adequately educa-	10.20	48.72	4.02	62.94
Undereducated	0.00	0.81	13.76	14.57
Column total	29.82	52.41	17.78	100

Source: Own calculations using 2006-2010 Income and Living Conditions Panel Dataset.

4. Empirical Specification and Identification

Following the Duncan and Hoffman (1981) methodology outlined in the previous section, the empirical model is specified as:

$$\ln w_{it} = \delta_r S_{it}^r + \delta_o S_{it}^o + \delta_u S_{it}^u + x_{it}'\beta + \alpha_{it} + \varepsilon_{it} \quad (5)$$

where α_i represents the individual fixed effects which is time-invariant and represents ability. The independent variable is defined as the natural logarithm of the real hourly gross wages. The X vector contains workers' sex, age, marital status, having a child, experience and experience squared.

If the explanatory variables and ability are correlated the OLS estimates will become biased. The OLS estimator of δ given below will be inconsistent, if the second component of the following expression does not tend to zero:

$$\widehat{\delta_{OLS}} = \delta + \left[\sum_{i=1}^{N}\sum_{t=1}^{T}(x_{it} - \bar{x})(x_{it} - \bar{x})'\right]^{-1}\left\{T\sum_{i=1}^{N}(x_{it} - \bar{x})(\alpha_{it} - \bar{\alpha})\right\} \quad (6)$$

As a matter of fact, identification issue is a central theme in the educational mismatch research. The fact that estimated returns of over/undereducation may well reflect unobservable individual heterogeneity has obstructed establishing a causal effect of educational mismatch on wages.

To address the issue, several attempts have been made. Korpi and Tahlin (2009) instrumented the three schooling variables using number of siblings, place of residence during childhood, economic problems and disruption in the family of origin. As an alternative method, several articles relied on fixed effects models (Bauer, 2002; Dolton and Vignoles, 2000; Korpi and Tahlin, 2009; Lindley and McIntosh, 2008; Tsai, 2010) where unobervable heterogenity is assumed as time invariant. The

returns to over/underschooling are estimated using the fixed effects' estimates from individuals who changed their schooling, job or both. In this paper, we also exploit the panel nature of our survey data and employ fixed effects panel estimation to account for the influence of omitted variables.

Another concern in the empirical specification is the attenuation bias which might occur de to measurement error in the years of schooling variable, particularly for that in the required years of schooling variable (Leuven and Oosterbeek, 2011). Among the limited attempts in the empirical literature Robst (1994), Dolton and Silles (2008) and Iriondo and Perez-Amaral (2016) rely on instrumental variable procedures, whereas Tsai (2010) use a minimum distance approach. Following the first strand of empirical studies, this study applies an instrumental variable method where the mean measure of the required years of schooling variable (δ_r), is instrumented with the mode measure, and the overeducation (δ_o) and undereducation (δ_u) variables are estimated accordingly.

5. Results

In their seminal work, Duncan and Hoffman (1981) find a return to attained years of schooling equal to 0.058. When broken down, they find a return of 0.063 to a year of required schooling, 0.029 for a year of surplus schooling, and a negative return of -0.042 for a year of deficit education. Therefore, returns to overeducation are significantly and substantially lower than that to a required year of education. Table 3 presents the estimation results of the Duncan and Hoffman (1981) model. Column (1) displays pooled OLS estimates, column (2) represents the fixed-effects estimates using the mean index, column (3) shows the random-effects estimates using the mean index and lastly column (4) reports the coefficients from the fixed effects estimation using mode index as an instrument for the mean index variables. In all specifications, controls for year, sector of economic activity and age are also included. The Lagrange Multiplier (LM) tests display that individual and time effects are statistically significant in the model. As per se, panel data regression models are preferred over classical pooled OLS estimation.

Table 3: Estimated wage equations

	Pooled OLS (1)	Fixed Effects (2)	Random Effects (3)	IV Fixed Effects (4)
Req_educ	0.120***	0.014	0.117***	0.010
Over_educ	0.051***	0.002	0.052***	0.001
Under_educ	0.057***	0.013	0.063***	0.014
female	-0.087***	-	-0.102***	-
exper	0.044***	0.026***	0.044***	0.026***

expersq	-0.001***	-0.001***	-0.001***	-0.001***
married	0.122***	0.105***	0.139***	0.105***
child	-0.047***	-0.038**	-0.054***	-0.038*
informal	-0.443***	-0.110***	-0.348***	-0.110***
Year Controls	Yes	Yes	Yes	Yes
Sector Controls	Yes	Yes	Yes	Yes
Age Controls	Yes	Yes	Yes	Yes
Constant	-0.321***	0.467***	-0.314***	0.511***
N	22780	22780	22780	22780
R^2	0.4772	0.2044	0.4714	0.2041

Source: Own calculations using the 2006-2010 Turkish Income and Living Conditions Survey (Turkstat).

Notes: Cluster robust standard errors are calculated using STATA. All estimation equations include year, age and sector of economic activity dummies. R^2 refers to overall R^2 for columns (2)-(4). Hausman specification test rejects the null hypothesis that the preferred model is random effects vs. the alternative fixed effects.

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

In the pooled OLS estimation an additional year of required schooling is associated with a 12 percent increase in wages. The size of the effect falls to 5.1 percent for an additional year of overeducation, and a penalty of 5.7 percent for an additional year of undereducation. The results also display that female workers earn significantly less then male counterparts. Lower returns are also associated with workers who are single when compared to those married; who have children when compared to those who do not have children; and who are informal compared to those formal. Earnings increase at a decreasing rate with experience.

When the same specification is estimated using fixed effects method, the coefficient estimates of all education variables drop in magnitude and lose significance. The effects of the other controls, meanwhile, remain significant at similar magnitudes to the OLS counterparts. Accordingly, one can argue that if individual heterogeneity is held constant which is expected to be correlated with the explanatory variables, undereducated/undereducated workers receive almost the same labor returns as those whose level of education just matches to that required by their job. In other words, workers accept jobs for which they are overeducated simply due to having lower unobservable ability or other characteristics (Tsai, 2010).

However, if we use the random effects estimation, which given the nature of the data where individuals in the sample comprise a larger population is more

appropriate (Hsiao, 2003), all variable estimates turn out as statistically significant. The magnitudes of estimated returns to required, surplus and deficit years of schooling display very similar results to those in column (1). Confirming most studies in the literature, the estimated returns to a year of required education is statistically significantly positive at 11.7 percent. The estimated wage differential is about 5.2 and 6.3 percent for each year of additional and deficit years of schooling, respectively. That is to say, no significant effect of individual heterogeneity is detected on the returns to required, over- or undereducation.

In order to address the potential attenuation bias which might occur due to the measurement error in the over- and undereducation variables, the instrumental variable method, which is the most common approach in the empirical literature, is employed. More specifically, the mode index is used to measure required years of schooling for a job, and calculate the years of over- and undereducation accordingly. The coefficient estimates of the fixed effects IV model displayed in column (4) reveal no statistically significant effect of required, over- or undereducation on earnings. The other controls remain as statistically significant at similar magnitudes to those obtained in the previous specifications. More specifically, the estimated returns to experience are significantly positive but grow at a diminishing rate. As per observable individual characteristics, female workers, single workers, workers with children and workers without a social security are found to be more likely to receive lower returns. These results confirm the existing empirical evidence.

6. Conclusion

Educational mismatch, particularly overeducation, may imply an inefficient allocation of scarce resources, hence constitutes a matter of public policy. The empirical evidence has consistently reported a strikingly robust negative effect of educational mismatch on earnings. However, this result is heavily criticized for being biased as most analyses do not account for unobservable individual heterogeneity which is considered as substantial and may possibly explain the entire difference between returns to required schooling and over/underschooling. The other major concern in the empirical studies is the potential attenuation bias which might occur due to measurement error in educational mismatch, which by its nature, varies both across and within occupations.

This paper aims to examine whether and to what extent educational mismatch effects wages in the Turkish labor market, using the 2006-2010 Turkish Income and Living Conditions Panel Data set. The empirical earnings equation specification based on Duncan and Hoffman (1981) model, is estimated first using a pooled OLS regression. The results, which assume individual homogeneity, reveals that an additional year of required schooling is associated with a 12 percent increase in wages. The impact of a year of surplus education drops to 5.1 percent for an additional year of overeducation, and 5.7 percent penalty for a deficit year of education. The

remaining control variables confirm the theoretical literature. More specifically, female workers earn significantly less then male counterparts. Lower returns are also associated with workers who are single when compared to those married; who have children when compared to those who do not have children; and who are informal compared to those formal. Earnings increase at a decreasing rate with experience. The main contribution of this paper is that after controlling for omitted variable bias and measurement error using a consistent fixed-effects IV estimator, the return on an additional year of schooling over the required level of schooling is very small, even statistically insignificant. Similarly, undereducated workers receive a relatively smaller wage penalty for each year of deficit schooling.

The main theoretical implication of the analysis is that, Turkish labor market displays a structure where the human capital and job competition theories can be reconciled. In particular neither individuals' human capital endowments nor job characteristics solely determine the level of returns, but both effects work together. Moreover, when unobservable heterogeneity and measurement error bias are accounted for, there is no statistically significant effect of overeducation or undereducation in workers' earnings. Thus, at a policy making level one can argue that overeducation is a waste of resources for both the individual and society.

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