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A nonparametric approach for wage differentials of higher education graduates

Monica Mihaela Matei ^{a*}, Ana-Maria Zamfir ^b, Eliza Olivia Lungu ^c

^{abc}National Scientific Research Institute for Labour and Social Protection, 6-8 Povernei, Bucharest 010643, Romania

Abstract

The analysis developed in this paper aims to identify the factors with positive influence and those with a negative impact on gross earnings for higher education graduates. The investigation is based on a dataset, obtained as a result of the surveys conducted in the HEGESCO (*Higher Education as a Generator of Strategic Competences*) project. We performed a nonparametric regression analysis between gross earnings in current job and a set of explanatory variables like gender, economic sector of the current job, work duration.

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1. Introduction

Education is the most important factor shaping the access of individuals to labour market opportunities in modern economies. Apart from education, scholars agree that age, gender, working experience, professional or vocational background are important variables explaining the wage differentials across individuals. However, there is still an important debate on the level of influence of all these factors on earnings (Rosen, 1972, Mincer, 1974). In this article, we test the impact of several factors on wages, focusing on individuals with higher education, five years after their graduation. We restrict our study to the influence of workforce characteristics and firm/product market characteristics. Considering the profile of our population, we analyse four explanatory factors: gender, work duration, type of organization and economic sector.

2. Method

Our findings are based on the estimation results obtained through nonparametric techniques. This means that our approach does not require any assumptions about the distributions of the observed data. We used routines included in the *np* package build for R (Hayfield and Racine, 2008) which implements nonparametric and semi-parametric kernel based estimators. We computed kernel regression estimate of one continuous variable represented by gross earnings on four explanatory variables. Three of these are unordered discrete variables and the last one is continuous. The kernel method of density estimation is the main ingredient in this nonparametric approach. The bandwidth selection is based on Li and Racine (2004) approach which employ generalized product kernels admitting

* Corresponding Author: Monica Mihaela Matei. Tel.: +4-072-823-0514

E-mail address: matei.monica@protonmail.com

a mix of continuous and discrete data types. A test of significance for the explanatory variables was performed. The test is based on Racine, Hart and Li (2006) and it is also implemented in *np* package. Bootstrap is conducted in order to make the computation, a number of 399 bootstrap replications being generated.

We are dealing with a local estimator which means that for each data point we obtain an estimation of the coefficient associated to each independent variable. Thus in the next section we analyse the distribution of these coefficients in order to identify how the explanatory factors influence higher education graduates earnings.

3. Results

The analysis developed in this paper aims to identify the factors with positive influence and those with a negative impact on gross earnings for higher education graduates. The investigation is based on a dataset, obtained as a result of the surveys conducted in the HEGESCO (*Higher Education as a Generator of Strategic Competences*) project, which includes information about the labour market participation of graduates five years after leaving education in the following countries: Slovenia, Turkey, Lithuania, Poland and Hungary. Because we had to eliminate from the dataset the respondents whose employment status was different from „Employed” and also those not reporting their gross earnings, the sample sizes for each country were: Slovenia (2343 respondents), Turkey (1378 respondents), Lithuania (729 respondents), Poland (999 respondents), Hungary (898 respondents).

We used these samples to perform a nonparametric regression analysis between the logarithm of gross earnings per hour (euro) at current job (*Y*) and a set of four explanatory variables (*X1*, *X2*, *X3* and *X4*). The independent variables were chosen as follows:

- *X1* is a discrete variable showing the gender of the respondent
- *X2* is also a categorical variable with four levels: 1 if the respondent is currently working in public sector, 2 if the respondent is working in private non-profit sector, 3 for private profit sector and 4 for other responses.
- *X3* is a categorical variable constructed on the answer concerning the economic sector the respondent is working, according to the International Standard Industrial Classification. It has the following levels:
 - Agriculture and fishing (1) if the answer belongs to {Agriculture, Hunting and forestry, Fishing };
 - Industry and Construction (2) if the answer belongs to { Mining and quarrying, Manufacturing, Electricity, gas and water supply, Construction };
 - Services (3) if the answer belongs to { Wholesale and retail trade; Repair of motor vehicles, motorcycles and personal and household goods, Hotels and restaurants, Transport, storage and communications, Financial intermediation, Real estate, renting and business activities, Other community, social and personal service activities};
 - Public Services (4) if the answer belongs to { Public administration and defence; compulsory social security, Education, Health and social work, Extraterritorial organizations and bodies }.
- *X4* is a continuous variable measuring the work duration at current job (months).

We estimated one model for each country included in HEGESCO database. In Table 1 are presented the results returned by the significance test:

Table 1. Significance test results (P-values)

Country	<i>X1</i>	<i>X2</i>	<i>X3</i>	<i>X4</i>
Slovenia	<2e-16	<2e-16	<2e-16	<2e-16
Lithuania	0.048	0.002	0.025	0.704
Turkey	0.311	0.102	0.273	0.672
Poland	0.020	<2e-16	0.0476	0.283
Hungary	0.107	0.112	0.190	0.253

The probabilities presented in Table 1 allow us to draw the following conclusions: (1) for the model estimated on Slovenia sample all the independent variables have explanatory power for higher education graduates earnings; (2) for Turkey and Hungary the models are not validated meaning that the four independent variables are not explaining

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