

# Return on education in Turkey: A regional analysis (2008-2018)\*

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## Abstract

This article analyzes the change in the returns of education at different points of the wage distribution in twelve regions of Turkey according to the classification Nomenclature of Territorial Units for Statistics (NUTS-1). The estimates are based on the Mincer wage equation, but quantile regression technique was used to identify variations between returns to education at different wage levels. The data is taken from the Household Labor Force Survey for the years 2008, 2013 and, 2018. Education in Turkey is characterized by sustained expansion at the university level or higher.

The results indicates that the returns of education in the Turkish labor market have decreased over time. In 2008, the rate of return on one additional education year for a worker was ranging between 5 percent and 7.8 percent, while in 2018, it declined to between 3.7 and 6.4 percent. The results obtained in this study show the relationship between the distribution of wages and the educational level of the workforce are consistent with those found in previous studies.

*Key words:* Wage Inequality, Returns to Education, Quantile Regression.

*JEL codes:* E24-I26- J31.

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## 1. Introduction

The distribution of income among socioeconomic class is fundamental in the analysis of the growth and economic development of nations. In this context, understanding the evolution of the wage, returns of education are essential to understand inequality from the labor market dynamics.

Since the development of the theory of human capital, the analysis of the returns associated with the investment in education has been continuous. Traditionally, education performance rates have been estimated from the equation of Mincer (1974), which establishes a relationship between the logarithm of wages, years of schooling and a quadratic function of workers' experience.

In this context, the main objective of this study is to determine the rate of return of one more additional year of education on the labor income in Turkey using the quantile regression methodology. The quantile regression is especially relevant for the study of the decomposition of wage gaps at different points in the distribution, in situations where disparities are wide since the analysis is conducted for the twelve regions of Turkey according to the Nomenclature of Territorial Units for Statistics (NUTS) aligned with Eurostat. The chosen years were 2008, 2013 and, 2018 and the data sets used are comparable over time. The methodology of quantile regression is applied in the same way to the data sets, ensuring that the comparability among the regions is maximized. The returns to education have been studied extensively in Turkey. However, unlike other studies that have been carried out, in this work a comparative analysis of the twelve regions defined by (NUTS-1) is made. Furthermore, the study contributes to the earlier literature by extending the period of analysis at one decade. This study also includes a set of control variables that have not been studied jointly in other articles, such as the affiliation of the worker's social security, the economic sector, or branch in which it is located, which will allow a better identification of the estimator of the returns to education. The document finds that not only it is necessary to increase the coverage and quality of the education system, but also to ensure that returns are homogeneous so that workers with less income have a return to an additional year of education equivalent to those with high incomes.

The paper is organized as follows: In the first section, we start with a compilation of previous estimates for Turkey. The second section offers a brief review of the labor market. Then, a summary of the methodology used to estimate the wage differences along with the model, and the main characteristics of the data are presented. The results of the quantile estimates are presented in the fourth Section. Finally, the fifth section concludes with the main findings.

## 2. Previous studies

One of the main foundations of the theory of human capital is the relationship between the level of an individual's education and its level of productivity. Therefore, the higher degree of education that an individual possesses, the higher its marginal productivity will be, which in turn will increase its labor income. Therefore, the importance of education in economic growth has been the subject of a large number of studies in the recent literature. The results of these studies are quite useful, providing insights about the formulation and decision making by policymakers, especially for improving the functioning of the labor market.

One of the most important research studies is by Psacharopoulos and Patrinos (2004)<sup>1</sup>. They use Ordinary Least Squares (OLS) regression to estimate the rates of return to education for 98 countries. They also analyzed the returns of education for different regions of the world.<sup>2</sup> The study presents the return rates of education by levels; primary, secondary, and higher education in 83 countries. It also provides estimates of the coefficients according to the years of schooling, taking the average years of schooling for each country, and using data mainly from the years 1980 to 1999. The compiled evidence showed that on average annual returns to education are around 10 percent. Besides, the study also presents the returns by gender for several countries.

For Turkey, several studies that use different methodologies such as OLS regression by quantiles and Multinomial Logit, for which table A-1 of the annex shows the estimates of the rate of return in previous research carried out for Turkey, within the studies that employ OLS as a methodology are those of Tunaer and Gülcan (2006), Salehi-Isfahani et al. (2009), Güriş and Çağlayan (2012), Tansel and Daoud (2014), Tansel (2016), Tansel and Di Paolo (2017) and Patrinos et al. (2019).

The study by Tunaer and Gülcan (2006) uses the Household Budget Surveys for the years 1994, 2003, and 2004. The study shows that the average performance of an additional year of schooling presents lower marginal returns for the lower educational degrees for both genders. Salehi-Isfahani et al. (2009) present a comparative study of the returns of education in Egypt, Iran, and Turkey using data from similar surveys. The data are only for men located in urban areas, the results showed that over time, the returns of education in Turkey increased, stagnated in Egypt, and decreased in Iran.

Güriş and Çağlayan (2012) examine the wage distribution for female and male employees in the years 2003 and 2006 using data from the Household Labour Force

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<sup>1</sup> It is a more recent study and was an update of the review of (Psacharopoulos, 1994).

<sup>2</sup> This study includes Latin America and the Caribbean, Sub-Saharan Africa, Asia, Europe, the Middle East, North Africa and countries belonging to the OECD.

Survey (HLFS) conducted by the Turkish Statistical Institute. The results clearly show that the returns to education for female workers, are higher compared to their male counterparts. Another study that also uses the OLS methodology is by Tansel and Daoud (2014) in which private returns to education are compared between Palestine and Turkey during the 2004-2008 period. The results suggest that returns to education are higher for Turkey at different levels of education for both women and men and the return of education is greater for women than for men in both countries.

In a more recently, Tansel and Di Paolo (2017) researched the factors that determine the wage differences among university graduates according to their respective fields of study. The empirical analysis is based on the HLFS Survey, which covers the period 2009-2015. The authors find wage differences according to the field of study, explained in part by differences in observable characteristics (occupation and employment sector). Finally, Patrinos et al. (2019) using data from the (HLFS) for 2017, find that the average rate of return to education is 8.8 percent for Turkey, which puts it at almost the world average. The results also show that women receive higher returns to schooling compared to men.

Some studies carried out the estimations through other methodologies such as multinomial logit. For instance, the study by Tansel (2005) considers the wage differences in the public and private sectors in Turkey using data at the individual level which is derived from the Household Expenditure Survey (HES) of 1994. Among the main findings is that the wages of men working in the public sector are higher compared to the salaries of men who work in the private sector, except for individuals with a university-level education, where there is parity between the two sectors. For the years 2002 and 2010 the article by Popli and Yılmaz (2017) also uses a multinomial logit model, finding a decrease in wage inequality in Turkey for the period analyzed, caused by the diminishing returns of education and the experience.

The evolution of wages, wage inequality, and its relation to education using the quantile regression models have been widely used in several studies across many countries, both developed and developing. Martins and Pereira (2004) used this method to analyze a sample of 16 European countries. However, the data sets vary widely among countries, which may affect the results and their comparability between countries. The authors find that, in the highest quantiles of the wage distribution, higher returns for education are presented.

There are research exploring Turkey that utilized this methodology, such as the studies by Tansel and Bodur (2011) and Kaya (2017). Tansel and Bodur (2011) estimated the Mincer wage equation to explore the male wage inequality and its evolution in Turkey during the period 1994-2002. The results of the study show that male wage inequality is high. They also found that the returns to different levels of

education decreased significantly from 1994 to 2002. Kaya (2017) explores the gender wage gap over the wage distribution only for the year 2006. The results revealed the characteristics of the Turkish labor market. The gender wage gap is more pronounced in the upper part of the wage distribution, revealing the existence of a significant glass ceiling<sup>3</sup> effect in the labor market. This effect is mainly due to the differences in the remunerations between women and men and can be explained by the different characteristics of men possess within the labor market.

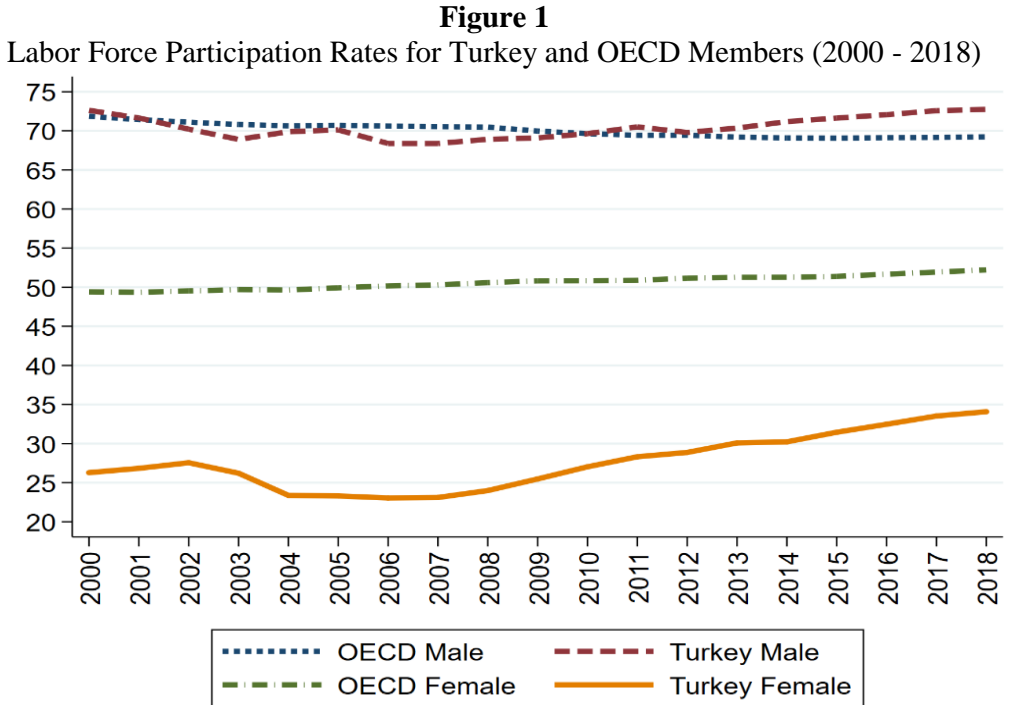
### 3. A brief overview of Turkish labor market

Whilst analyzing the labor market in Turkey, it can be observed that it has a lower labor force participation rate than the average of the Organization for Economic Cooperation and Development (OECD) member countries (World Bank, 2019). In this estimator only, the data of the population over 15 years old is used. For year 2000, the difference was 11 percentage points, but for 2019 the difference declined to 7.5 percentage points.

This is due to the very low female labor force participation rate in Turkey, as it is shown in Figure 1. In the first decade of this century, the participation of women ranged between 20 and 30 percent, and during recent years it has stabilized around 30 percent. On the other hand, for the aggregate, the participation of women in the labor force in the OECD member countries has been constant between 2000 and 2019, which is always close to 50 percent.

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<sup>3</sup> The concept of the "glass ceiling" corresponds to those difficulties that hinder the progress of a qualified person within a hierarchy to a higher level of authority, especially in their workplaces, which is linked to those people do not reach higher wage levels.



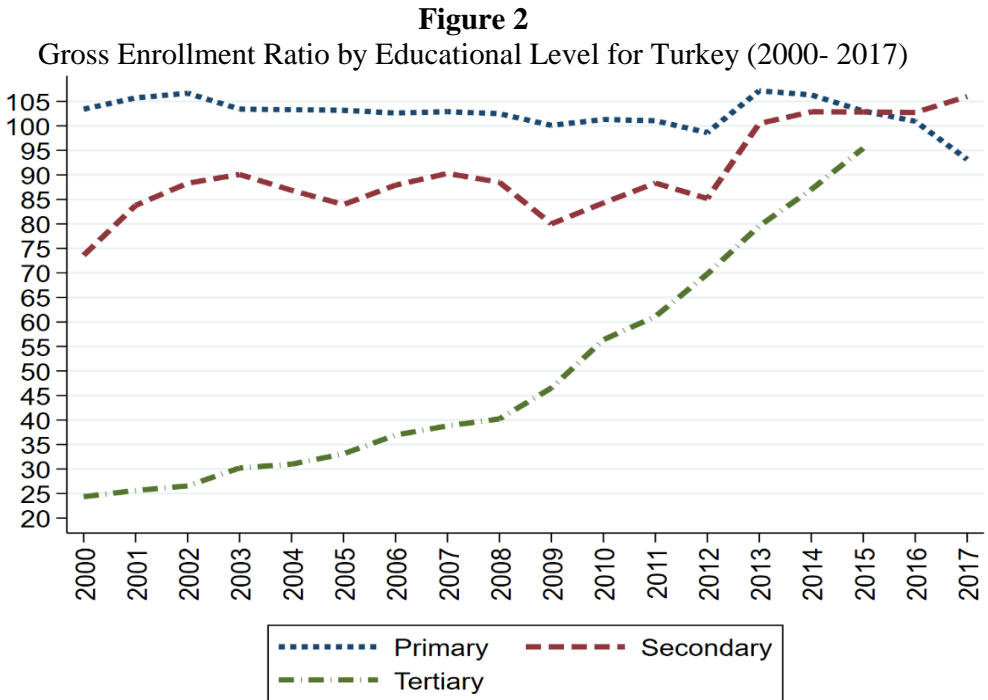
Source: World Bank (2019).

Note: Labor force participation rate is the proportion of the population ages 15-64 that is economically active: all people who supply labor for production of goods and services during a specified period.

Regarding the participation rate of men, the values have remained constant and close to 70 percent in Turkey and the average of the OECD countries during the last 17 years. Although for Turkey, the difference between the two genders has decreased in recent years, male participation is greater compared to women. Also, young people under 25 years of age, workers with low levels of schooling and women are the most vulnerable groups of the economically active population facing the unemployment.

The low labor force participation rates in Turkey represent a challenge in accession to the European Union, which was one of the lowest labor force participation rates among the OECD countries (Kaya, 2017: 4).

However, the workforce in Turkey has become increasingly qualified in recent years. It can be concluded that the economy has undergone a technological change biased towards qualified work together with a labor supply that has responded to market incentives, increasing its rating significantly.



Source: World Bank (2018).

Note: There is no data for tertiary education in the years of 2016 and 2017.

In figure 2, the gross enrollment rate by educational level for Turkey from 2000 to 2017 demonstrates the differences in access to the three educational levels of the system. The first level is that of primary education which shows a gross enrollment rate (GER)<sup>4</sup> over 100 percent for the period analyzed and the graph shows a decrease in final two years. This rate corresponds to the total number of students enrolled in primary education, regardless of their age, expressed as a percentage of the total population of official primary school age.

In terms of secondary education, the GER has gone from 80 percent to 90 percent between 2000 and 2012, over 100 percent since 2013. This is mainly due to the reform implemented in 2012 and the implementation of the "4 + 4 + 4" system where the last 4 years of education in the upper secondary school became compulsory. Following this measure, a notable improvement in the coverage of the secondary education level is apparent (Popli and Yılmaz, 2017: 77).

With all the reforms made to university education by the Turkish government between the decades 1980 and 2000, it is possible to see that from the beginning of

<sup>4</sup> The GER can be higher than 100 percent due to the inclusion of older and younger students at the official age either by repeating grades or by an early or late entrance to said level of education.

the century until 2016 the GER<sup>5</sup> had increased by about 70 percentage points. In 2000, this rate had a very low value close to 24 percent, mainly due to two factors. First, the increase of the quotas for students in the universities. Secondly, because the GER includes students older than the official age either by repeating grades or by a late entry to that level of education. Thus, the difference between the number of students enrolled and the total population of official age students in attendance of those levels has been reduced.

## 4. Data and methodology

### 4.1. *The data*

The data used has been taken from the micro data of Household Labor Force Survey (HLFS) for the years 2008, 2013, and 2018. The surveys are conducted monthly by the Turkish Statistics Institute (TURKSTAT). These years are selected since they show four years before and six years after the reform of the education system of 2012, also these years represent a decade after the global economic crisis of 2008, showing how these events affected the Turkish labor market. The HLFS presents the largest sample of Turkish labor market data and collects demographic information, including age, sex, marital status, living situation, residence location, and the highest level of education completed. Beyond these demographic questions, the survey mainly asks questions about behavior and results related to the labor market, including the labor situation, the labor activity branch, the average salaries, bonuses, and the size of the company.

The classification that is handled for the regions of Turkey according to the Nomenclature of Territorial Units for Statistics (NUTS). The twelve regions defined by (NUTS at level 1) are Istanbul Region (TR1), West Marmara Region (TR2), Aegean Region (TR3), East Marmara Region (TR4), West Anatolia Region (TR5), Mediterranean Region (TR6), Central Anatolia Region (TR7), West Black Sea Region (TR8), East Black Sea Region (TR9), Northeast Anatolia Region (TRA), Central East Anatolia Region (TRB) and Southeast Anatolia Region (TRC).

In this study, all workers between the ages of 15 and 64 years are considered. The age categories not in consideration and thus excluded are those who are above 65 since it is the age of retirement and those under 15 years since it is not legal to work before that age. Another group excluded from the analysis are workers who did not work in the month of the survey conducted and/or did not report positive income for that month. Self-employed workers are also not considered since their

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<sup>5</sup> The gross enrollment rate of higher education for Turkey corresponds to the total number of students enrolled to obtain associate and undergraduate degrees; students enrolled in distance education programs are not included.



income is difficult to analyze in the framework of the Mincer model. Finally, a very small proportion of self-employed women and men (unpaid family workers) together with those already retired are not considered in the final sample. Table A-2 of the annexes shows the total number of observations and the total number of male and female employees presented for each year of the HLFS.

After eliminating the individuals with missing values in the relevant variables such as years of education, monthly wage and the number of hours worked per week, the sample is 77,194 for 2008, 97,339 for 2013, and 97,969 for 2018. Therefore, for the three years, the sample is relatively stable, it is also seen that the participation of women in the Turkish labor market is much lower than men, reaching respectively 25 and 75 percent in 2008 and changing in 2018 to a ratio of 30 percent for women and 70 percent for men.

#### 4.2. Empirical methodology

For the model, the wage equation based on the Mincer model (1974) is employed. For the estimations, we will use the quantile regression method, to evaluate the wage gap,

The determinants of wages are analyzed through the functional relationship known in the labor economics literature as the income function of human capital, the Mincer equation<sup>6</sup>, or the Mincerian function. It relates to wage increases with two variables, education, and experience. It is mainly expected that one more year of education will cause an increase in the rate of return (wage).

The typical Mincerian function is represented as:

$$\ln Y_i = \beta_0 + \beta_1 S_i + \beta_2 \text{Exp}_i + \beta_3 \text{Exp}_i^2 + \varepsilon_i \quad (1)$$

Where  $Y_i$  is the wage received by the individual  $i$  in a given period,  $S_i$  are the years of education,  $\text{Exp}_i$  experience and  $\text{Exp}_i^2$  the potential experience squared (which captures the non-linearity of the age-income profile),  $\beta_0$  is the intercept, and represents the logarithm of the wage of an individual who has no education or experience.  $\beta_1$  measures the effect of education on wages, whereas  $\beta_2$  measures the effect of experience on wages, holding everything else constant (*ceteris paribus*). Theoretically,  $\beta_1$  and  $\beta_2$  must be positive, and  $\beta_3$  must be negative. Finally,  $\varepsilon$  is the random perturbation term that is distributed normally with mean 0, and standard deviation  $(\sigma\varepsilon)$ .

As mentioned before to make the estimations, we will use the quantile regression methodology, which was proposed by Koenker and Bassett (1978), the

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<sup>6</sup> The Mincer equation, as well as the study carried out, was published in the article "Schooling, Experience and Earnings" in 1974.

objectives pursued by this methodology are the same as in the linear regression by OLS, both seek to model the relationship between variables. However, due to problems such as heteroscedasticity, presence of atypical values, and structural change, the mean response value of the endogenous variable offered by the OLS estimate is not always the most representative (Vicéns and Sánchez, 2012: 7). Therefore, another advantage of quantile regression lies in the possibility of estimating any quantile, thus being able to assess what happens with extreme values of the population.

Despite being a technique with more than thirty years of history, and even though the advantages it reports are only fulfilled under certain conditions, this method is still quite unknown and the applications that can be found are not very numerous. Studies that use quantile regression in economics have been used in different applications, including the determination of salaries, the size of firms, house prices, income inequality, among others.

## 5. The econometric model

The main objective of the model is to determine the sensitivity of income to the variable named years of schooling of individuals; this relationship is established by the Mincer equation. The interpretation of this equation, in terms of rates of return to the investment of human capital, suggests that the only distinction between the income of people come exclusively from the differences found in the level of education attained and the level of training of the individual (experience).

Equation 2 shows the association between the dependent variable (Y) and the independent variables (X).

$$\ln W_1 = \beta_1 + \beta_2 NS_i + \beta_3 Exp_i + \beta_4 Exp_i^2 + \beta_5 G_i + \beta_6 MS_i + \beta_7 NW_i + \beta_8 O_i + \beta_9 SS_i + \beta_{10} ES_i + \varepsilon_i \quad (2)$$

### 5.1. Dependent variable

The logarithm of wage per hour: constructed from the natural logarithm<sup>7</sup> of the hourly wage worked by the individual, where all income derived from work is considered as wage.

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<sup>7</sup> By not having a normal distribution, the hour wage is transformed into a logarithmic function. With this correction it is possible to obtain the percentages of the coefficients estimated in the multivariate regressions. The wage is weighted by the number of hours worked to consider the differentiation of workload worked by men and women.

### 5.2. Independent variables

**Years of Education:** It is the variable of interest and corresponds to the years of education that the individual has. The maximum value that this variable can take is 26 years, which would be the case of an individual with post-doctorate studies.

**Experience:** Corresponds to the years of experience that the individual has.<sup>8</sup>

**Gender:** Dummy variable showing the worker's gender

**Marital status:** Categorical variable that shows the civil status of the worker.

**Social Security:** Dummy variable that shows if the individual is registered with any social security institution.

**Number of Workers:** Variable that shows the number of people employed in the individual's workplace. This variable is a proxy of labor informality, generally workers who are in a group of fewer than 10 workers lack social protection. It has the following categories: Less than 10, 10-24, 25-49 and 50 or more than 50

**Occupation:** Categorical variable that shows the main tasks and duties of the individual in the workplace.

**Economic sector:** Variable that indicates the economic sector in which the individual works. It is divided into the following categories: Primary sector: Extraction of raw materials, mining, fishing and agriculture, Secondary Sector: Manufacturing and Construction, Tertiary sector: Services<sup>9</sup> and Other activities<sup>10</sup>

## 6. Estimation results

As mentioned above, the analysis was made using the quantile regression method to evaluate the returns of education and experience, among other variables. For each year an estimation was carried out (2008, 2013, and 2018).

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<sup>8</sup> Using the measure of potential experience proposed by Mincer  $\text{Exp} = \text{age} - \text{years of education} - 6$ .

<sup>9</sup> It includes wholesale and retail trade, hotels and restaurants, transport and communication, financial intermediation, real estate and business activities, public administration and defense, education and health and social work.

<sup>10</sup> It includes other service activities, activities of households as employers and activities of non-governmental organization and extraterritorial organizations.

**Table 1**  
**OLS and Quantile Regression Estimating of Returns to Schooling for Turkey and**  
**NUTS-1 Regions (2008-2018)**

		<b>OLS</b>	<b>Q 25</b>	<b>Q 50</b>	<b>Q 75</b>
<b>Turkey</b>	2008	0.06749*** (0.0006)	0.06563*** (0.0008)	0.06825*** (0.0007)	0.07044*** (0.0008)
	2013	0.06417** (0.0005)	0.05720*** (0.0007)	0.06285*** (0.0006)	0.06920*** (0.0007)
	2018	0.05589*** (0.0005)	0.04734*** (0.0006)	0.05383*** (0.0005)	0.06026*** (0.0006)
<b>TR1 İstanbul</b>	2008	0.06745*** (0.0013)	0.05119*** (0.0016)	0.06179*** (0.0015)	0.07274*** (0.0018)
	2013	0.06406*** (0.0013)	0.04925*** (0.0015)	0.06010*** (0.0014)	0.06555*** (0.0018)
	2018	0.05726*** (0.0013)	0.04443** (0.0016)	0.05127*** (0.0015)	0.06278*** (0.0019)
<b>TR2 West Marmara</b>	2008	0.07079*** (0.0026)	0.06518*** (0.0035)	0.07225*** (0.0032)	0.07924*** (0.0036)
	2013	0.06102*** (0.0021)	0.05332*** (0.0025)	0.05762*** (0.0022)	0.06414*** (0.0026)
	2018	0.04512*** (0.0016)	0.03746*** (0.0021)	0.04002*** (0.0019)	0.04736*** (0.0021)
<b>TR3 Aegean</b>	2008	0.06825*** (0.0015)	0.06718*** (0.0018)	0.06744*** (0.0016)	0.06814*** (0.0019)
	2013	0.06196*** (0.0014)	0.05210*** (0.0019)	0.05844*** (0.0016)	0.06182*** (0.0019)
	2018	0.05832 (0.0013)	0.04623*** (0.0015)	0.05559** (0.0015)	0.06397*** (0.0016)

<b>TR4 East Marmara</b>	2008	0.05925*** (0.0016)	0.05478*** (0.0021)	0.06229*** (0.0018)	0.06778*** (0.0023)
	2013	0.06395*** (0.0014)	0.05001*** (0.0018)	0.06179*** (0.0015)	0.06961*** (0.0018)
	2018	0.05150*** (0.0014)	0.03759*** (0.0016)	0.05043*** (0.0016)	0.05759*** (0.0018)
<b>TR5 West Anatolia</b>	2008	0.07591*** (0.0021)	0.07837*** (0.0025)	0.08006*** (0.0025)	0.07783*** (0.0028)
	2013	0.07788*** (0.0014)	0.07268*** (0.0018)	0.07839*** (0.0015)	0.08457*** (0.0017)
	2018	0.05902*** (0.0014)	0.05013*** (0.0018)	0.05478*** (0.0016)	0.06445*** (0.0017)
<b>TR6 Mediterranean</b>	2008	0.06990*** (0.0020)	0.06532*** (0.0025)	0.07333*** (0.0023)	0.07407*** (0.0026)
	2013	0.06104*** (0.0016)	0.05280*** (0.0021)	0.06157*** (0.0019)	0.07117*** (0.0022)
	2018	0.05912*** (0.0014)	0.04432*** (0.0019)	0.05811*** (0.0017)	0.06608*** (0.0018)
<b>TR7 Central Anatolia</b>	2008	0.07135*** (0.0030)	0.07445*** (0.0039)	0.07694*** (0.0036)	0.07553*** (0.0040)
	2013	0.06808*** (0.0024)	0.06198*** (0.0033)	0.07135*** (0.0028)	0.08161*** (0.0033)
	2018	0.05609*** (0.0018)	0.04369*** (0.0024)	0.05274*** (0.0021)	0.06407*** (0.0023)
<b>TR8 West Black Sea</b>	2008	0.07976*** (0.0023)	0.07907*** (0.0029)	0.08197*** (0.0028)	0.08152*** (0.0030)
	2013	0.06956*** (0.0023)	0.06835*** (0.0034)	0.07043*** (0.0027)	0.07644*** (0.0030)
	2018	0.06074*** (0.0017)	0.05981*** (0.0023)	0.06357*** (0.0019)	0.06375*** (0.0022)

<b>TR9 East Black Sea</b>	2008	0.06271*** (0.0038)	0.06759*** (0.0049)	0.06240*** (0.0041)	0.05678*** (0.0052)
	2013	0.06280*** (0.0026)	0.06131*** (0.0035)	0.06115*** (0.0029)	0.06256*** (0.0036)
	2018	0.04935*** (0.0025)	0.04341*** (0.0034)	0.04341** (0.0027)	0.04898*** (0.0031)
<b>TRA Northeast Anatolia</b>	2008	0.07171*** (0.0041)	0.07580*** (0.0054)	0.06820*** (0.0052)	0.06724*** (0.0052)
	2013	0.05824*** (0.0032)	0.06032*** (0.0046)	0.05493*** (0.0039)	0.05910*** (0.0042)
	2018	0.04777*** (0.0023)	0.04387*** (0.0033)	0.04389*** (0.0027)	0.04527*** (0.0030)
<b>TRB Central East Anatolia</b>	2008	0.05930*** (0.0034)	0.05839*** (0.0049)	0.06395*** (0.0042)	0.05879*** (0.0046)
	2013	0.04612*** (0.0028)	0.04062*** (0.0042)	0.04125*** (0.0033)	0.04665*** (0.0043)
	2018	0.05055*** (0.0020)	0.05099*** (0.0026)	0.04895*** (0.0024)	0.04977*** (0.0025)
<b>TRC Southeast Anatolia</b>	2008	0.04940*** (0.0026)	0.05214*** (0.0034)	0.05246*** (0.0030)	0.04604*** (0.0035)
	2013	0.05912*** (0.0024)	0.05592*** (0.0032)	0.05552*** (0.0026)	0.05896*** (0.0027)
	2018	0.05130*** (0.0017)	0.04410*** (0.0023)	0.05077*** (0.0020)	0.05370*** (0.0022)

*Source:* Authors' estimates using Household Labor Force Survey.

Standard errors in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

Table 1 shows the returns of education for quantiles respectively at .25, .50, and .75 and by the OLS method, based on the Mincer wage equation, it is recalled that the variable year of education is defined as the years of education completed by the individual. This means that the performance of an additional year of education is constant at all educational levels.

The first result that can be seen is that the coefficients of education are statistically significant and present the right sign, the returns to education are positive, which implies that wages grow as the number of years of education of the workers increase.

The results for Turkey indicate that the returns of this variable present a similar pattern of change over time for the three quantiles. However, the results show significant differences in the magnitude, in general, the returns are higher in the upper quantiles (upper part of the wage distribution) than in the lower ones (lower part of the wage distribution).

According to the estimated coefficients, the rate of return for a Turkish worker to have one more year of education is between 4.7 percent and 7.1 percent, according to the three years analyzed and for the selected quantiles, which implies that wages increase as the number of years of education of workers increase.

Table 1 also reports the coefficients of education for the twelve regions and the three different years. When observing the coefficients of the regions they show that the returns of this variable have a similar pattern for eight of the twelve regions: Istanbul, West Marmara, Aegean, East Marmara, West Anatolia, Mediterranean, Central Anatolia, and West Black Sea, in each of these regions as well as for all of Turkey, the returns are higher in the upper quantiles and the coefficients are very similar to those mentioned over the years for the whole country as they range from 3.7 percent to 8.4 percent.

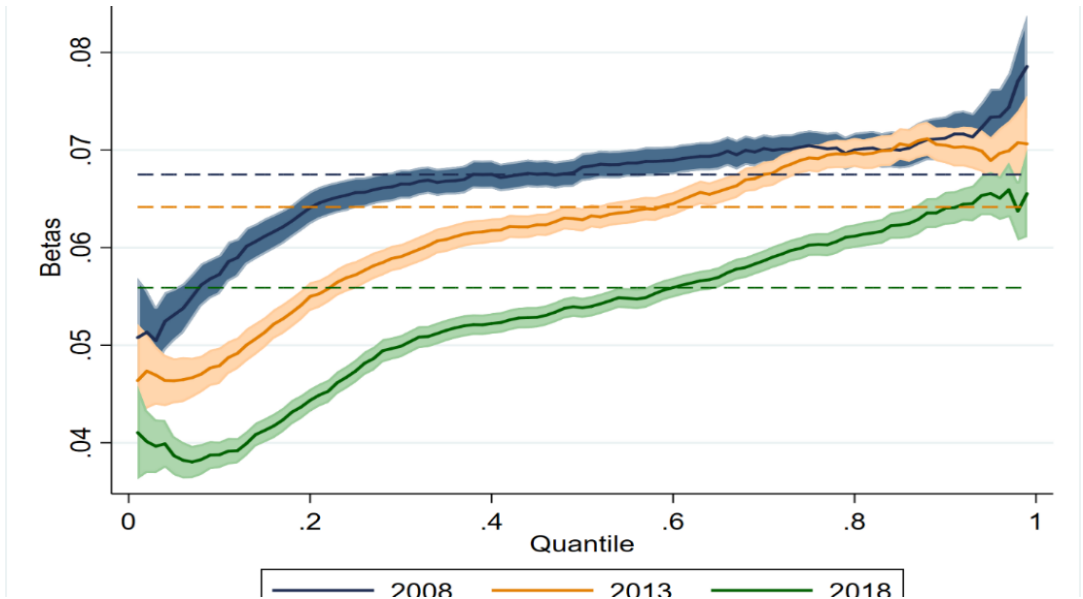
However, the other 4 regions that are located east of Turkey: East Black Sea, Northeast Anatolia, Central East Anatolia, and Southeast Anatolia, the education coefficients present different patterns in each quantile during the years explored.

The rate of return for a worker in the East Black Sea and Northeast Anatolia regions by having one more year of education, according to the estimated coefficients in each of the 3 quantiles, is ranging between 4.3 percent and 7.5 percent, showing values that decrease over the years for each quantile but remain constant or decrease between quantiles.

For the Central East Anatolia region, it is found that education coefficients decreased in all quantiles between 2008 and 2013, but increased in 2018, showing an unusual behavior concerning the other regions. Finally, the Southeast Anatolia region over the years has decreasing coefficients for the first quantile and increasing yields for the .5 and .75 quantiles. It is also observed that the coefficients of education for quantile do not vary much among quantiles as seen in the other regions, since for this region the coefficients are between 4.4 percent and 5.8 percent.

Figure 3 for Turkey and figure 4 for the twelve regions are the main result of this research, as they show the evolution of the coefficients of schooling of workers for each wage quantile. On the other hand, the shaded regions show 95 percent confidence intervals, in this way the importance of changes in education coefficients between quantiles, years, and regions can be assessed. Finally, the horizontal lines in the figures indicate the corresponding OLS estimates for each year.

**Figure 3**  
Schooling coefficients for Turkey (2008-2018).



Source: Authors' estimates using Household Labor Force Survey.

Figure 3 shows how in Turkey for each of the three years the education coefficients increase steadily between the 1st and 75th quantiles, which then become much more homogeneous for the last 25th quantiles. According to the estimated coefficients, in 2008 the profitability rate of one additional year of education is ranging between 5 percent and 7.8 percent while looking at the coefficients of the same variable for 2018 these are between 3.7 percent and 6.4 percent. In line with the results found previously, the education returns in the Turkish labor market decrease over time. These decreases may be mainly due to the greater relative supply of educated labor, an effect caused by the reforms made to education in previous years and changing composition of economic sectors.

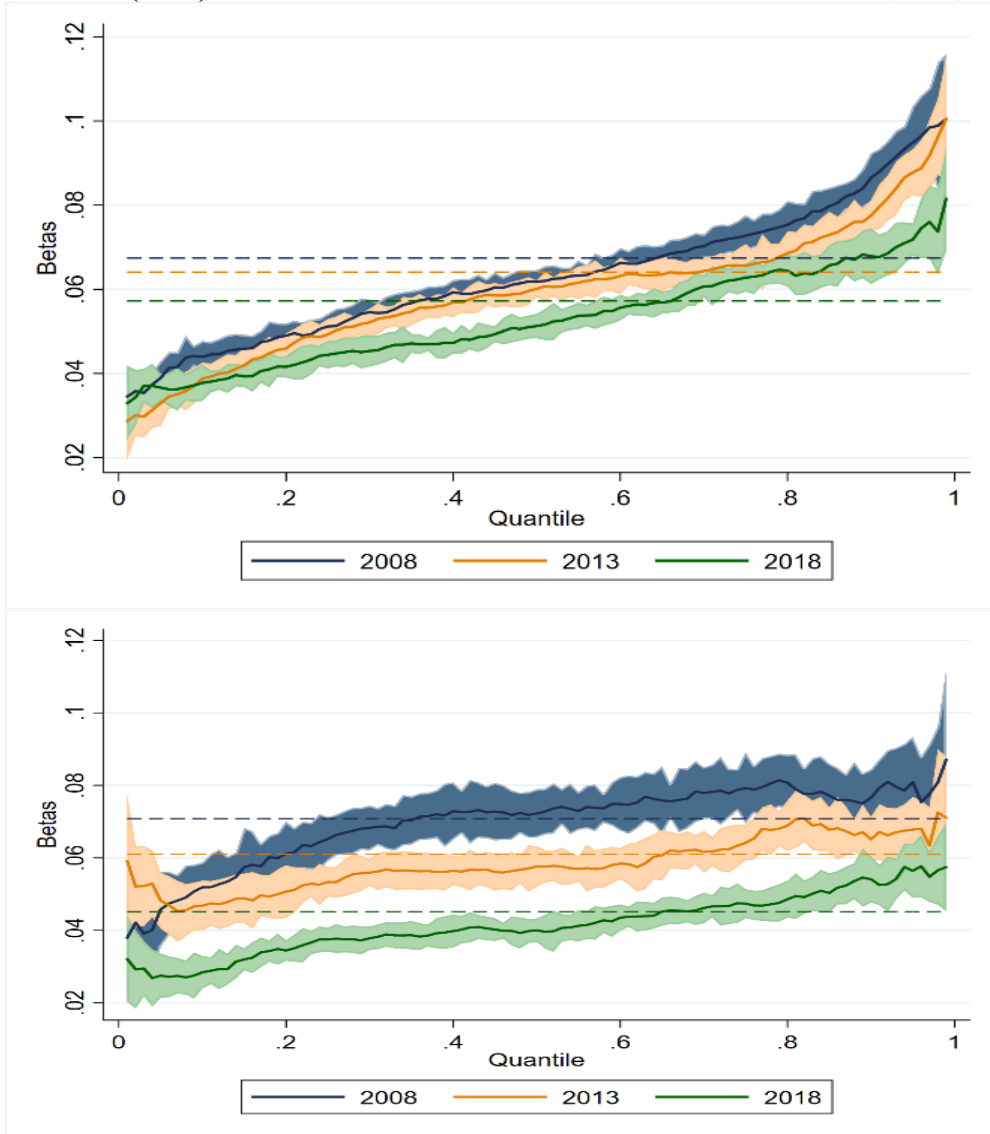
The fact that there are segments of quantiles in the figure in which the simultaneous confidence intervals do not overlap, shows the statistically significant differences over the years. For example, the 2008 band does not overlap with the 2018 band, which suggests a marked and statistically significant change in the relationship between the years of education and the wage distribution in the decade analyzed.



**Figure 4**  
Schooling coefficients by Region

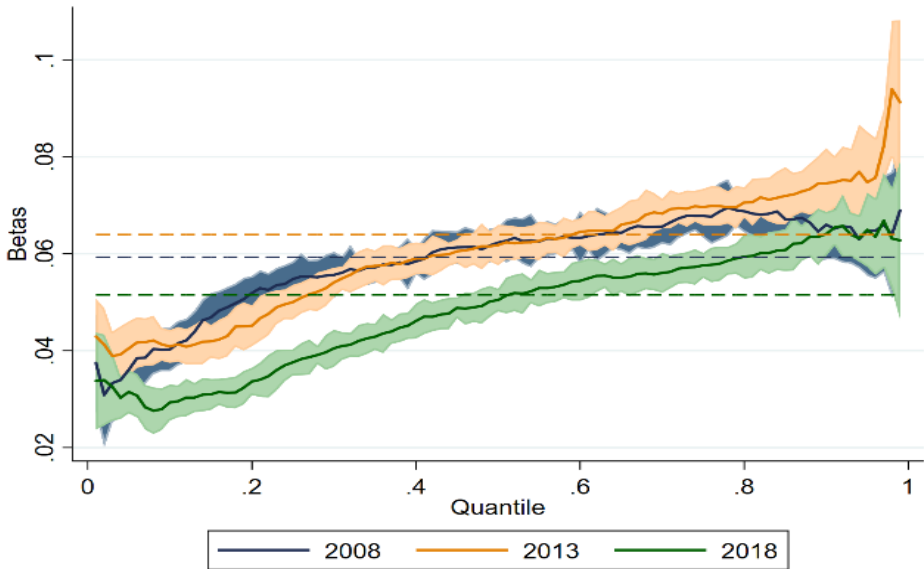
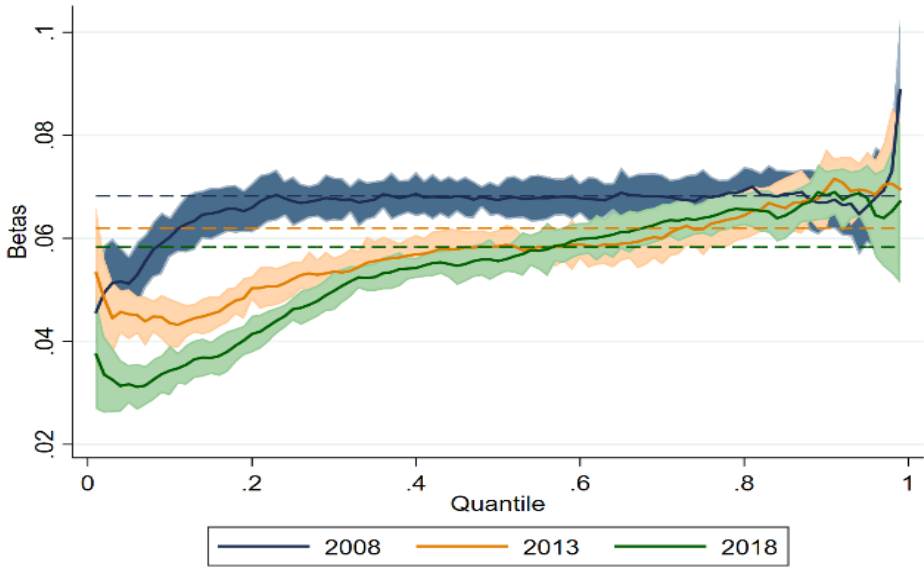
**İstanbul (TR1)**

**West Marmara (TR2)**



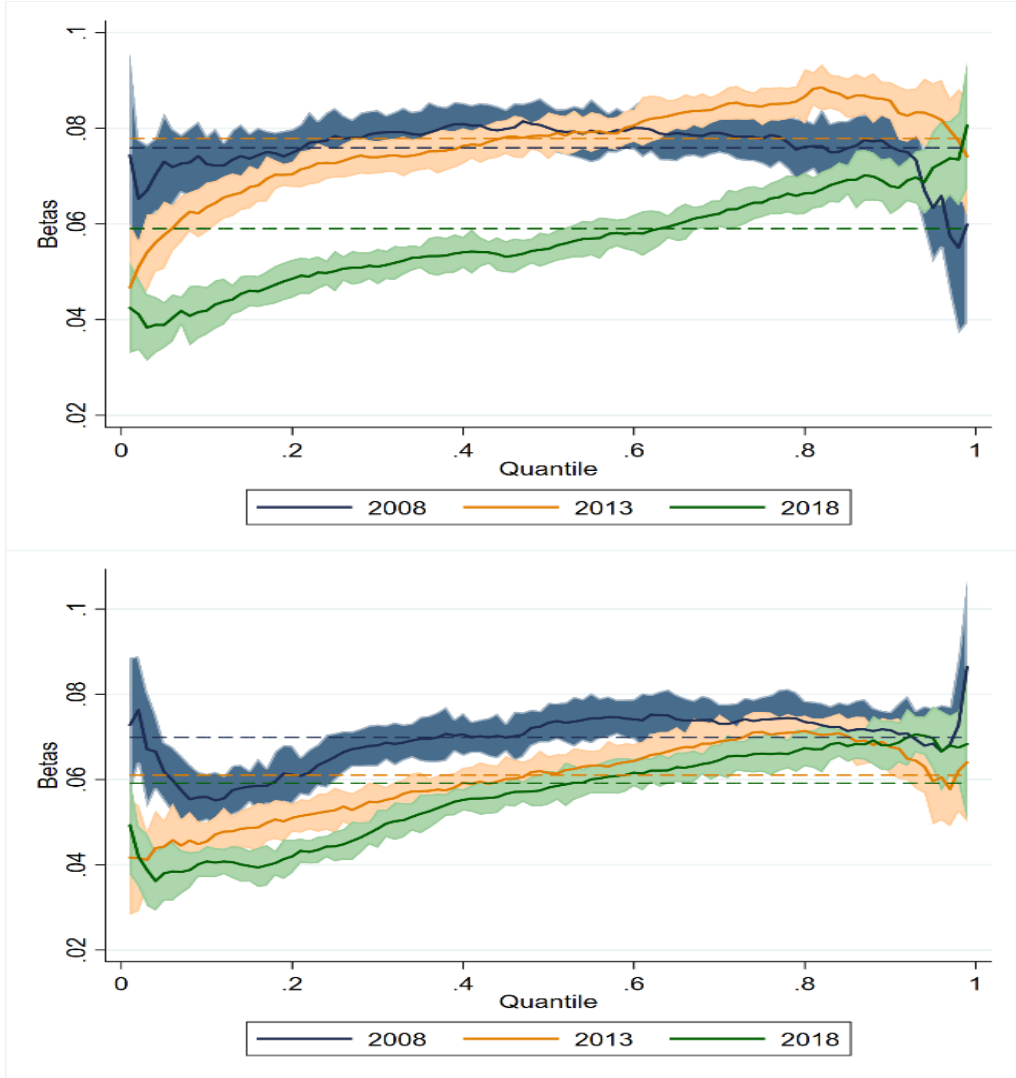
**Aegean (TR3)**

**East Marmara (TR4)**



**West Anatolia (TR5)**

**Mediterranean (TR6)**

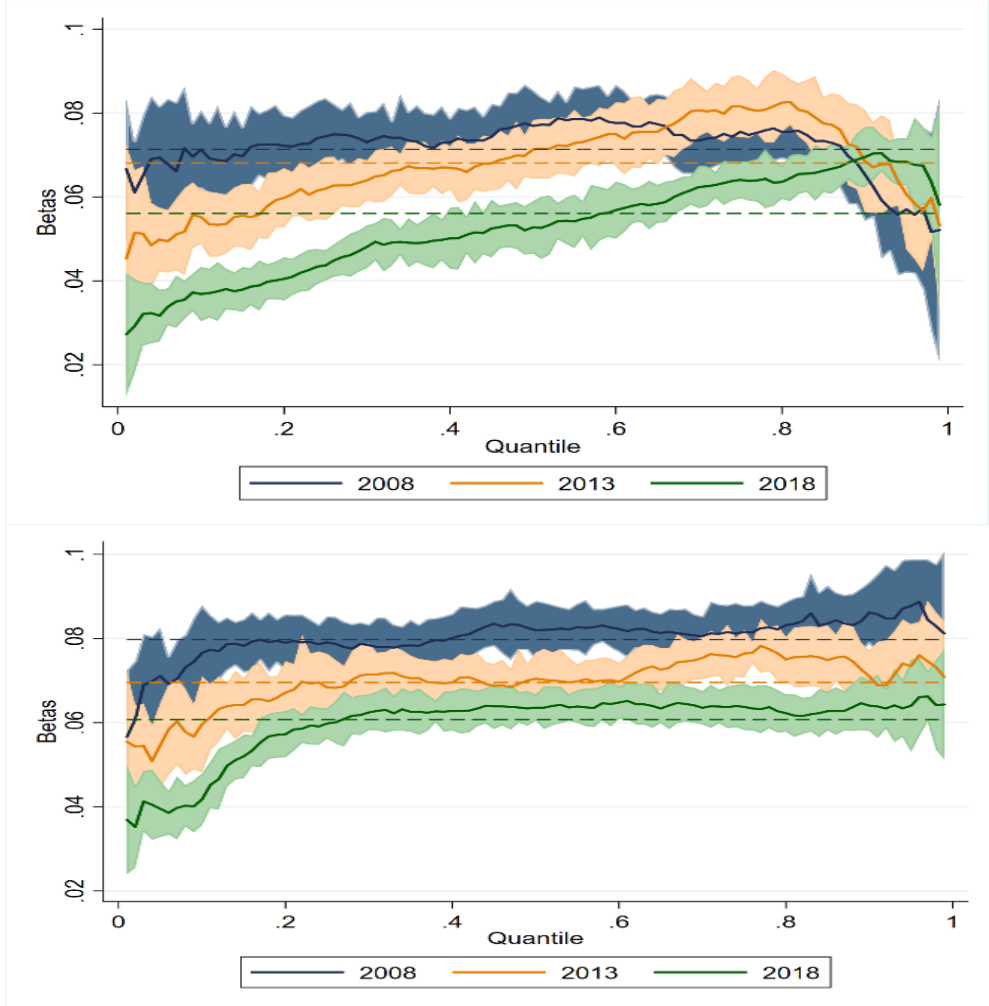


Source: Authors' estimates using Household Labor Force Survey.

**Figure 4**  
Schooling coefficients by Region

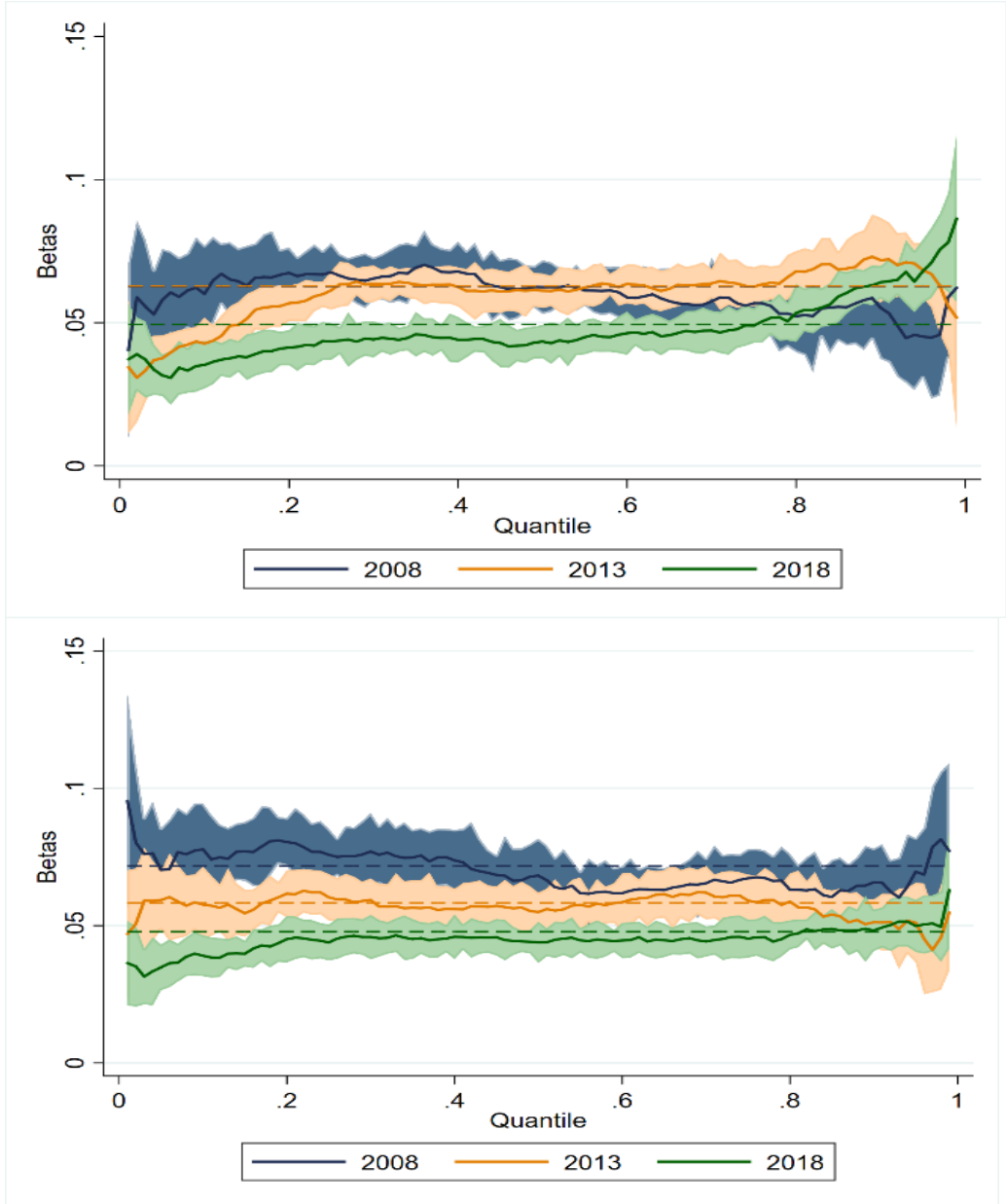
**Central Anatolia (TR7)**

**West Black Sea (TR8)**



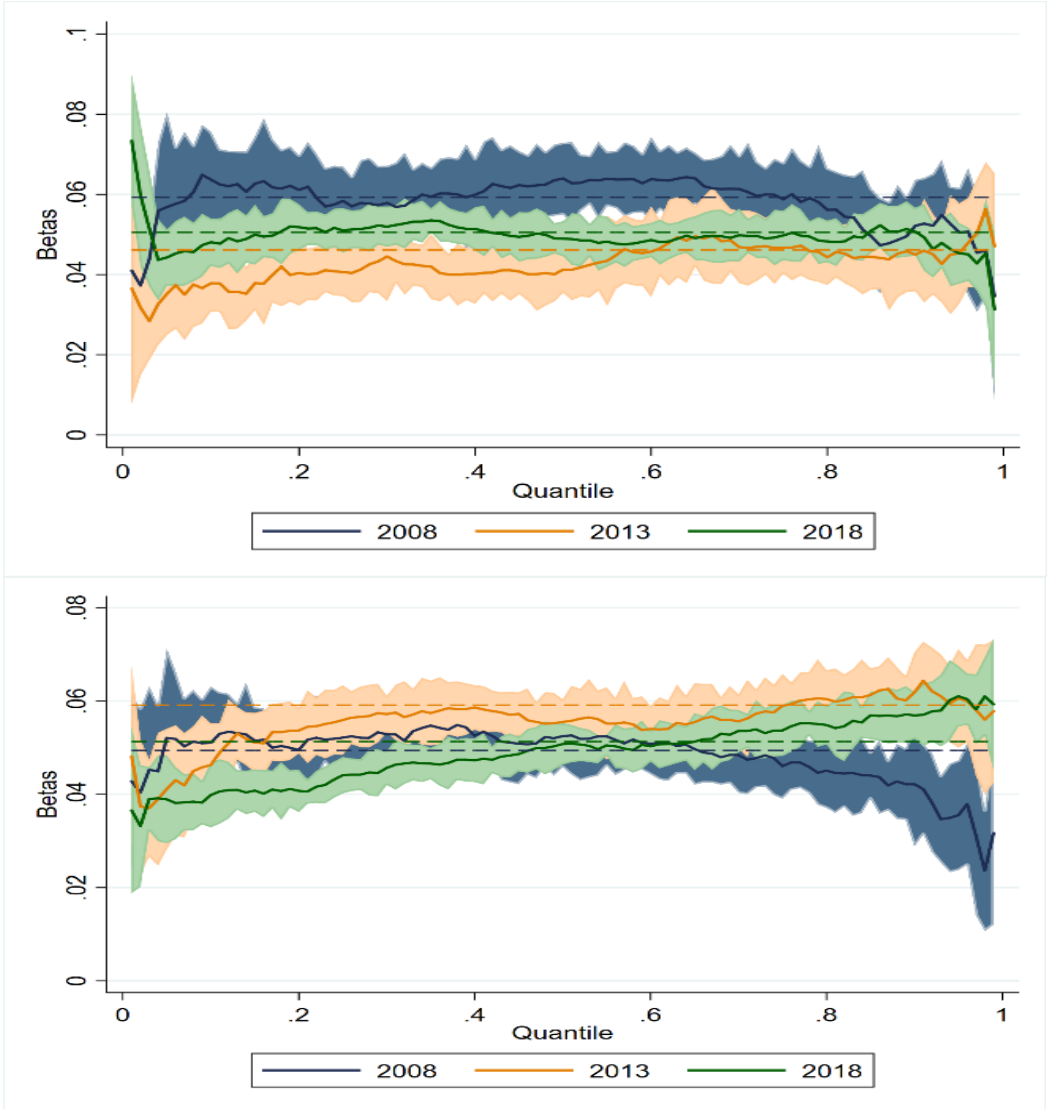
**East Black Sea (TR9)**

**Northeast Anatolia (TRA)**



Central East Anatolia (TRB)

Southeast Anatolia (TRC)



Source: Authors' estimates using Household Labor Force Survey.

As for all of Turkey, Figure 4 shows that for most of the regions during each of the three selected years, returns to education increase as the quantile of wages studied increases and decreases over the years. The difference is that for the regions located in the eastern part of the country, the returns of education have different

patterns, because as the wage quantile increases, the returns remain constant or in some cases decrease.

For the Istanbul region in 2008, the profitability rate of one more year of education for a worker was between 3.4 percent and 9.9 percent, when looking at returns for 2018 these were between 3.7 percent and 8.1 percent, showing that in the labor market of the largest city, the commercial center of the country, education returns also decrease with respect to time and especially for the highest wage quantiles.

Furthermore, in Figure 4 the East Marmara region shows that for the year 2008 and 2013 between quantile 30 and quantile 80, there are segments in which the simultaneous confidence intervals overlap, suggesting that for those years in this region there was a marked and statistically significant change in the relationship between years of education and wage distribution.

A similar case can be seen for the Northeast Anatolia region in Figure 4. In this region also for a segment of the quantiles the simultaneous confidence intervals overlap, for this region from quantile 1 to quantile 50, the returns of education decrease with respect to the years, but from quantile 50 to 100 the returns of education do not decrease, and the confidence intervals overlap, indicating that in this region over the years there was no change in the Returns of education for people with high salaries.

The Southeast Anatolia and East Black Sea regions present an atypical case with respect to the other regions, since for 2008 the returns of education decrease as the quantiles of wages increase, it is also observed that with respect to 2008 the returns of education in 2013 and 2018 did not decrease, on the contrary, they increased.

Finally, when comparing the results of the estimates derived by the OLS, which show the returns with respect to the average, it is observed that for Turkey and the twelve regions the estimates of the returns of education made by QR present important differences in different points of the wage distribution. Hence, it can be concluded that an increase in education is not uniformly rewarded in the labor market.

The results are consistent with other studies on the subject. Psacharopoulos and Patrinos, (2004), found that the returns of education have declined over the years in several regions of the world. Likewise, in this study, it is found that the returns to education increase through quantiles similar to the findings by Martins and Pereira (2004).

For Turkey, there are previous studies that use QR as a methodology. In the study by Tansel and Bodur (2011), the returns of education also decrease over the years and show an increase among the quantiles, as in the study by Popli and Yılma (2018), in which between 2002 and 2010 for workers with secondary and university

levels, the returns of education also decrease. Finally, in the study of Kaya (2018), it is found that the returns of education increase for both men and women through the quantiles.

## 7. Conclusions

This work constitutes an effort to provide a comprehensive study of the returns of education in Turkey and for the twelve regions of the country according to the classification (NUTS-1), showing its evolution from 2008 to 2018. In the estimates, comparable data are used, and the quantile regression technique was used as a methodology. Estimates also show that QR accurately captures changes in wage distribution for the selected period.

One of the main conclusions is that the educational system in Turkey has high coverage rates for primary and secondary education. With respect to higher education, it can be observed that factors such as the increase in the number of universities, reforms in the education system, and the programs used by the Turkish government in past decades had a substantial effect on wage distribution, increasing the supply of an educated workforce.

For this reason, the returns of education in the Turkish labor market have decreased over time. In 2008 the rate of return on one additional education year for a worker was ranging between 5 percent and 7.8 percent, while in 2018, it declined to between 3.7 and 6.4 percent.

In Turkey, factors in the demand side of the labor market such as weak investment in the industrial sector (i.e., weak high value-added manufacturing sector investment) and the high-quality service sector in which skilled labor is mainly employed in tourism and finance, causes a decrease in wages. Also, other factors in the demand-side that negatively affect the returns of education are jobs characteristics which are generally ordinary types and require only low and medium level skilled labor. Therefore, rapidly increasing low and medium skill level labor supply depresses wages in the labor market.

In the case of the regions, the returns of education present a similar pattern of change for eight of the twelve regions which are in the west and center of the country and are as follows: İstanbul, West Marmara, Aegean, East Marmara, West Anatolia Region, Mediterranean, Central Anatolia, and West Black Sea. More specifically, the returns of education decreased, while they have remained constant in some quantiles. Most of the population in Turkey is concentrated in those regions, especially in Istanbul, which hosts almost the 18 percent of the country's total population. This explains the presence of a greater relative supply of educated labor, causing education returns to decrease.



For the remaining 4 regions located in the eastern part of Turkey (East Black Sea, Northeast Anatolia, Central East Anatolia, and Southeast Anatolia), the returns of education are not homogeneous, and each region presents a different pattern. For example, in the case of East Black Sea and Southeast Anatolia, education returns decrease as wages increase, but these do not decrease over the years, in the eastern part of the country where these are located regions the population is not very high, for this reason the relative supply of educated labor is lower compared to the big cities.

In the eastern regions, job opportunities for university graduates are very limited, especially due to the lack of development of the industrial sector (manufacturing sector) and the little development of the service sector, these are the main factors that determine the employment and salaries of university graduates in this part of the country.

The results obtained in this study show the relationship between the distribution of wages and the educational level of the workforce are consistent with those found in previous studies. However, QR is additionally to carry out the estimates. The results found at the country and the regional level could be useful for entities responsible for formulating public policies on education and the development of human capital.

The considerable decline in education returns in Turkey, suggests that there was an increase in labor supply while at the same time labor demand remained stable or increased only by a little. This could indicate a problem for future generations, highlighting the role of the Turkish government, which is necessary to implement new policies or measures to reduce the rigidities of the labor market so that investment in education becomes an attractive option.

## Annex

**Table A-1**  
Education Performance Rates in Turkey

Author	Method	Rates of Return (%)				
			<b>Secondary</b>			
			Public Sector		Private Sector	
		Year	Men	Women	Men	Women
<b>Tansel (2005)</b>	Multinomial Logit	1994	8.67	6.54	13.32	11.99
			<b>University</b>			
			Public Sector		Private Sector	
		Year	Men	Women	Men	Women
		1994	13.1	14.86	19.04	22.20
			<b>Men</b>			
		Year	Years of Schooling	Secondary	University	
		1994	9	17	10	
<b>Tunaer &amp; Gülcan (2006)</b>	Ordinary Least Square	2004	10	15	16	
			<b>Women</b>			
		Year	Years of Schooling	Secondary	University	
		1994	5	5	10	
		2004	10	21	19	
			Years of Education	Secondary	University	
<b>Salehi-Isfahani, Tunali &amp; Assaad (2009)<sup>a</sup></b>	Ordinary Least Square	1988	6.5	33.2	90.2	
		1994	9.6	77.1	130	
		2003	12.4	86.1	158.1	
			<b>Secondary</b>			
		Year	Quan. 0.1	Quan. 0.5	Quan. 0.9	
		1994	8.6	7.5	8	
<b>Tansel &amp; Bodur (2011)</b>	Quantile Regression	2002	6.9	5.9	7.7	
			<b>University</b>			
		Year	Quan. 0.1	Quan. 0.5	Quan. 0.9	
		1994	12.4	14	16.6	
		2002	9.9	12.9	16	
			<b>Ordinary Least Square</b>			
		Year	Men	Women		
		2003	4.5	6.9		
<b>Güriş &amp; Çağlayan (2012)</b>	Ordinary Least Square and Resistant regression	2006	8.6	11.4		
			<b>Resistant regression</b>			
		Year	Men	Women		
		2003	4.1	5.2		

			2006	8.6	9.8
<b>Tansel &amp; Daoud (2014)<sup>b</sup></b>	Ordinary Least Square	Year	Years of Education	Secondary	University
		2004	11.7	12.	16.6
		2008	12.4	9.43	19
<b>Tansel (2016)</b>	Ordinary Least Square		Years 2002-2015	Years of Education Men	Women
				8.9	10.4
			<b>Secondary - Men</b>		
		Year	Quan.0.1	Quan. 0.5	Quan. 0.9
		2006	1.0	2.1	13.1
			<b>Secondary - Women</b>		
		Year	Quan.0.1	Quan. 0.5	Quan. 0.9
<b>Kaya (2017)</b>	Quantile Regression	2006	1.4	4.3	23
			<b>University - Men</b>		
		Year	Quan. 0.1	Quan. 0.5	Quan. 0.9
		2006	5.7	38	82.8
			<b>University – Women</b>		
		Year	Quan. 0.1	Quan. 0.5	Quan. 0.9
		2006	4.9	281	81.9
			<b>Secondary</b>		
		Year	Men	Women	
		2002	43	25	
<b>Popli &amp; Yilmaz (2017)</b>	Multinomial Logit	2010	15	06	
			<b>University</b>		
		Year	Men	Women	
		2002	79	56	
		2010	50	27	
			<b>Field of study</b>	<b>Coefficient</b>	
			Education	2.0	
			Arts	-4.7	
			Humanities	-3.6	
			Law	30.9	
			Personal Services	0.2	
<b>(Tansel &amp; Di Paolo, 2017)</b>	Ordinary Least Square		Social Sciences And Services	2.9	
			Hard Sciences	4.5	
			Maths & Statistics	-0.9	
			Computing	0.8	
			Engineemg	6.7	
			Manufacturing	-1.1	
			Architecture	4.4	
			Agriculture & Veterinary	2.3	
			Health	41.0	

		Returns to Schooling:	Coefficient
<b>Patrinos, Psacharopoulos, &amp; Tansel (2019)</b>	Ordinary Least Square	All	8.8
		Men	8.3
		Woman	10.3
		Sector of employment	Coefficient
		Public	7.9
		Private	6.5

<sup>a</sup> Study conducted for Egypt, Iran, and Turkey

<sup>b</sup> Study conducted for Palestine and Turkey

**Table A-2**  
Total Number of Observations for Turkey (2008-2018)

Years	Total Observations of HLFS	Total Number of Employees	Number of Male Employees	Number of Women Employees
2008	481.154	77.194	59.429	17.765
2013	502.426	97.339	71.341	25.998
2018	374.172	97.969	68.232	29.737

Source: Household Labor Force Survey (HLFS)

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## Özet

### Türkiye'de eğitimin geri dönüşü: Bölgesel bir analiz (2008-2018)

Bu makale, İstatistik Bölge Birimleri Sınıflandırmasına (Düzyey-1) göre Türkiye'nin on iki bölgesindeki ücret dağılımının farklı noktalarında eğitim getirilerindeki değişimi analiz etmektedir. Tahminler Mincer ücret denkleminde dayanmaktadır, ancak farklı ücret seviyelerinde eğitim getirileri arasındaki farklılıkları belirlemek için niceliksel regresyon teknikleri kullanılmıştır. Veriler, 2008, 2013 ve 2018 yılları Hanehalkı İşgücü Anketinden alınmıştır. Türkiye'de üniversite ve lisansüstü eğitim oranları sürekli artan bir eğilim sergilemektedir. Ampirik sonuçlar, Türk işgücü piyasasında eğitim getirilerinin zaman içinde azaldığını göstermektedir. 2008 yılında bir işçi için bir yıllık ek eğitim süresinin getiri oranı yüzde 5 ile yüzde 7,8 arasında değişirken, 2018'de yüzde 3,7 ile 6,4 arasına düşmüştür. Bu çalışmada elde edilen sonuçlar, ücretlerin dağılımı ile işgücünün eğitim düzeyi arasındaki ilişkinin önceki araştırmalarda bulunanlarla tutarlı olduğunu göstermektedir.

*Anahtar kelimeler:* Ücret Eşitsizliği, Eğitim Getirileri, Quantile Regresyon.

*JEL kodları:* E24-I26- J31.

