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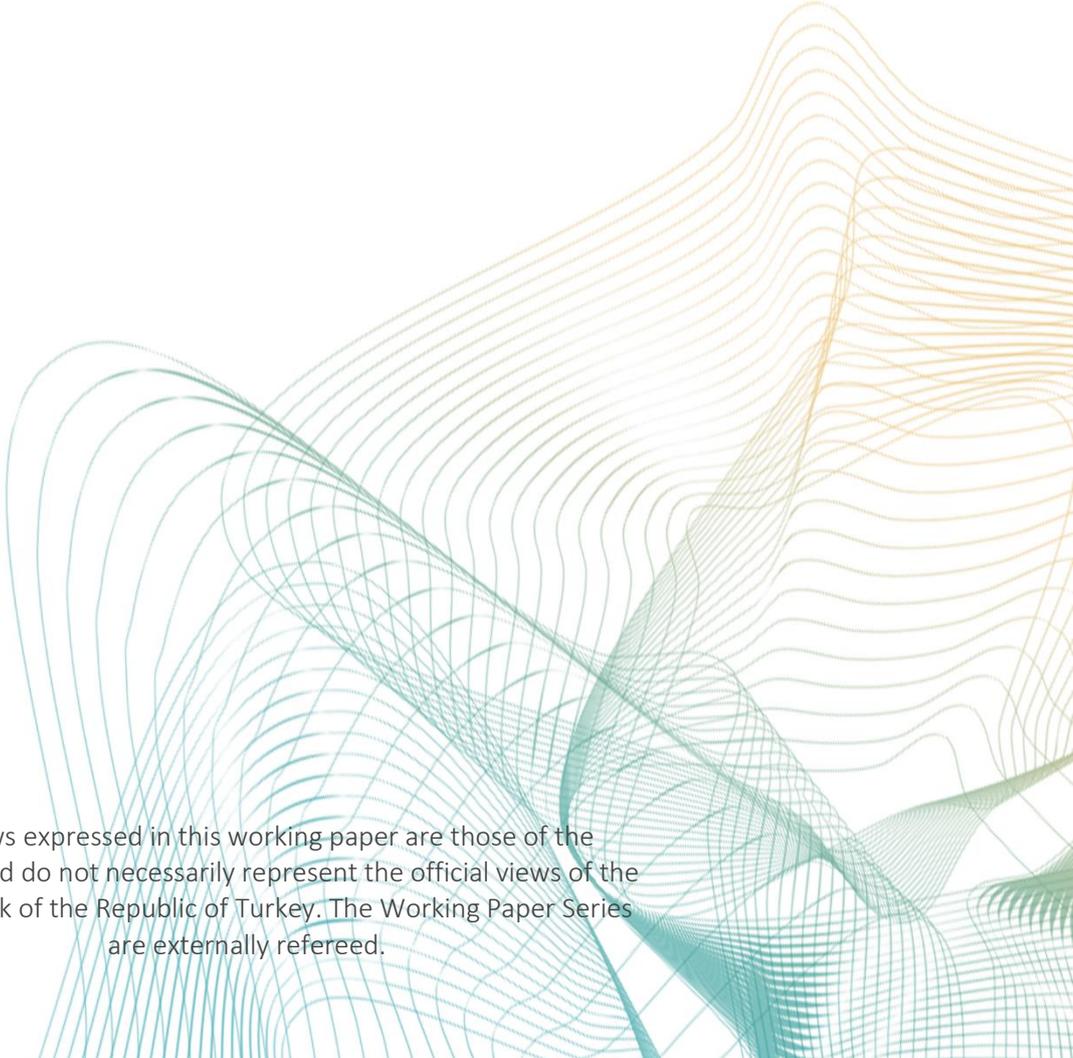
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# Evolution of the University Wage Premium in Turkey: 2004-2015

Okan Eren\*

## Abstract

This paper presents evidence about the university wage premium in Turkey, and is the first that displays its evolution between 2004 and 2015. The results suggest that a typical university-educated worker in the private sector, on average, earns more than a high school graduate by a factor of 1.5. On the other hand, the wage gap significantly narrows down throughout the period. The main reason behind the observed fall seems to be the rise in relative excess supply of university graduates. In particular, the evolution of university wage premium is shaped by the changes in supply and demand conditions.

## Özet

Bu çalışma, Türkiye'de üniversite eğitimi kaynaklı ücret primini tahmin etmekte ve bu primin 2004 ile 2015 yılları arasındaki değişimine ilişkin ampirik bulguları ilk kez sunmaktadır. Çalışmanın bulguları, özel sektördeki üniversite mezunu bir çalışanın, lise mezunu bir çalışana kıyasla ortalama 1,5 kat daha fazla ücret geliri elde ettiğine işaret etmektedir. Öte yandan, bu ücret farkının, zaman içerisinde önemli oranda düştüğü görülmektedir. Bunun temel nedeninin, üniversite mezunlarının görece arz fazlasındaki artış olduğu değerlendirilmektedir. Bu da üniversite eğitimi kaynaklı ücret primi gelişiminin, değişen arz ve talep koşullarıyla şekillenmiş olduğunu göstermektedir.

*Keywords:* University wage premium, college wage premium, relative excess supply, relative unemployment.

*JEL Codes:* J24, J31, I21.

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## **Non-Technical Summary**

University wage premium refers to the difference between the average wages of university-educated and high-school-educated workers. In particular, it shows that by what factor a university graduate earns more than a high school graduate in terms of labor income. The bigger the university premium is, the more high school graduates prefer to pursue university education, a costly process through which they acquire new skills. Apart from the productivity-related wage differences between the two types of jobs, the relative scarcity or abundance of university-educated workers may substantially contribute to the wage gap between the two educational groups. In this paper, I estimate the university wage differential for Turkey and analyze its evolution between 2004 and 2015 in conjunction with the supply and demand developments regarding the university graduates.

To the best of my knowledge, this paper is the first empirical attempt to directly estimate the university wage premium in Turkey and to examine its evolution between 2004 and 2015. The findings reveal that although there is a sizeable wage differential in favor of the university graduates, it decreases noticeably during the period of analysis. To explain the fall in the wage differential, I employ a relative excess supply measure which is essentially the ratio of unemployed university graduates to the unemployed high school graduates which reflects both supply and demand developments. The results also suggest that there is a strong inverse relationship between the university wage premium and the relative excess supply of university graduates. The fall in the university wage premium is mostly due to the big rise in the relative number of university graduates or more specifically, due to the rise in their relative excess supply. In particular, the wage differential becomes smaller as the relative scarcity of university graduates decreases over time.

## 1. Introduction

Since 2004, the number of university degree holders has surged rapidly in Turkey changing the composition of university and high school graduates within the workforce. Their fraction almost doubled from 8.5 percent to 16.9 percent between 2004 and 2015.<sup>1</sup> University education is a costly process through which individuals acquire new skills that allow them to apply to the jobs that pay relatively higher wages than those available to the high-school graduates. Apart from the productivity-related intrinsic wage difference between the two types of jobs, the relative scarcity or abundance of university-educated workers may substantially contribute to the wage gap between the two educational groups, which is literally called as the university or college wage premium.<sup>2</sup> Due to the big increase in the fraction of university graduates, it is likely that the university wage differential in Turkey has changed over the period of analysis. In this paper, I estimate the university/high school wage differential for Turkey and analyze its evolution between 2004 and 2015 in conjunction with the supply and demand developments regarding the university-graduated workers.

Understanding the evolution of university wage differential and its relationship with the supply of and demand for the skills accumulated via university education has conspicuous and important policy implications for the policymakers. Knowing the reasons behind the change in wage structure, they may design specific policies that would facilitate the adjustment of the workforce to the new environment or would stop and even reverse the ongoing change. If the evolution of the wage gap is predominantly driven by the demand and supply factors, policymakers may cling to the policies that would boost or reduce either the supply or the demand or both depending on their policy goals. Or, if the wage gap is changing because of a technological development that favors either university or high school graduates, a totally different set of policies would be implemented by the policymakers depending on their policy intentions. All those policy decisions heavily depend on identifying the behavior of the university wage premium over time and revealing the true sources of the observed movements. Therefore, it is crucial to study the evolution of the university wage gap and its

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<sup>1</sup> The reference sample consists of those whose age is between 21 and 65, inclusively.

<sup>2</sup> I usually prefer to use university wage premium throughout the paper instead of college wage premium because my definition of university graduates, in addition to college graduates, includes those who successfully complete two- or three-year long vocational higher education at a university.

relationship with the demand for or the supply of the skills acquired throughout university education.

As for the factors deriving the temporal development of the university wage premium, there is a huge literature centered around the explanation that the evolution of the college wage premium is mainly shaped by the fluctuations in the demand for and the supply of the university skills. My paper is principally related to this branch of the literature. In their pioneering work, Katz and Murphy (1992) studies the changes in the college wage differential in the United States (US) from 1963 to 1987 within a simple supply and demand framework. They assume that the college labor and high school labor are imperfect substitutes, and so, their relative supply and demand may shape the evolution of the college wage premium. According to their findings, the changes in the college wage premium are mainly driven by the growth in the demand for college-educated workers and negatively related to the fluctuations in their relative supply.

Autor, Katz and Kearney (2005) extends the basic regression model used by Katz and Murphy (1992) by adding the minimum wage and unemployment rate as additional independent variables so as to better explain the fluctuations in the US college wage gap. They report that addition of cyclical variables leads to a limited improvement in the explanatory power of the model. In a similar manner, Card and Lemieux (2001) separate individuals into age and education groups and assume that not only the college and high school labor are imperfect substitutes for each other but also the labor supplies of different cohorts within the same education group are imperfect substitutes. Their findings show that the observed rise in the college wage gap is mostly attributed to the younger cohorts and reflects the changes in the relative supply of and demand for college-educated workers. In a more recent study, Lindley and Machin (2016) investigates the increase in the post-graduate wage premium in the US and United Kingdom (UK) and relates it to the rising demand for postgraduates relative to college-only graduates.

To the best of my knowledge, this paper is the first empirical attempt to estimate the university wage premium in Turkey and to examine its evolution between 2004 and 2015.<sup>3</sup> According to my findings, a typical university-educated worker in the private sector, on average, earns more than a high school graduate by a factor of 1.5. This is a sizeable wage differential in favor of the university graduates, and more importantly it displays a declining trend during the period of analysis. To be more precise, the estimated university wage premium remains almost unchanged around 1.54 until 2008 and then steadily declines and reaches 1.43 in 2015. In other words, the relative valuation of the university graduates by the market noticeably deteriorates as reflected by the relative wages.

To explain the evolution of the university wage premium from 2004 to 2015 and its deriving factors, I use a simple supply and demand framework like the one developed by Katz and Murphy (1992).<sup>4</sup> The papers that attempt to explain the changes in the university wage premium by using the supply and demand developments generally include both relative supply of university graduates in efficiency units and a linear trend that accounts for the demand-side developments. Unlike those papers, I employ a relative excess supply measure of university graduates to capture the developments on both supply and demand sides. The relative excess supply is simply the ratio of the number of unemployed university graduates to the number of unemployed high school graduates. By construction, the relative excess supply or the relative unemployment of the university graduates reflect the demand- and supply-side developments simultaneously. In this respect, it is a more comprehensive measure than a relative supply indicator that is immensely employed by the previous studies.

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<sup>3</sup> The evolution of university wage premium in Turkey, a developing country, has received no attention at all. Yet, there are papers that focus on the return to education and its relationship with wage inequality in Turkey. My paper is indirectly related to those papers since the university wage premium is considered as a simple and key indicator of wage inequality. I prefer not to include a vast list of those studies for space considerations. Two meticulously written examples are Tansel and Bodur (2012) and Aydemir and Kırdar (2013).

<sup>4</sup> In this respect, my paper is, in addition to the aforementioned studies, related to the papers that investigate the temporal development of the university wage differential and its driving forces in countries other than the US. Within a supply and demand framework, Crivellaro (2014) analyzes the causes of the evolution of the college wage premium by exploiting the variations in relative supply, demand, and labor market institutions across 12 European countries from 1994 to 2009. Based on the work of Card and Lemieux (2001), Azam (2009) attempts to explain the changes in the college wage differential in India from 1987 to 2004 by employing a demand and supply model. In a similar setup, Benita (2014) investigates the evolution of the college wage differential in Mexico from 2005 to 2012.

Both the relative supply and the relative excess supply measures of university graduates are found to be inversely related with the university wage differential with correlation coefficients of -0.85 and -0.96, respectively. The two measures seem to have a tight relationship with the university wage gap. Moreover, the calculated correlation coefficients indicate that the university wage premium has a closer relationship with the relative excess supply than the relative supply. Those findings suggest that the observed fall in the university wage premium is mostly due to the supply and demand developments. In other words, the university wage differential falls as the relative scarcity value of university graduates is reduced by the relatively high increase in the number of university graduates.

Last but not least, the estimated wage differential reflects the relative pricing of university-educated workers by the market, but not necessarily the relative value of skills and abilities acquired during university education. In this respect, another group of researchers claim that the demand for the university-educated workers is not only due to the skills acquired during the university education but also due to the belief that higher ability individuals are more likely to complete university education, and hence a university graduate is highly likely to be endowed with a relatively higher innate productivity. Since such productivity is unobservable, it cannot be detected or measured directly but a university degree may function as a signal for its relative level.<sup>5</sup> On the contrary, Fang (2006) finds that college education increases the productivity of individuals rather than functioning as a signal for higher innate ability and this accounts for the two-thirds of the wage premium observed in the US.

The rest of the paper is organized as in the following way: Section 2 describes the data and presents some key statistics about the labor market developments in Turkey; Section 3 reports the findings and provides a discussion about them; and finally, Section 4 concludes the paper by summarizing the key findings and results.

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<sup>5</sup> In this context, Taber (2001) argues that the large increase in the US college wage premium during 1980s may be explained by a rise in the demand for unobserved ability rather than the skills acquired in college. Carneiro and Lee (2010) shows that a decline in the average quality of college-educated workers leads to a decrease in the college wage premium. In a similar framework, Wang (2015) finds that the decline in the university premium in Brazil between 1995 and 2013 is mainly attributed to the rise in the relative supply of university graduates and the fall in their average quality.

## 2. Data

I use data from 12 waves of Household Labor Force Survey (HLFS) of Turkish Statistical Institute (TURKSTAT) between 2004 and 2015. HLFS is conducted annually and contains rich cross-sectional data about demographics, job characteristics, educational attainments and monthly earnings of around 500 thousand individuals per year.

Table 2.1. Descriptive Statistics About Labor Market (Ages 21-65, Percent)

|      | Labor Force Participation Rate | Unemployment Rate | Fraction Within the Employed |          |               |               |
|------|--------------------------------|-------------------|------------------------------|----------|---------------|---------------|
|      |                                |                   | Employee                     | Employer | Self-Employed | Family Worker |
| 2004 | 53.6                           | 10.4              | 55.8                         | 5.5      | 24.0          | 14.7          |
| 2006 | 53.6                           | 9.7               | 59.4                         | 6.1      | 22.9          | 11.6          |
| 2009 | 54.6                           | 12.1              | 60.9                         | 6.1      | 21.1          | 11.9          |
| 2012 | 57.6                           | 7.9               | 63.8                         | 5.3      | 19.0          | 11.9          |
| 2015 | 59.8                           | 9.9               | 67.9                         | 4.7      | 16.9          | 10.5          |

My reference sample consists of individuals who are aged between 21 and 65 and work for a wage or salary income. Thus, employers, the self-employed and family workers are not included in the estimation sample. Table 2.1 exhibits some statistics about the reference sample which reflect the basic labor market developments in the whole economy throughout the period of analysis.<sup>6</sup> According to the table, the labor market is mainly characterized by a growing labor force participation rate and a relatively elevated unemployment rate. The rise in the labor force participation rate took place especially after the global financial crisis. Moreover, the fraction of employees within the employed group has increased steadily while the shares of employers, self-employed and family workers have mostly fallen since 2004.

The employees can be divided into two main groups with respect their employers; namely, private- and public-sector employees. The wages in the public sector are directly set by the government and any university wage premium in this sector simply reflects the policy choices of the government. On the other hand, wages in the private sector are generally determined by the forces of supply and demand in a competitive manner. Public sector workers constitute a

<sup>6</sup> The weights provided within the questionnaire are used when obtaining the descriptive statistics given here and throughout the paper.

sizeable fraction, 20 percent of all employees as of 2015. As shown by Table 2, the share of the public workers dropped by almost 9 percentage points from 29 to 20 percent between 2004 and 2015. This simply points to that the employment by the private sector outpaced the government sector during the period of analysis.

Table 2.2. Weekly Work Hours of Employees (Ages 21-65)

|      | Fraction of<br>Public Workers<br>(Percent) | Average Weekly Work Hours |                  |      |
|------|--|---------------------------|------------------|------|
|      |  | Private<br>Sector         | Public<br>Sector | All  |
| 2004 | 28.7                                       | 55.7                      | 44.0             | 52.2 |
| 2006 | 25.6                                       | 56.3                      | 43.7             | 52.8 |
| 2009 | 22.8                                       | 54.3                      | 42.9             | 51.6 |
| 2012 | 22.1                                       | 53.3                      | 42.6             | 50.9 |
| 2015 | 20.3                                       | 51.4                      | 42.5             | 49.6 |

Following the common practice in the literature, those who have temporary jobs and work less than 35 hours a week are discarded. The respondents who usually work longer than 96 hours a week are considered as extreme observations and excluded from the sample. Average weekly work hours are given in Table 2.2 in both private- and public-sectors, separately. The average weekly work hour within the whole sample is observed to drop roughly from 52 to 50 hours a week throughout the period of analysis. Although the fall is much bigger in the private sector than the public sector, the discrepancy remains around 9 hours a week in 2015.

In the estimations, I choose the weekly wage as my earnings measure. The HLFS questionnaire includes a question about the net earnings from the main job in the preceding month. The weekly wage is obtained by simply dividing monthly figures by the average number of weeks in a month. All monetary variables are transformed into 2015 prices by using the rate of change in the consumer price index.

Table 2.3. Distribution of Employees Across Education Groups  
(Ages 21-65, Final Sample)

|      | University | High School | Less Than High School |
|------|------------|-------------|-----------------------|
| 2004 | 17.9       | 29.0        | 53.2                  |
| 2006 | 21.7       | 29.6        | 48.7                  |
| 2009 | 24.9       | 28.2        | 46.8                  |
| 2012 | 28.7       | 27.2        | 44.1                  |
| 2015 | 31.7       | 25.7        | 42.6                  |

After all adjustments are done, individuals are divided into three educational groups. The first group is called as university graduates and consists of those who hold at least a two-year degree from a university. The second group involves the individuals whose highest educational attainment is a high school diploma; and hence encompasses the university drop-outs. The last group is composed of individuals without a high school diploma of any kind. The distribution of individuals across those educational groups is reported in Table 2.3 for the selected years. The university graduates accounts for 32 percent of all employees in 2015, up from 18 percent in 2004 indicating a striking upsurge in both supply of and demand for individuals with a university degree.

### 3. Main Findings

The calculations are carried out in two stages. In the first stage, the university wage differential is estimated controlling for observable differences across individuals such as gender, age, geographical region of residence and sector of economic activity. These estimations are done for each year separately and the resulting time path of the wage premium is obtained. In the second step, a simple supply and demand framework is employed to understand the forces driving the observed evolution of the university wage gap. A relative excess supply measure of university graduates is calculated and its relationship with the university wage premium is analyzed by using the relevant correlation coefficients.

#### 3.1. Evolution of the University Wage Premium

When estimating the university wage differential, I exclude individuals who work in the public sector because their wages are mostly determined by the government whose goal is to fulfill its policy promises and targets. Hence, the wages in the public sector may noticeably

differ from those in the private sector.<sup>7</sup> For instance, if a government is policy-bound to reduce wage inequality, it pulls down the wages of high-skilled individuals while raising the wages of low-skilled individuals as much as possible regardless of their relative productivities. This is, in fact, the case in Turkey as reported by Gürbüz and Polat (2014). Therefore, my estimation sample only consists of the individuals who work in the private sector to help avoid biased estimates for the university wage premium.<sup>8</sup>

In the first stage, I employ a rather standard Mincer's (1974) log wage equation of the following form:

$$\ln(w_i) = D_i\beta + X_i\delta + \varepsilon_i \quad (1)$$

where  $w_i$  is the weekly wage of individual  $i$ ,  $D_i$  consists of dummy variables for educational attainment,  $X_i$  contains a constant term and the control variables, and finally  $\varepsilon_i$  is the error term. Notice that the regression model lacks time dimension, and hence it is basically a cross-sectional regression equation. A quartic polynomial is used to control for the age differences across individuals. Further compositional adjustments are also done by including dummy variables for gender, region of residence and sector of economic activity<sup>9</sup>. For a given set of control variables, the university wage premium ( $u$ ) is simply given by

$$u = e^{\beta_c - \beta_h} \quad (2)$$

where  $\beta_c$  and  $\beta_h$  are the estimated coefficients of university and high school dummies, respectively.

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<sup>7</sup> Using micro data for Turkey, Gürbüz and Polat (2014) finds that the wage gap between the public- and private-sector workers is in favor of the former in the lower end of the wage distribution while it is in favor of the latter in the higher end. They lay down an overview of the characteristics of the public sector in Turkey along with a discussion about the reasons for the observed wage differentials.

<sup>8</sup> Eren (2016) estimates the university wage premium for the private- and public-sectors separately. The university wage differential is, in a slightly different manner, defined as the difference between the wages of university graduates and the other workers who consist of high school, middle school, elementary school graduates and the illiterate. The wage differential in the public sector is found to be noticeably lower than the one in the private sector.

<sup>9</sup> In the regressions, I use 11 regional and 20 sectoral dummies. The information about the region where the individual resides and the sector in which he or she works is also retrieved from HLFs micro data set. Sector of economic activity is determined according to Statistical Classification of Economic Activities in the European Community (NACE Rev. 2) at one-digit level.

Table 3.1. Estimation Results

|                         | 2004           | 2007           | 2011           | 2015           |
|-------------------------|----------------|----------------|----------------|----------------|
| Coefficient Estimates   |                |                |                |                |
| University Dummy        | 0.64*          | 0.62*          | 0.58*          | 0.52*          |
|                         | (0.012)        | (0.009)        | (0.007)        | (0.007)        |
| High School Dummy       | 0.21*          | 0.19*          | 0.19*          | 0.16*          |
|                         | (0.006)        | (0.005)        | (0.004)        | (0.004)        |
| University Wage Premium | 1.54           | 1.54           | 1.48           | 1.43           |
| Number of Observations  | 36420          | 42246          | 54345          | 55852          |
| R-squared               | 0.99           | 0.99           | 0.99           | 0.99           |
| Age Polynomial          | <i>quartic</i> | <i>quartic</i> | <i>quartic</i> | <i>quartic</i> |
| Gender Dummies          | <i>yes</i>     | <i>yes</i>     | <i>yes</i>     | <i>yes</i>     |
| Regional Dummies        | <i>yes</i>     | <i>yes</i>     | <i>yes</i>     | <i>yes</i>     |
| Sectoral Dummies        | <i>yes</i>     | <i>yes</i>     | <i>yes</i>     | <i>yes</i>     |

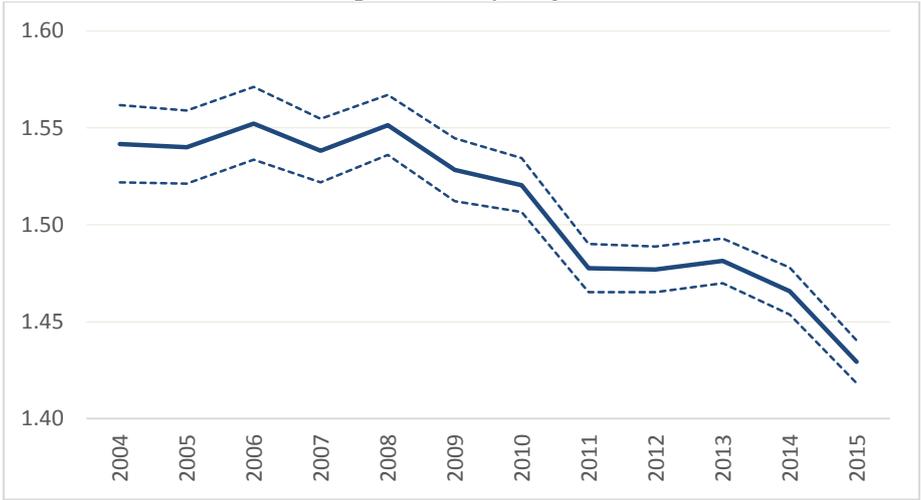
- Standard errors are given in parenthesis. \* denotes significance at 0.01 level.

The above regression equation is estimated over a large cross-sectional sample for each year separately by ordinary least squares. In all estimations, the population weights are used to account for the relative share of each single individual in the total population. A summary of the estimation results for selected years are reported in Table 3.1 along with the private-sector university wage differentials. The table exhibits the findings for only four selected years. The estimated coefficients of university and high school dummies are found to be significant at 1 percent in all estimations. The estimated coefficients of quartic age polynomial are also reported to be significant indicating the presence of a strong age effect in weekly wages of private-sector workers. Additionally, coefficients of the control dummies for gender, region of residence, and sector of economic activity are mostly significant at 1-percent or 5-percent significance levels. Control dummy variables being significant indicates that real weekly wages conspicuously vary across regions, sectors and genders.

In general, the university wage premium I estimate essentially measures the gap between the average real weekly wages of university and high school graduates after controlling for some observable heterogeneities across individuals. Yet, it may not always be true to attribute this gap entirely to the differences in level of educational attainment. For instance, there are

unobserved individual characteristics that are highly correlated with both wages and the level of educational attainment as mentioned and discussed earlier in introduction. Dickson (2013) argues that innate ability and discount rate, as examples of such characteristics, have a potential to be correlated with both wages and the level of educational attainment, and therefore may create a considerable upward bias in the estimated coefficients if left unattended. Unfortunately, the HLFS data set does not have an appropriate variable that would help reveal such unaccounted individual heterogeneity and allow us to properly distinguish between education- and ability-related wage differences. In this regard, my estimate can be taken as an upper bound for ability-adjusted university wage differential, which can also be called as true wage differential.

Figure 3.1 – Evolution of the University Wage Premium (Compositionally Adjusted)

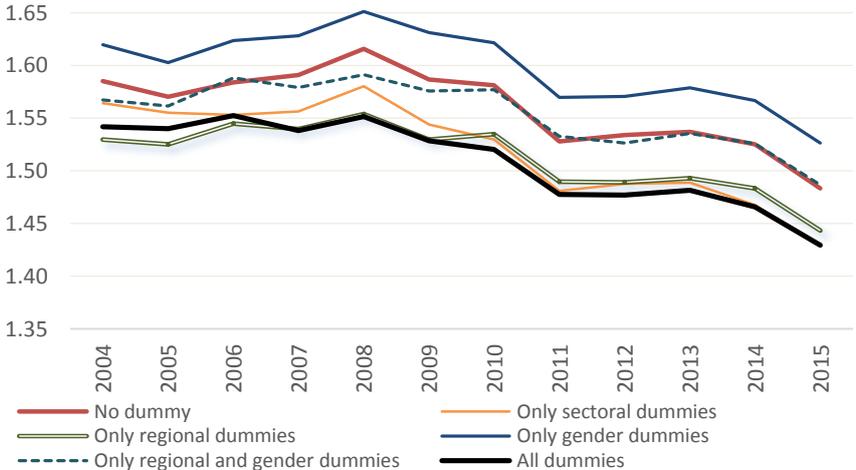


The evolution of the university wage premium is illustrated by Figure 3.1 from 2004 to 2015. The dotted lines mark the confidence band the upper and lower bounds of which are just one standard error away from the estimated differential. According to the figure, the estimated university wage gap exhibits a downward trend that indicates an evident decline in the relative wages of the university graduates. To be more specific, the wage gap remains virtually unchanged till 2008 and steadily declines in the following three years. Afterwards, it stays roughly constant for two years and then falls again for the rest of the years. So, there seems to be two identifiable episodes of steady decline in the evolution of the university wage premium in Turkey. On the other hand, the period average of the wage differential is found to

be 1.51 pointing to a sizable difference between the wages of the two education groups. In the last year of the analysis, a typical university-educated worker, on average, earns more than a high-school-educated worker by a factor of 1.43 compared to 1.54 in 2004. The observed decline in the university wage gap is found to be statistically significant at 1 percent significance level.<sup>10</sup>

As a robustness check, the regression model in Equation 3.1 is estimated with different combinations of control variables and even without any of them. The aim of this exercise is to see both the individual and combined impact of gender, region and sector dummies on the estimated university wage differential and its evolution over time. Given that the distribution of individuals over the selected education levels may differ significantly across those groups, ignoring between-group wage differences would lead to a significant bias in the estimated wage premium even if the intra-group university wage differential does not vary noticeably across the groups. The direction of the bias depends on whether the fraction of university graduates is bigger within the group with relatively higher wages or lower wages. If the concentration of the university-educated workers is higher in the group with a higher average wage, there will be an upward bias in the estimated university wage premium when the wage differences across groups left unattended.

Figure 3.2. – Impact of the Control Variables on the Evolution of University Wage Premium



<sup>10</sup> The null hypothesis,  $H_0: up_{2004} - up_{2015} = 0$ , is rejected at 1-percent level with a z-statistic of 5.

The results of the robustness exercise are succinctly illustrated in Figure 3.2. When only sectoral dummies or only regional dummies are included in the regression model, the university wage gap is observed to drop in all years indicating the presence of an upward bias associated with the omission of sectoral or regional wage differences. On the other hand, when only the gender difference is controlled for, the university premium is elevated in all years as the associated downward bias is eliminated. In addition to the gender dummies, the inclusion of the regional dummies reverts the university wage premium to the levels from the estimation without any control variables as shown by the dotted line in the figure. The change in the estimated university wage premium due to the inclusion of control variables lies outside the one-standard-error interval. However, the observed fall in the university wage premium seems to be robust to the choice of control variables.

### **3.2. The Role of Demand and Supply Factors**

The university wage gap is attributed not only to the differences in educational attainment but also to the differences in innate ability as higher ability individuals are more likely to earn more and to achieve higher educational levels. Therefore, any change in the demand for university-educated workers may be due to a change in the demand for either skills acquired during the university education or the unobservable innate ability. Since HLFS micro data set does not have a question that would help satisfactorily distinguish high ability individuals from the others, no attempt could be made to explain the degree to which the unobservable skills or abilities affect the evolution of the university wage differential. So, I will simply focus on the relationship of the university wage premium with the supply and demand changes.

Table 3.2. Private Sector Workers Across Education Groups (Ages 21-65)

|      | Number of<br>Workers (Millions) | Distribution of Workers (Percent) |                |                          |
|------|---------------------------------|-----------------------------------|----------------|--------------------------|
|      |                                 | University                        | High<br>School | Less Than High<br>School |
| 2004 | 7.0                             | 10.0                              | 24.0           | 66.1                     |
| 2006 | 8.1                             | 11.6                              | 25.5           | 62.8                     |
| 2009 | 9.0                             | 14.4                              | 26.4           | 59.2                     |
| 2012 | 11.2                            | 16.7                              | 26.4           | 57.0                     |
| 2015 | 12.9                            | 20.2                              | 25.1           | 54.7                     |

To understand the reasons behind the observed decrease in the university wage premium, I analyze the developments in the demand for and supply of university graduates relative to high school graduates. The number of workers who are employed by the private sector was almost doubled between 2004 and 2015 as shown by Table 3.2. Similarly, the fraction of private-sector employees with a university degree also doubled during the same period whereas the fraction of high school graduates remained almost unchanged. To capture the movements of the relative supply of the university graduates, I first use a relative supply measure in efficiency units of labor as it is a common practice in the relevant literature. My findings suggest that there is an inverse relationship between the relative supply and the university wage premium with a correlation coefficient of -0.85. In other words, the university wage differential becomes smaller as the relative supply of university-educated workers surges over time.

The relative supply measure is basically the labor supplied by the university graduates divided by the amount of labor supplied by high school graduates, both in efficiency units. Although it may reflect the changes in the labor supplied by the university-educated workers relative to the high school graduates, it fails to account for the impact of the changes in the relative number of the unemployed with at least a university degree. Unlike the existing literature, I approach the issue from the side of the unemployed instead of the employed and use a relative excess supply measure to keep track of the changes on the supply side. Here, the term, excess supply, is used to emphasize the fact that the unemployed signify the part of the labor supply in excess of the amount demanded by the private sector. Accordingly, the

relative excess supply is simply defined as the ratio of the number of university graduates to the high school graduates among the unemployed.

Table 3.3. Distribution of Unemployed (Ages 21-65) \*

|      | Ratio of University to High School Graduates Among the Unemployed | Distribution Across Education Levels (Percent) |             |                       |
|------|---|--|-------------|-----------------------|
|      |   | University                                     | High School | Less Than High School |
| 2004 | 0.6   | 14.8   | 27.0        | 58.2                  |
| 2006 | 0.5   | 14.0   | 25.6        | 60.4                  |
| 2009 | 0.6   | 15.1   | 24.7        | 60.1                  |
| 2012 | 1.0   | 22.6   | 23.2        | 54.2                  |
| 2015 | 1.2   | 25.3   | 21.4        | 53.3                  |

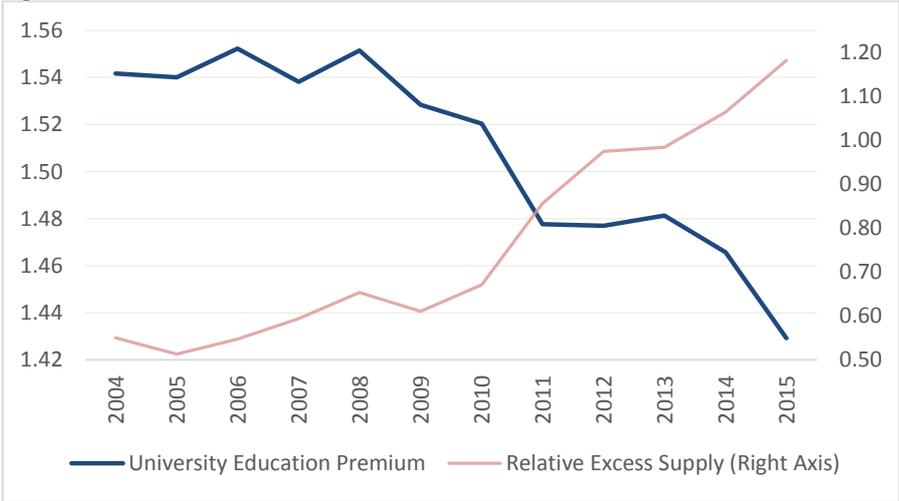
\* The unemployed who plan to start their own businesses are excluded when constructing the distributions and ratios in the table.

In the last three columns of Table 3.3, the distribution of the unemployed individuals who want to work is given across different educational attainment levels. Even though the share of the university-educated workers in the employed doubled from 2004 to 2015, the ratio of university graduates among the unemployed doubled as well with much of the increase taking place after 2009. On the contrary, the fraction of the unemployed with a high school diploma noticeably dropped during the same period. As a result, the relative excess labor supply of the university-educated workers doubled thereby creating a downward pressure on their wages with respect to those of the high-school-educated workers.

There may be various developments that lead to a rise in the relative excess supply measure. For instance, if the number of university-educated individuals grows faster than the number of jobs that require at least a university degree, the number of unemployed university graduates may quickly multiply. Or, if the supply of workers persistently exceeds the demand in some professions or skills which are achieved through university education, the overall number of university-educated unemployed may rapidly increase. A boom in the unemployed university graduates exerts a strong downward pressure on the wages and may ultimately reduce the university wage differential unless the number of unemployed high school graduates increase at a much higher pace and their wages fall much faster. The average wage of university-educated workers declines over time as the firms hire them at relatively lower

wages exploiting the ever-increasing supply or/and a prolonged unemployment duration makes university graduates accept the jobs that pay lower wages and require only a high school diploma or less.

Figure 3.3 – Excess Supply of University Graduates and University Wage Premium



The time path of the relative excess supply is thoroughly illustrated by Figure 3.3 along with the university wage premium. An immediate observation is that there is an inverse relationship between the relative excess supply and university wage differential during the period of analysis. This negative relationship becomes more obvious especially in the years following the global financial crisis in 2009. The correlation coefficient between the two series is found to be -0.96 pointing to a strong negative relationship. So, the relative excess supply measure has a stronger relationship with the university wage premium than the relative labor supply in efficiency units according to the correlation coefficients. Concisely, a significant rise in the relative excess supply is always accompanied by a substantial fall in the university wage premium almost simultaneously.

**4. Conclusion**

In this paper, I basically estimate the university wage premium for private sector workers, which reflects the market’s valuation of university graduates relative to high school graduates. In all estimations, individual differences in age, gender, region of residence and sector of economic activity are controlled for, and hence the estimated university premiums are

compositionally adjusted. The university wage premium is obtained for each year separately from 2004 and 2015. My findings suggest that the university graduates, on average, earn more than high school graduates by a factor of 1.5. Moreover, the wage differential remains almost unchanged until 2008, and substantially decreases in the following years. The total decline amounts to an economically relevant rate of about 7 percent.

To explain the observed reduction in the university wage differential, I employ a relative excess supply measure which is defined as the ratio of unemployed university graduates to the unemployed high school graduates. The university wage premium is found to be negatively and highly correlated with the relative excess supply measure with a correlation coefficient of -0.96. This finding implies that the relatively higher increase in the number of unemployed university graduates appears to depress the wages of university-educated workers and to drive the observed fall in the university wage differential. So, the declining scarcity value of university graduates seems to dominate the evolution of the university wage premium between 2004 and 2015.

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