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# Gender Wage Inequality Along the Wage Curve: In Quest For Discrimination in Turkiye

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# Ücret Eğrisi Boyunca Cinsiyete Dayalı Ücret Eşitsizliği: Türkiye'nin Durumu

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**Abstract**

This study aims to investigate male and female wage differentials in Turkiye, using the Household Budget Surveys of 2003 and 2011. First, descriptive statistics are introduced to capture the gender-based outlook of employment. Then, Mincerian wage equations are estimated by quantile regression to explore the returns to labor characteristics and per-year returns to educational categories are obtained to observe the role of wage premia in determining the gender wage gap. Finally, a counterfactual analysis by Juhn, Murphy, and Pierce (1993) is conducted to decompose sources of gender wage inequality into endowment, remuneration, and unobservable effects. The pattern of wage inequality and returns to education differ along the wage distribution. The gender wage gap tends to fall during the period and across the wage curve as we move towards the upper tail. Price discrimination preserves its position irrespective of income level but decreases over the course of time.

**Keywords:** Decomposition of Inequality, Discrimination, Quantile Regression, Returns to Education, Wage Inequality

**Öz**

*Bu çalışma, 2003 ve 2011 Hanehalkı Bütçe Anketlerini kullanarak Türkiye'de kadın ve erkek ücret farklılıklarını araştırmayı amaçlamaktadır. İlk olarak, istihdamın cinsiyete dayalı görüntüsünü yakalamak için betimleyici istatistikler sunulmaktadır. Daha sonra, emek özelliklerinin getirilerini araştırmak için Mincerian ücret denklemleri kantil regresyonla tahmin ediliyor ve cinsiyetler arası ücret farkının belirlenmesinde ücret priminin rolünü gözlemlemek için eğitim kategorilerinin yıllık getirileri elde ediliyor. Son olarak, cinsiyete dayalı ücret eşitsizliğinin kaynaklarını donanım, ücretlendirme ve gözlemlenemeyen etkiler olarak ayrıştırmak için Juhn, Murphy ve Pierce (1993) karşı-olgusal analizi yapılmıştır. Ücret eşitsizliğinin örüntüsü ve eğitimin getirileri, ücret dağılımı boyunca farklılık göstermektedir. Cinsiyetler arası ücret farkı dönem boyunca ve ücret eğrisi boyunca üst kuyruğa doğru ilerledikçe düşme eğilimindedir. Fiyat ayrımcılığı gelir düzeyinden bağımsız olarak konumunu korumakta ancak zamanla azalmaktadır.*

***Anahtar Sözcükler:*** *Eşitsizliğin Ayrıştırılması, Ayrımcılık, Kantil Regresyon, Eğitimin Getirisi, Ücret Eşitsizliği*

## Introduction

Equal pay for equal work is one of the founding principles of the European Union. However, its universal consent is still questionable because equal work is not mostly paid equally, according to empirical findings. To what extent wages are distributed equally across genders or groups having similar characteristics has been gathering more and more academic attention since the 1980s, when the US wage inequality

began to become apparent and be widely tested empirically. From then on, this issue has been taken more seriously and led to the development of new analytical tools to capture to what extent wage inequality exists and which factors stimulate it.

Lemieux (2008) states two opposing views on wage inequality. The first explanation is put forward by Katz and Murphy (1992) and Juhn, Murphy, and Pierce (1993) (hereinafter JMP) by claiming increased relative demand for skill through the agency of skill-biased technical change, which widens the wage distribution. The second explanation gives more weight to wage-setting institutional factors such as the decline in real minimum wage (DiNardo, Fortin, and Lemieux, 1996) and the decrease in unionization (Card,1992). From the gender perspective, there are two main dimensions in the quest for wage inequality. First, the evolution pattern of the wage gap between females and males along the wage curve; and second, the underlying reasons for wage differential.

This study refocuses on the issue of gender wage gaps by adopting the mentioned multidimensional approach to provide further insight into the Turkish labor market in the 2000s. Some notable structural changes include increased registration in the social security system, improved education levels, a higher share of wage earners, and greater female labor force participation. However, exploratory data analysis and more advanced techniques, including Mincerian wage equation estimation using quantile regression and the decomposition method of JMP, are employed to observe wage inequality transformations and disentangle them into different aspects and percentiles. As a result, discrimination against females, if it exists, can be quantified where discrimination is defined as "a pay differential that occurs neither as a result of different productivity levels nor as a result of the location of the job or type of workplace, but merely due to the sex of the worker" (İlkkaracan and Selim, 2007, p.588).

The remainder of the study is planned as follows: the next section introduces the leading studies on the Turkish case, then the boundary of the data is defined, and some descriptive statistics are presented in Section 3. Quantile regression, derivation of returns to education, and decomposition of the gender wage gap into endowment, discrimination, and unobserved effects are discussed in Section 4. Finally, the results are concluded in the conclusion section.

## Literature Review

Wage inequality is a recently flourishing empirical field for the Turkish case because the data availability limited researchers to conducting fully-fledged analysis until the 2000s when TURKSTAT started to publish surveys more systematically on the structures of households. Since then, wage inequality and its dimensions, including gender, have pursued an evergreen texture, and the Turkish literature, in one respect, was initiated by a series of papers by Tansel (2001, 2005, 2012) and Dayıoğlu and

Kasnakoğlu (1997) by using the Oaxaca-Blinder method (Oaxaca, 1973), hereinafter OB, and subsequent studies also used either this method or extensions extensively. The 1987 Household Income and Expenditure Survey was used by Dayıoğlu and Kasnakoğlu (1997). They explained that more than 64% of the gender wage gap stemmed from market discrimination, and higher educated women had a higher probability of entering the workforce, yet that was not enough to lessen the wage differentials because returns to factors like experience were higher for men than for females. For 1994, using the Household Expenditure Survey, Tansel (2001) documented substantial discrimination against women, particularly by finding no significant difference in wages of females, unlike males, between the informal and formal private sectors. Then, this framework was extended to private and public sectors, and gender-based wage discrimination in the private sector was found to be greater than in the public sector since the unexplained part is 42% in the Oaxaca decomposition in the private sector (Tansel, 2005). Hisarcıklı and Ercan (2005) employed the 1988 Household Labor Force Survey and obtained discrimination against women rather than differences in their human capital characteristics. The gender wage gap was diminishing due to females with higher human capital, in general, joining the labor market and with less human capital did not prefer to participate in the job market. İlkkaracan and Selim (2007) studied gender wage inequality using the 1994 Employment and Wage Structure Survey. 43% of the wage gap was explained by outright discrimination, and the rest was attributed to differences in endowments such as lower experience and tenure. Controlling some workplace variables reduced the unexplained part or outright discrimination to 22%. Additionally, females were observed as concentrated in jobs with a lower degree of unionization, which widened the gender wage differential. Kara (2006) attached 30% of the gender wage gap to discrimination using the 1994 Turkish Household Expenditure and Income Survey, and better education and employment in the public sector contributed to reducing gender discrimination. According to the Household Budget Survey, discrimination in 2003 increased to 60% (Cudeville and Gurbuzer, 2010).

Günalp, Cilasun, and Acar (2015), using the 2003 and 2010 Household Budget Surveys, checked the discrimination along the wage curve, and JMP decomposition ended up with more pay discrimination at the upper-income groups. Investigation of the entire wage distribution through the OB confirms Cudeville and Gurbuzer (2010); however, the trajectory of the discrimination using the JMP from 2003 to 2010 was different, changing between 50% to 118%. Limanlı (2015) implemented unconditional quantile regression (25th, 50th, and 75th) using the recentered influence function for 2006-2009 using the Income and Living Condition Survey. Explained effects contributed to lessening the gender wage gap, but discrimination was found to be too high, reaching 278%, and for the 75th, surprisingly, discrimination against males was found. Quantile regression and Machado and Mata (2005) decomposition were also applied to the Structure of Earnings Survey of 2006 by Kaya (2017) and concluded the existence of the glass ceiling as the gender wage gap was more salient at the upper tail and discrimination against women rose as climbed up in the wage distribution. The same dataset with a similar framework was adopted by Aktaş and Uysal (2016) and

provided resembling results but paid particular attention to education because the gender gap in returns was sensitive to education and widened as moved up to the upper end of the wage distribution. Tekgüç, Eryar, and Cindoğlu (2017) focused on working with disaggregated data with respect to education level and using the OB and Household Labor Force Surveys from 2004 to 2011, explored that the gender wage gap shrank in favor of higher educated females, but although labor force participation increased during that period, the gender wage gap for all education levels deteriorated. Akgül (2018) extended the coverage of Tekgüç et al. (2017) to 2017 by utilizing the OB and JMP methods simultaneously and gave some shreds of evidence on discrimination and wage gaps across regions. A higher degree of industrialization or higher agricultural employment in a region conduced to a worse gender wage gap. Besides, 2010 was detected as a threshold year, and until 2010, there was a tendency to experience lower discrimination against women, whereas it accelerated after 2010. Toksöz and Memiş (2020) adopted a unique view and concentrated on informality using the Household Labor Force Survey and discussed the gender wage gap for chosen manufacturing sectors where females worked intensively, such as textile, garment, and food production. Informally worked females were found to earn less than their male counterparts in those subsectors, and higher import competition gave rise to a deeper gender wage gap among informally employed workers during 2004-2016. Wage inequality is also examined in Turkiye from various perspectives, such as occupations (Özbay-Daş, 2021; Eriş-Dereli, 2021), sectors (Bozdoğan, 2021a), regions (Elveren, 2010; Sefil-Tansever and Kent, 2018; Kent, 2022), or wage mobility (Tansel, Dalgıç, and Güven, 2019).

## Data and Descriptive Statistics

### Wage Data

The wage variable for 2003-2011 is constructed from the Household Budget Surveys (HBS) of the Turkish Statistical Institute (TURKSTAT). The HBS reports monthly incomes, and question 69 in the HBS asks, "How much was your total net cash income from your main job over the past month?" corresponding to wage. Employers, self-employed individuals, and unpaid family workers are excluded, and regular and casual workers are kept only. Some restrictions on wage earners are put following Bakış and Polat (2015). Workers who work at least 8 hours but no more than 84 hours per week in their main job are included to eliminate potential biases. Individuals with a second job or part-time/temporary work in the survey month are also allowed as in Tansel and Bodur (2012). By doing so, labor market characteristics can be better captured as work done at home is accounted for, and it is quite essential, especially for female workers in Turkiye. Respondents who do not work in the survey month or do not report income are removed from the data. Therefore, wage-earning is defined as monthly cash and payment in kind from the main job and the second job. Wage earners are limited by the working age of 15-65.

Second job holders, aggregately, increased from 5% to 10% during the sample period in the refined dataset. That rise stemmed from male wage earners because female wage earners with a second job rose slightly to 4.5% from 3%. However, male wage earners with a second job reached 11.7% of the male sample, while in the beginning, it was only 5.5%. In order to get the real wage, monthly wage earnings in each year are deflated to the corresponding year-end by using the monthly inflation rates. It enables a comparable wage series as monthly wage earning is reported in different months. Then, the consumer price index with the 2003 base year is used to obtain real monthly wages[1]. As a final refinement step, the real weekly wage is derived by dividing the monthly wage (cash and in-kind) by 4.3, which, in turn, is further divided by the total number of hours worked weekly to obtain the real hourly wage.

**Descriptive Statistics**

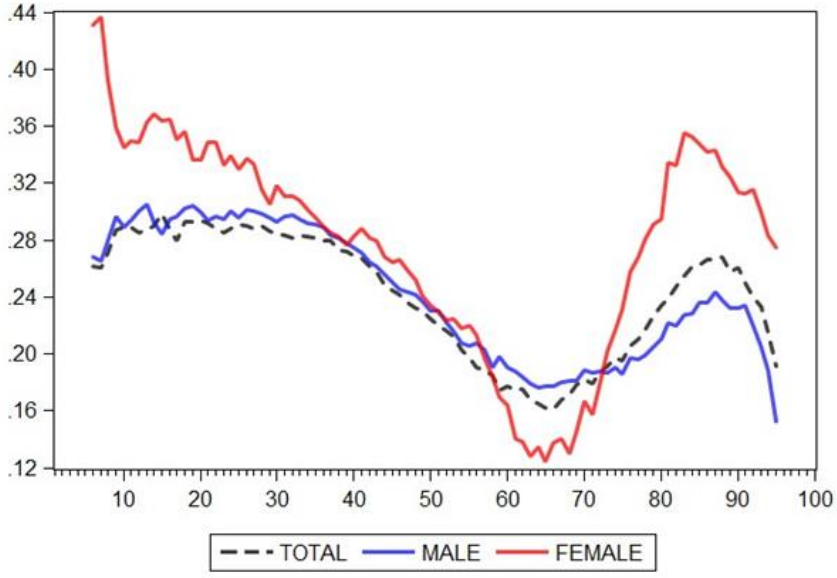
Selected summary measures of wage inequality are presented in Table 1. The upper part of Table 1 indicates that although average real hourly wages increased more for females than males, still females earned less. In terms of wage inequality, variation can be checked with standard deviation. Wage dispersion remained more solid for females, while a significant alleviation in males took place at around 26%. The number of working hours increased during the sample period. The lower part of Table 1 manifests the corresponding real hourly wages at different parts of the wage curve, such as the 5th, 10th, 25th…90th, and 95th percentiles. At the upper tail of the wage distribution, females earned more than males in 2011; thus, it is not possible to mention the existence of the glass ceiling effect. However, this pattern was not visible at the beginning of the sample period. Thus, the glass ceiling, to some extent, has been broken, and there was a significant transformation in favor of females. Additionally, such an improvement could be observed at the lower tail, too, but the current performance was not enough to overtake the males.

**Table 1:** Summary Measures of Wage Inequality

| Real Hourly Wage | Total 2003 | Total 2011 | Δ(%) | Male 2003 | Male 2011 | Δ(%) | Female 2003 | Female 2011 | Δ(%) |
|---|---|---|---|---|---|---|---|---|---|
| **Mean** | 2.75 | 3.25 | 18.18 | 2.79 | 3.27 | 17.2 | 2.55 | 3.19 | 25.1 |
| **Std. Dev.** | 5.94 | 4.39 | -26.1 | 6.36 | 4.66 | -26.7 | 3.77 | 3.55 | -5.84 |
| **HoursWorked** | 50.64 | 53.3 | 5.25 | 52.08 | 55.7 | 6.93 | 44.92 | 46.78 | 4.14 |
| **Quantiles** | **Total 2003** | **Total 2011** | **Δ(%)** | **Male 2003** | **Male 2011** | **Δ(%)** | **Female 2003** | **Female 2011** | **Δ(%)** |
| **q5** | 0.51 | 0.65 | 27.15 | 0.56 | 0.72 | 27.91 | 0.35 | 0.50 | 44.09 |
| **q10** | 0.70 | 0.93 | 33.57 | 0.75 | 1.01 | 33.55 | 0.55 | 0.77 | 40.84 |
| **q25** | 1.10 | 1.47 | 33.67 | 1.15 | 1.54 | 34.41 | 0.92 | 1.28 | 39.20 |
| **q50** | 1.79 | 2.24 | 25.22 | 1.83 | 2.31 | 25.91 | 1.61 | 2.04 | 26.47 |
| **q75** | 3.23 | 3.92 | 21.57 | 3.25 | 3.92 | 20.42 | 3.17 | 3.99 | 25.84 |
| **q90** | 5.08 | 6.59 | 29.76 | 5.09 | 6.42 | 26.15 | 5.06 | 6.91 | 36.64 |
| **q95** | 6.85 | 8.29 | 21.11 | 6.86 | 7.99 | 16.48 | 6.74 | 8.86 | 31.54 |
| **Observations** | 16469 | 8216 | | 13165 | 6016 | | 3304 | 2200 | |

[1] In the sample period, HBSs have no information about the regions, giving rise to a drawback. Deflating wage with respect to regional inflation rates is not possible. However, surveys are conducted according to regional weights and it may reduce the issue of regional heterogeneity in inflation rate.

**Figure 1:** Percentile Wage Growth Rates




Wage growth rates at the percentile level for genders are visualized in Figure 1. Except for the wage interval between approximately 60th to 75th percentiles, the wage growth rate of males exceeded female counterparts. For the rest of the wage distribution, the wage growth rates of females were faster, which provided signals about mitigating the gender wage gap. Figure 1 also displays an inverted U-shaped structure at the upper tail with a peak around 85th percentile. In terms of wage growth rates, females experienced stronger decelerations or accelerations compared to males.

**Table 2:** Summary Measures of Wage Inequality

| Relative Hourly Wages | Male | | | Female | | | Male/Female | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2003 | 2011 | Δ(%) | 2003 | 2011 | Δ(%) | 2003 | 2011 | Δ(%) |
| **Non-graduate** | 1.49 | 1.67 | 12.08 | 1.16 | 1.39 | 19.83 | 1.28 | 1.2 | -6.25 |
| **Primary Sch.** | 2.06 | 2.31 | 12.14 | 1.43 | 1.81 | 26.57 | 1.44 | 1.28 | -11.1 |
| **Middle Sch.** | 2.2 | 2.15 | -2.27 | 1.34 | 1.58 | 17.91 | 1.64 | 1.36 | -17.1 |
| **High Sch.** | 3.04 | 3.12 | 2.63 | 2.4 | 2.68 | 11.67 | 1.27 | 1.16 | -8.66 |
| **Vocational Sch.** | 3.71 | 3.49 | -5.93 | 2.6 | 2.85 | 9.62 | 1.43 | 1.22 | -14.7 |
| **University** | 5.28 | 6.41 | 21.4 | 4.73 | 5.82 | 23.04 | 1.12 | 1.1 | -1.79 |
| **Formal** | 3.01 | 3.91 | 29.9 | 2.83 | 4.21 | 48.76 | 1.06 | 0.93 | -12.3 |
| **Informal** | 2.59 | 1.81 | -30.1 | 2.4 | 1.56 | -35 | 1.08 | 1.16 | 7.41 |
| **Public** | 4.18 | 6.1 | 45.93 | 4.18 | 6.03 | 44.26 | 1 | 1.01 | 1 |
| **Private** | 2.23 | 2.56 | 14.8 | 1.94 | 2.34 | 20.62 | 1.15 | 1.09 | -5.22 |
| **Union** | 4.39 | 5.54 | 26.2 | 4.29 | 6.76 | 57.58 | 1.02 | 0.82 | -19.6 |
| **Non-Union** | 2.57 | 2.97 | 15.56 | 2.4 | 2.82 | 17.5 | 1.07 | 1.05 | -1.87 |
| **Physical** | 2.3 | 2.37 | 3.04 | 1.72 | 1.99 | 15.7 | 1.34 | 1.19 | -11.2 |
| **Mental** | 4.53 | 5.56 | 22.74 | 3.79 | 5.04 | 32.98 | 1.2 | 1.1 | -8.33 |
| **Both** | 4.12 | 3.57 | -13.4 | 3.84 | 3.43 | -10.7 | 1.07 | 1.04 | -2.8 |
| **Regular Job** | 2.99 | 3.55 | 18.73 | 2.94 | 3.71 | 26.19 | 1.02 | 0.96 | -5.88 |
| **Temporary Job** | 1.75 | 2.03 | 16 | 1.21 | 2.06 | 70.25 | 1.45 | 0.99 | -31.7 |
| **No Contract** | 1.51 | 1.81 | 19.87 | 1.37 | 1.19 | -13.1 | 1.1 | 1.52 | 38.18 |
| **Urban** | 2.9 | 3.53 | 21.72 | 2.68 | 3.39 | 26.49 | 1.08 | 1.04 | -3.7 |
| **Rural** | 2.29 | 2.37 | 3.49 | 1.78 | 2.15 | 20.79 | 1.29 | 1.1 | -14.7 |
| **Firm Size (0-9)** | 2 | 2.28 | 14 | 1.77 | 2.05 | 15.82 | 1.13 | 1.11 | -1.77 |
| **Firm Size (10-24)** | 2.64 | 3.01 | 14.02 | 2.7 | 2.76 | 2.22 | 0.98 | 1.09 | 11.22 |
| **Firm Size (>25)** | 3.61 | 4.25 | 17.73 | 3.09 | 4.41 | 42.72 | 1.17 | 0.96 | -18 |
| **Age (15-24)** | 1.45 | 1.69 | 16.55 | 1.63 | 1.88 | 15.34 | 0.89 | 0.9 | 1.12 |
| **Age (25-34)** | 2.5 | 3.14 | 25.6 | 2.88 | 3.79 | 31.6 | 0.87 | 0.83 | -4.6 |
| **Age (35-44)** | 3.25 | 3.8 | 16.92 | 3.01 | 3.53 | 17.28 | 1.08 | 1.08 | 0 |
| **Age (45-54)** | 3.6 | 3.84 | 6.67 | 3.23 | 3.31 | 2.48 | 1.11 | 1.16 | 4.5 |
| **Age (55-65)** | 3.1 | 4.15 | 33.87 | 2.05 | 2.63 | 28.29 | 1.51 | 1.58 | 4.64 |

Real hourly wages for males and females and corresponding changes in the sample period are given in Table 2. Higher education, being registered to the social security system, working in the public sector, membership in a union, having a white-collar job, working in a full-type job, residing in urban areas, and working in a larger company were correlated with higher average wages irrespective of gender. A similar pattern was seen in the age section for males, but the last cohort (55-65) for females interrupted the secular rise of wages with respect to age. Lower wages for this cohort can be attributed to females' informality or temporary jobs because around 25% of female workers were not registered. Formality as an institutional structure is also important for protecting workers against exploitation and securing higher wages than informality. Tansel and Kan (2012) found that as the earning level increases, the

penalty for informality diminishes, and confirmed that informality worsens the conditions of lower-tier jobs while the impact on upper-tier jobs remains quite limited. However, a more detailed analysis of this cohort has to be conducted.

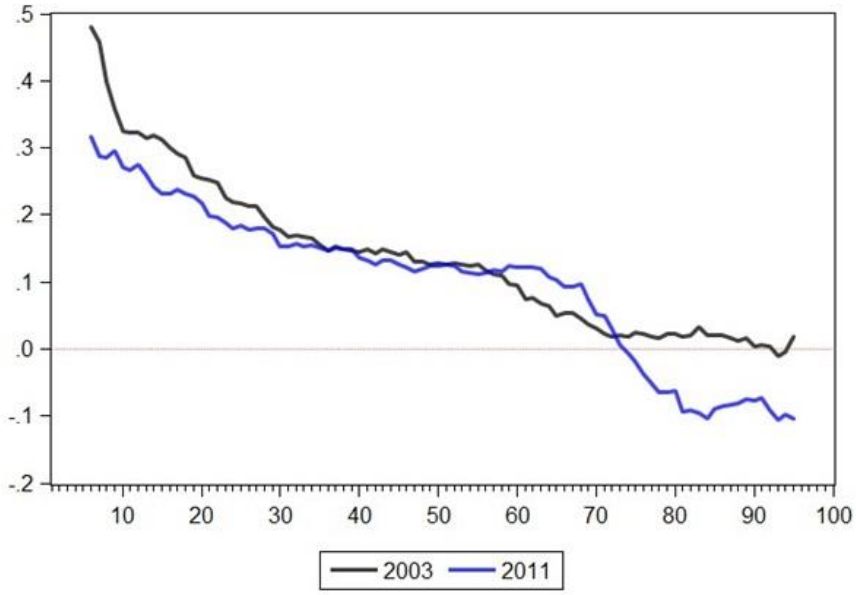
For some breakdowns, such as education level, the gender wage gap recovered in favor of females. The negative sign in the last column of Table 2 demonstrates the improvement of the gender wage gap. Wages increased in favor of males and widened the gender wage gap for the titles of informal work, particularly jobs with no contract, employment in a middle-sized firm, and age cohorts except for 25-34. The lowest wage discrepancy was among university graduates according to educational categories. The other striking feature is that middle school graduates earned less than primary school graduates, and considering the 1997 compulsory education reform, the importance of experience for the lower level education, in some sort, could be realized since most of the middle school graduates were relatively new entrants to the labor market.

DiNardo, Fortin, and Lemieux (1996) and Lee (1999) point out that minimum wage can alter the wage inequality at the lower tail of the wage distribution. Lee (1999) links the real wage erosion in the US to the 1980s wage inequality, primarily for females and males in the lower tail. Bakış and Polat (2015; 2023), Pelek (2018), and Tamkoç and Torul (2020) find some pieces of evidence supporting minimum wage hike as a correcting factor of wage inequality in Turkiye, especially for the lower end of the wage distribution.

Gender wage gap lines shown in Figure 2 depict the log wage dispersion between males and females. The red line passing through the origin reflects perfect equality; thus, positive numbers mean that males earned more than females at that percentile, while negative numbers at the y-axis stand for higher-paid females than males. Males were paid more than females in the lower percentiles, but the reverse was true in the higher percentiles. From the beginning to the end of the sample period, the gender wage gap narrowed for low-wage earners but widened for high-wage earners. To sum up, the gender wage gap improved in favor of females, with the exception of the bump observed around the 60th-75th percentiles. Combining the information from Figures 1 and 2 and Table 1 provides some evidence of the invalidity of the sticky-floor effect at the very low end of the distribution, as in Aktaş and Uysal (2016). The lower end is characterized by rather convergence, whereas divergence is experienced at the upper end. One explanation could be found in changes in the supply and demand of the labor market. For example, Bakış and Polat (2015) and Popli and Yılmaz (2016) attribute the fall in wage inequality, in particular in the lower tail, to the increase in the supply of more educated workers due to the rise in the years of compulsory schooling and the number of universities. The transformation of the country in terms of sectoral composition may also have some impacts on the wage inequality dynamics. To the best of my knowledge, there is an empirical void in this

field. The other explanation could be related to returns to education, and the next section will shed more light on this nexus.

**Figure 2:** Gender Wage Gap




The employment of women in jobs requiring mental tasks was more widespread than that of men. Females were also employed more heavily in the public sector or in less secure jobs like temporary jobs or jobs without a contract. Employed females were also overqualified in the labor market; in other words, higher-educated females joined the labor market more, and almost 1/3 of the females had university graduation, and years of schooling were greater. This structure was also found in Dayıoğlu and Kasnakoğlu (1997) and still describes the Turkish labor market. There was a significant decline in high school for both genders. Those who graduated from high school were probably directed to universities, or they stopped having formal education after middle school and preferred to enter the job market. Rising the middle schooling in Table 3 partially supports this view. Females had much lower experience or tenure at the job due to marriage, childbearing, and rearing (Limanlı, 2015). Females and males, together, experienced lower tenure in 2011, and this reduction could originate from job changes or an increase in the number of newly employed workers. Nevertheless, uncovering the actual cause requires more effort on that issue. Therefore, the labor market turned out to be less sclerotic during the sample period. Employed females were younger, but the difference between males was diminishing. Initially, the difference was almost 4 years (35.4 and 31.47), but it reduced slightly over 2 years (35.58 and 33.3). The average age of employed females and males increased for most cohorts. On the other hand, the 15-24 age interval of females exhibited a remarkable fall, and without further dynamics, it would not be possible to determine the roots of this change. Some potential factors can be associated with this, such as a fall in female labor force participation or continuing their education in high school or university. Besides, the 2000s was the period of large-scale privatization of state

enterprises and a greater tendency towards subcontractors in the public sector. In alignment with this, public sector employment decreased. However; formality soared notably, reaching 69.59% and 61.63% for males and females, respectively. The gender distribution with respect to firm sizes did not differentiate, which was reinforced by the mean hourly wages in Table 2.

**Table 3:** Distributional Characteristics of the Labor Market

| Distribution (%) | Male | | | Female | | |
|---|---|---|---|---|---|---|
| | 2003 | 2011 | Δ(%) | 2003 | 2011 | Δ(%) |
| **Non-graduate** | 3.56 | 4.18 | 17.42 | 7.62 | 8.54 | 12.07 |
| **Primary Sch.** | 40.36 | 32.11 | -20.44 | 28.42 | 26.39 | -7.14 |
| **Middle Sch.** | 15.92 | 19.73 | 23.93 | 10.01 | 13.54 | 35.26 |
| **High Sch.** | 20.75 | 13.01 | -37.3 | 21 | 10.72 | -48.95 |
| **Vocational Sch.** | 6.24 | 12.13 | 94.39 | 6.41 | 9.4 | 46.65 |
| **University** | 13.14 | 18.81 | 43.15 | 26.51 | 31.4 | 18.45 |
| **Years of Sch.** | 8.22 | 8.73 | 6.2 | 9.15 | 9.29 | 1.53 |
| **Formal** | 48.12 | 69.59 | 44.62 | 35.89 | 61.63 | 71.72 |
| **Public** | 28.95 | 19.99 | -30.95 | 27.39 | 23.09 | -15.7 |
| **Union** | 12 | 11.6 | -3.33 | 8.17 | 9.4 | 15.06 |
| **Physical** | 77.39 | 46.22 | -40.28 | 59.71 | 38.72 | -35.15 |
| **Mental** | 19.24 | 12.76 | -33.68 | 36.68 | 19.86 | -45.86 |
| **Both** | 3.36 | 41.00 | 1120.24 | 3.60 | 41.40 | 1050.00 |
| **Regular Job** | 85.65 | 83.16 | -2.91 | 76.21 | 74.59 | -2.13 |
| **Temporary Job** | 6.22 | 6.99 | 12.38 | 10.07 | 14.22 | 41.21 |
| **No Contract** | 8.12 | 9.85 | 21.31 | 13.71 | 11.18 | -18.45 |
| **Urban** | 81.88 | 78 | -4.74 | 85.59 | 84 | -1.86 |
| **Firm Size (0-9)** | 38.33 | 39.74 | 3.68 | 33.32 | 39.45 | 18.4 |
| **Firm Size (10-24)** | 20.78 | 15.97 | -23.15 | 24.21 | 17.4 | -28.13 |
| **Firm Size (>25)** | 40.87 | 44.28 | 8.34 | 42.46 | 43.13 | 1.58 |
| **Tenure** | 8.16 | 7.55 | -7.48 | 5.54 | 5.17 | -6.68 |
| **Age** | 35.4 | 35.58 | 0.51 | 31.47 | 33.3 | 5.82 |
| **Age (15-24)** | 14.23 | 16.28 | 14.41 | 29.66 | 22.72 | -23.4 |
| **Age (25-34)** | 33.71 | 32.01 | -5.04 | 33.47 | 33.95 | 1.43 |
| **Age (35-44)** | 33.28 | 28.97 | -12.95 | 26.63 | 28.59 | 7.36 |
| **Age (45-54)** | 15.7 | 17.63 | 12.29 | 8.08 | 11.95 | 47.9 |
| **Age (55-65)** | 3.05 | 5.08 | 66.56 | 2.14 | 2.77 | 29.44 |

After the general outlook of between-inequality, Table 4 displays some statistics about within-inequality, which is proxied by the log wage dispersion between specific percentiles. Upper-tail inequality corresponds to wage dispersion between 90th and 50th (or median) percentiles, whereas lower-tail inequality equals wage dispersion between 50th and 10th percentiles. The overall inequality is quantified by the distance

of the 90th to the 10th percentile. 90-10 gap decreased for each gender, indicating a reduction in the overall wage inequality. Although lower-tail inequality was moderated by around 7% and 4% for men and women, respectively, upper-tail inequality was scaled up by around 7% for females, while for males, it remained constant. Most of the change occurred around the median. 50-25 wage differential decreased by 13% for males and 17% for females, and 75-50 dispersion widened by 10% and 17% for males and females, respectively. All these developments worked in favor of females, and both within and between group inequalities were moderated.

**Table 4:** Within Wage Inequality

| Log Wage Dispersion | Total 2003 | Total 2011 | Δ(%) | Male 2003 | Male 2011 | Δ(%) | Female 2003 | Female 2011 | Δ(%) |
|---|---|---|---|---|---|---|---|---|---|
| **lnq90-lnq10** | 1.99 | 1.96 | -1.46 | 1.91 | 1.85 | -2.99 | 2.23 | 2.2 | -1.35 |
| **lnq90-lnq50** | 1.04 | 1.08 | 3.35 | 1.02 | 1.02 | 0.2 | 1.14 | 1.22 | 6.74 |
| **lnq50-lnq10** | 0.94 | 0.88 | -6.9 | 0.89 | 0.83 | -6.64 | 1.08 | 0.98 | -9.97 |
| **lnq90-lnq75** | 0.45 | 0.52 | 14.32 | 0.45 | 0.49 | 10.29 | 0.47 | 0.55 | 17.77 |
| **lnq75-lnq50** | 0.59 | 0.56 | -5.08 | 0.57 | 0.53 | -7.85 | 0.68 | 0.67 | -0.74 |
| **lnq50-lnq25** | 0.48 | 0.42 | -13.5 | 0.47 | 0.41 | -13.8 | 0.56 | 0.46 | -17.1 |
| **lnq25-lnq10** | 0.46 | 0.46 | 0 | 0.42 | 0.42 | 1.68 | 0.52 | 0.51 | -2.11 |
| **lnq75-lnq25** | 1.07 | 0.98 | -8.85 | 1.04 | 0.93 | -10.6 | 1.24 | 1.13 | -8.18 |
| **lnq95-lnq5** | 2.6 | 2.55 | -1.99 | 2.51 | 2.41 | -3.94 | 2.96 | 2.87 | -2.81 |

## Methodology and Estimation Results

### Quantile Regression

Results from descriptive statistics strengthen the variant nature of inequality along the wage distribution, between-group, within-group inequality, and gender wage gap along the different percentiles. However, factors contributing to the inequality for specific percentiles cannot be statistically identified. To gain some insight into which mechanisms provoked within-group wage inequality and the gender wage gap along the wage curve, an extended version of the Mincerian wage equation is estimated. The salient by-product of OLS estimation is the treatment of marginal returns in the same way for different quantiles, shadowing the diversifying behavior of explanatory variables along the wage curve. Thus, selecting the estimation technique for the wage equation as Quantile Regression helps to get rid of estimating the coefficients or marginal returns only at means. The following equation is estimated for males and females separately with respect to the 10th, 25th, 50th, 75th, and 90th percentiles, and reported in Tables 5 and 6.

$$\ln(wage)_i = f\begin{pmatrix} education_i, union_i, urban_i, public_i, firmsize_i, married_i, formal_i, \\ jobstructure_i, tenure_i, tenure_i^2, age_i, age_i^2, industies_i, occupations_i \end{pmatrix}$$

Control variables are located on the right-hand side of the above equation. These are working years in the current job and its square (tenure), age and its square (age), 6 educational dummies (education), membership in a union (union), living in urban areas (urban), public employment (public), firm size according to small, medium and large with a number of employees 1-9, 10-24 and greater than 25, respectively (firmsize), a dummy for being married (married), registration to the social security

system (formal), temporary and no contract jobs (job structure), 18 industry dummies with respect to NACE rev.2 and 9 occupational dummies according to ISSO 88.

All the signs obtained in Tables 5 and 6 align with the literature, and explanatory variables do not produce any unexpected result at first glance, justifying the utilization of wage inequality along the wage curve. 18 industries and 9 occupational dummies are included, and independent of those controls, some coefficients remain insignificant for some quantiles. Squares of age and squares of tenure are added to assess if an inverted U-shaped effect exists. Tables 5 and 6 express that the square of age or tenure is either insignificant or significant but has a too trivial impact, approaching zero, along the wage curve. However, the minor distinction between females and males in terms of returns to experience disappeared in 2011. Experience was also more important at the lower end of the wage distribution.

For the upper part of the wage distribution, firm size did not play a role in wage determination, but employment in a larger firm always came up with a greater return independent of gender (for both genders). Irregular job owner was expected to suffer from lower returns than regular job owners. The positive impact of the formality declined as we moved up to higher percentiles in 2011. Higher wage earners generally worked in larger companies, had better education, and were probably law-abiding citizens by nature, as their informality would be costlier in case of being red-handed. Low-wage earners could be in a desperate position and would have no option other than to stay out of the formal system to gain more benefits, such as attempting to increase their income by working informally. However, in 2003, the mirror image was observed, and upper percentiles acquired greater returns from being registered to the social security system. Being married contributed to men in terms of higher returns but weakened in 2011 while being married or single had no significant influence on the female and supported the findings of Limanlı (2015). On the contrary, he found being widowed advantageous for females. Unionization and public sector employment positively affected the return. Unionization had more potent effects on the lower end of the wage distribution.

Up to this point, through the agency of quantile regression, it is found that different returns to different labor and job characteristics for males and females at different points in the wage distribution. In addition, more insight into how these characteristics, particularly education, impact the gender wage gap and within wage inequality requires further investigation. However, the extent to which returns to education are in charge of the gender wage gap is the missing point of the quantile regressions. Therefore, returns to educational categories will be examined first in the following subsection, and then by implementing a decomposition method, more dynamics will be uncovered.

**Table 5:** Wage Equations for 2003

| | Female Wage Equation | | | | | Male Wage Equation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Variables** | **(0.10)** | **(0.25)** | **(0.50)** | **(0.75)** | **(0.90)** | **(0.10)** | **(0.25)** | **(0.50)** | **(0.75)** | **(0.90)** |
| Tenure | 0.043*** | 0.033*** | 0.028*** | 0.025*** | 0.024*** | 0.026*** | 0.025*** | 0.022*** | 0.021*** | 0.019*** |
| | (0.007) | (0.006) | (0.004) | (0.004) | (0.008) | (0.004) | (0.002) | (0.002) | (0.002) | (0.004) |
| Tenure^2 | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.000*** | -0.000*** | -0.000*** | -0.000*** | -0.000* |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Age | 0.046*** | 0.030*** | 0.030*** | 0.024*** | 0.034** | 0.075*** | 0.061*** | 0.055*** | 0.051*** | 0.043*** |
| | (0.010) | (0.009) | (0.007) | (0.007) | (0.014) | (0.007) | (0.004) | (0.004) | (0.004) | (0.008) |
| Age^2 | -0.001*** | -0.000*** | -0.000*** | -0.000** | -0.000 | -0.001*** | -0.001*** | -0.000*** | -0.001*** | -0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Primary Sch. | 0.134* | 0.193*** | 0.147*** | 0.093** | 0.068 | 0.195*** | 0.157*** | 0.126*** | 0.160*** | 0.137** |
| | (0.070) | (0.055) | (0.044) | (0.042) | (0.084) | (0.044) | (0.028) | (0.028) | (0.030) | (0.055) |
| Middle Sch. | 0.178** | 0.236*** | 0.168*** | 0.110** | 0.125 | 0.246*** | 0.185*** | 0.175*** | 0.228*** | 0.189*** |
| | (0.084) | (0.067) | (0.054) | (0.052) | (0.101) | (0.047) | (0.030) | (0.030) | (0.032) | (0.059) |
| High Sch. | 0.317*** | 0.341*** | 0.296*** | 0.256*** | 0.336*** | 0.435*** | 0.377*** | 0.306*** | 0.345*** | 0.336*** |
| | (0.087) | (0.069) | (0.055) | (0.053) | (0.103) | (0.048) | (0.030) | (0.030) | (0.032) | (0.060) |
| Vocational Sch. | 0.383*** | 0.380*** | 0.358*** | 0.313*** | 0.443*** | 0.465*** | 0.414*** | 0.339*** | 0.328*** | 0.344*** |
| | (0.106) | (0.086) | (0.067) | (0.064) | (0.126) | (0.056) | (0.035) | (0.035) | (0.038) | (0.070) |
| University | 0.472*** | 0.534*** | 0.525*** | 0.447*** | 0.617*** | 0.713*** | 0.635*** | 0.538*** | 0.546*** | 0.597*** |
| | (0.107) | (0.084) | (0.064) | (0.061) | (0.119) | (0.057) | (0.036) | (0.036) | (0.039) | (0.072) |
| Union | 0.115* | 0.139*** | 0.116*** | 0.073* | 0.040 | 0.137*** | 0.122*** | 0.120*** | 0.101*** | 0.085*** |
| | (0.061) | (0.050) | (0.040) | (0.039) | (0.074) | (0.027) | (0.017) | (0.017) | (0.018) | (0.033) |
| Urban | 0.240*** | 0.163*** | 0.102*** | 0.042 | -0.071 | 0.123*** | 0.109*** | 0.107*** | 0.0583*** | 0.054** |
| | (0.045) | (0.037) | (0.032) | (0.031) | (0.060) | (0.021) | (0.013) | (0.014) | (0.014) | (0.027) |
| Public | 0.392*** | 0.354*** | 0.376*** | 0.307*** | 0.181* | 0.315*** | 0.378*** | 0.339*** | 0.253*** | 0.178*** |
| | (0.086) | (0.063) | (0.048) | (0.047) | (0.095) | (0.035) | (0.021) | (0.021) | (0.023) | (0.050) |
| Firm Size 10-24 | 0.210*** | 0.232*** | 0.125*** | 0.083** | 0.031 | 0.106*** | 0.112*** | 0.086*** | 0.050*** | 0.025 |
| | (0.052) | (0.041) | (0.033) | (0.032) | (0.065) | (0.023) | (0.015) | (0.015) | (0.016) | (0.028) |
| Firm Size 25 | 0.348*** | 0.346*** | 0.239*** | 0.191*** | 0.047 | 0.294*** | 0.267*** | 0.223*** | 0.215*** | 0.166*** |
| | (0.050) | (0.040) | (0.032) | (0.031) | (0.061) | (0.023) | (0.015) | (0.015) | (0.016) | (0.029) |
| Married | 0.016 | 0.030 | 0.005 | 0.021 | 0.026 | 0.112*** | 0.113*** | 0.115*** | 0.132*** | 0.139*** |
| | (0.037) | (0.031) | (0.026) | (0.026) | (0.051) | (0.026) | (0.017) | (0.018) | (0.020) | (0.036) |
| Formal | 0.171*** | 0.177*** | 0.162*** | 0.207*** | 0.246*** | 0.138*** | 0.134*** | 0.149*** | 0.140*** | 0.158*** |
| | (0.049) | (0.036) | (0.027) | (0.025) | (0.050) | (0.019) | (0.012) | (0.012) | (0.013) | (0.024) |
| Temporary Job | -0.685*** | -0.555*** | -0.349*** | -0.207*** | -0.221*** | -0.253*** | -0.163*** | -0.078*** | -0.004 | 0.056 |
| | (0.089) | (0.065) | (0.048) | (0.045) | (0.078) | (0.045) | (0.027) | (0.027) | (0.028) | (0.055) |
| No Contract | -0.577*** | -0.422*** | -0.112** | -0.003 | -0.039 | -0.346*** | -0.254*** | -0.157*** | -0.085*** | -0.026 |
| | (0.096) | (0.071) | (0.053) | (0.049) | (0.097) | (0.045) | (0.028) | (0.028) | (0.030) | (0.058) |
| Constant | -1.474*** | -1.077*** | -0.860*** | 0.027 | 0.240 | -2.281*** | -1.578*** | -1.002*** | -0.424*** | 0.097 |
| | (0.225) | (0.188) | (0.152) | (0.149) | (0.296) | (0.141) | (0.085) | (0.083) | (0.087) | (0.160) |
| Occupations | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 3,304 | 3,304 | 3,304 | 3,304 | 3,304 | 13,165 | 13,165 | 13,165 | 13,165 | 13,165 |

Notes: Numbers in parentheses are standard errors. Outcomes of industry and occupation dummies are not reported due to parsimony reasons. Non-graduate, non-union, rural, private, firm size (0-9), unmarried, and regular job are benchmarks. All statistics are rounded to three digits.

**Table 6:** Wage Equations for 2011

| | Female Wage Equation | | | | | Male Wage Equation | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Variables** | **(0.10)** | **(0.25)** | **(0.50)** | **(0.75)** | **(0.90)** | **(0.10)** | **(0.25)** | **(0.50)** | **(0.75)** | **(0.90)** |
| Tenure | 0.025*** | 0.015*** | 0.023*** | 0.014*** | 0.011 | 0.019*** | 0.021*** | 0.021*** | 0.017*** | 0.018*** |
| | (0.008) | (0.005) | (0.005) | (0.005) | (0.008) | (0.005) | (0.002) | (0.002) | (0.003) | (0.005) |
| Tenure^2 | -0.000 | -0.000 | -0.001*** | -0.000 | -0.000 | -0.000* | -0.000*** | -0.001*** | -0.000*** | -0.000** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Age | 0.014 | 0.026*** | 0.032*** | 0.019** | 0.028** | 0.054*** | 0.049*** | 0.042*** | 0.050*** | 0.044*** |
| | (0.014) | (0.009) | (0.008) | (0.009) | (0.014) | (0.001) | (0.005) | (0.004) | (0.006) | (0.010) |
| Age^2 | -0.000 | -0.000** | -0.000*** | -0.000* | -0.000* | -0.001*** | -0.001*** | -0.000*** | -0.001*** | -0.000*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Primary Sch. | 0.043 | 0.063 | 0.066 | 0.044 | 0.053 | 0.0310 | 0.010 | 0.098*** | 0.022 | 0.054 |
| | (0.084) | (0.055) | (0.048) | (0.049) | (0.076) | (0.066) | (0.034) | (0.030) | (0.041) | (0.071) |
| Middle Sch. | 0.076 | 0.152** | 0.172*** | 0.081 | 0.138* | 0.057 | 0.071** | 0.138*** | 0.070 | 0.156** |
| | (0.094) | (0.061) | (0.053) | (0.056) | (0.083) | (0.066) | (0.035) | (0.031) | (0.043) | (0.075) |
| High Sch. | 0.090 | 0.210*** | 0.312*** | 0.266*** | 0.405*** | 0.158** | 0.146*** | 0.182*** | 0.116** | 0.217*** |
| | (0.102) | (0.068) | (0.059) | (0.061) | (0.095) | (0.072) | (0.038) | (0.033) | (0.046) | (0.079) |
| Vocational Sch. | 0.185* | 0.216*** | 0.285*** | 0.311*** | 0.447*** | 0.176** | 0.155*** | 0.226*** | 0.188*** | 0.236*** |
| | (0.109) | (0.071) | (0.061) | (0.063) | (0.095) | (0.073) | (0.038) | (0.033) | (0.046) | (0.080) |
| University | 0.362*** | 0.406*** | 0.512*** | 0.448*** | 0.682*** | 0.360*** | 0.317*** | 0.413*** | 0.404*** | 0.488*** |
| | (0.112) | (0.072) | (0.063) | (0.064) | (0.099) | (0.081) | (0.042) | (0.035) | (0.048) | (0.082) |
| Union | 0.185** | 0.186*** | 0.151*** | 0.109** | 0.115 | 0.206*** | 0.163*** | 0.107*** | 0.066** | 0.026 |
| | (0.072) | (0.049) | (0.045) | (0.050) | (0.076) | (0.045) | (0.024) | (0.021) | (0.029) | (0.052) |
| Urban | 0.126** | 0.165*** | 0.131*** | 0.152*** | 0.216*** | 0.147*** | 0.148*** | 0.147*** | 0.116*** | 0.111*** |
| | (0.060) | (0.038) | (0.033) | (0.035) | (0.055) | (0.032) | (0.017) | (0.014) | (0.020) | (0.035) |
| Public | 0.238** | 0.242*** | 0.247*** | 0.260*** | 0.238*** | 0.338*** | 0.340*** | 0.356*** | 0.276*** | 0.269*** |
| | (0.094) | (0.057) | (0.047) | (0.051) | (0.079) | (0.067) | (0.033) | (0.028) | (0.040) | (0.075) |
| Firm Size 10-24 | 0.101* | 0.154*** | 0.123*** | 0.008 | -0.007 | 0.231*** | 0.149*** | 0.115*** | 0.102*** | 0.062 |
| | (0.061) | (0.040) | (0.035) | (0.038) | (0.058) | (0.037) | (0.020) | (0.017) | (0.024) | (0.042) |
| Firm Size 25 | 0.245*** | 0.216*** | 0.205*** | 0.155*** | 0.064 | 0.295*** | 0.214*** | 0.191*** | 0.163*** | 0.134*** |
| | (0.054) | (0.037) | (0.032) | (0.034) | (0.052) | (0.035) | (0.018) | (0.015) | (0.022) | (0.038) |
| Married | 0.079* | 0.0723** | 0.026 | 0.067** | 0.072 | 0.056 | 0.053*** | 0.045** | 0.030 | 0.073* |
| | (0.046) | (0.031) | (0.028) | (0.030) | (0.046) | (0.036) | (0.020) | (0.018) | (0.025) | (0.044) |
| Formal | 0.526*** | 0.404*** | 0.240*** | 0.170*** | 0.132** | 0.455*** | 0.331*** | 0.253*** | 0.200*** | 0.124*** |
| | (0.060) | (0.041) | (0.036) | (0.039) | (0.058) | (0.035) | (0.019) | (0.016) | (0.023) | (0.042) |
| Temporary Job | -0.307*** | -0.227*** | -0.179*** | -0.058 | 0.018 | -0.133** | -0.131*** | -0.061** | -0.065* | -0.012 |
| | (0.093) | (0.054) | (0.046) | (0.049) | (0.073) | (0.062) | (0.031) | (0.027) | (0.038) | (0.069) |
| No Contract | -0.659*** | -0.492*** | -0.374*** | -0.248*** | -0.228** | -0.204*** | -0.171*** | -0.105*** | -0.042 | -0.005 |
| | (0.094) | (0.060) | (0.053) | (0.058) | (0.092) | (0.060) | (0.031) | (0.026) | (0.038) | (0.071) |
| Constant | -0.817*** | -0.481** | -0.189 | 0.457** | 0.613** | -1.608*** | -0.827*** | -0.417*** | -0.031 | 0.368* |
| | (0.296) | (0.192) | (0.165) | (0.178) | (0.271) | (0.192) | (0.099) | (0.084) | (0.116) | (0.201) |
| Industries | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 2,200 | 2,200 | 2,200 | 2,200 | 2,200 | 6,016 | 6,016 | 6,016 | 6,016 | 6,016 |

Notes: Numbers in parentheses are standard errors. Outcomes of industry and occupation dummies are not reported due to parsimony reasons. Non-graduate, non-union, rural, private, firm size (0-9), unmarried, and regular job are benchmarks. All statistics are rounded to three digits.

**Returns to Education**

Per year returns to educational categories are derived following Bircan (2005), and Tansel and Bodur (2012) but with a difference. Instead of illiterate, non-graduate is chosen as the reference category. Later, Özbay-Daş and Doğruel (2017) and Kent and Sefil-Tansever (2021) also applied that method to generate per-year returns to education in Turkiye. Primary, middle, high, and vocational high schooling categories are preserved, but university is extended into two narrower categories, university_1 and university_2. The former is obtained using vocational high schooling, while the latter uses high schooling. Per year returns are calculated by utilizing the information in Tables 5 and 6 as follows: the coefficient of the relevant category is subtracted from the coefficient of the previous lower education level, then divided by the number of years between two education categories (Bircan, 2005). The increase in high schooling to 4 years in 2005 is incorporated into 2011 using information available in Table 3.

In general, higher education is associated with higher per-year returns, but in 2003, vocational high schooling stood out as an exemption and even outperformed two university categories along the entire wage distribution in Table 7. However, university categories took over the lead in 2011. Per year returns to education tended to increase towards the upper and lower tails of the wage distribution. Thereby the pressure from the lower tail created a plateau-like structure between the 10th percentile and the median, and the very upper tail further diverged from the rest, probably leading to a hump in the wage curve. At the lower tail, per year returns to university were relatively lower for females than the upper tail, intensifying within-group inequality. Furthermore, the gender wage gap inflated in 2003 as males had high wage premia for university at the bottom and the top of the wage curve. Middle schooling contribution was the least among the other educational levels regarding wages. Returns to education for males mainly were greater than for females in 2003, with some exceptions. Therefore, education stepped forward as a detrimental factor as it magnified the gender wage gap that year. In 2011, primary and middle schooling dropped out of the scene as they have insignificant statistics. High and vocational high schooling had lower returns in 2011. Males experienced a decline in returns to education, whereas higher returns to education portrayed females from 2003 to 2011. Bakış, Davutyan, Levent, and Polat (2009) lend some assistance to reveal that increment for females by finding twice larger knowledge spillovers for women compared to men. This situation contributes to attaining lower within-group and gender wage inequality. The fall in per year returns to education for males can be attributed to the saturation of the labor market due to the rise in the supply of educated male workers (Tansel and Bodur, 2012). On the other hand, broader and deeper awareness of gender issues over time may reduce the demand for males, and an equivalent decrease in returns may occur. Lower educational levels lost their importance along the wage curve, yet university, both over high schooling and vocational high schooling, turned out to be significant all over the wage distribution. High and vocational high schoolings, in particular for females, had the highest returns in 2011, which were statistically insignificant in 2003. As in the literature, vocational high schooling had higher returns than high schooling (Tansel and Bodur, 2012; Özbay-Daş and Doğruel, 2017; Kent and Sefil-Tansever, 2021). Many more stories can

be narrated only by looking at Table 7, and the pattern of per year returns to education resembles the findings of the literature but this study segregates genders and produces more concrete outcomes about the difference in the wage premia. The diminishing returns to schooling are violated as in Tansel and Bodur (2012), Özbay-Daş and Doğruel (2017), and Kent and Sefil-Tansever (2021); however, in Table 7, the diminishing returns to schooling hold only for primary and middle schooling consistently. Thus, it can be stated that the diminishing return to schooling is valid until a specific educational threshold level is reached. After that threshold, more educated workers enjoy higher returns to education. Two effects may have a role in the higher returns to university, as suggested by Tansel and Bodur (2012). The supply-side explanation is related to the capacity of the current number of universities because the increase in the demand for educated workers may exceed the new inflow to the supply, resulting in higher prices for labor. The other explanation links the capabilities of university graduates to the challenging and competitive university entrance exam, and better innate abilities inherently come up with greater returns.[2]

**Table 7:** Per Year Returns to Education by Gender

| | | **Female** | | | | | **Male** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **q10** | **q25** | **q50** | **q75** | **q90** | **q10** | **q25** | **q50** | **q75** | **q90** |
| **2003** | **primary** | 4.47 | 6.43 | 4.90 | 3.10 | **2.27** | 6.50 | 5.23 | 4.20 | 5.33 | 4.57 |
| | **middle** | 1.47 | 1.43 | 0.70 | 0.57 | **1.90** | 1.70 | 0.93 | 1.63 | 2.27 | 1.73 |
| | **high** | 4.63 | 3.50 | 4.27 | 4.87 | **7.03** | 6.30 | 6.40 | 4.37 | 3.90 | 4.90 |
| | **vocational** | 6.83 | 4.80 | 6.33 | 6.77 | **10.60** | 7.30 | 7.63 | 5.47 | 3.33 | 5.17 |
| | **university_1** | 2.23 | 3.85 | 4.18 | 3.35 | 4.35 | 6.20 | 5.53 | 4.98 | 5.45 | 6.33 |
| | **university_2** | 3.88 | 4.83 | 5.73 | 4.78 | 7.03 | 6.95 | 6.45 | 5.80 | 5.03 | 6.53 |
| **2011** | **primary** | **1.43** | **2.10** | **2.20** | **1.47** | **1.77** | **1.03** | **0.33** | 3.27 | **0.73** | **1.80** |
| | **middle** | **1.10** | **2.97** | **3.53** | **1.23** | **2.83** | **0.87** | **2.03** | 1.33 | **1.60** | **3.40** |
| | **high** | **0.45** | 1.87 | 4.51 | **5.95** | 8.59 | **3.23** | 2.40 | 1.41 | **1.47** | 1.95 |
| | **vocational** | **3.51** | 2.06 | 3.64 | **7.40** | 9.94 | **3.80** | 2.68 | 2.81 | **3.77** | 2.56 |
| | **university_1** | 4.43 | 4.75 | 5.68 | 3.43 | 5.88 | 4.60 | 4.05 | 4.68 | 5.40 | 6.30 |
| | **university_2** | **6.80** | 4.90 | 5.00 | 4.55 | 6.93 | 5.05 | 4.28 | 5.78 | 7.20 | 6.78 |

Notes: Bold numbers indicate insignificance.

### Decomposition of Gender Wage Gap

Gender wage inequality is decomposed using the JMP[3]. By doing so, what would the gender gap have been if males had female characteristics or if male characteristics had been paid by female returns can be answered. Nevertheless, notations of Yun (2009)

[2] The higher pace of technology adoption in an economy may enlarge the returns. See Bozdoğan (2021b) for the detailed discussion.

[3] See Fortin, Lemieux, and Firpo (2011) for more information about the pros and cons of the JMP.

are followed in this study to simplify the JMP procedure. Assume the following equation,

$$Y_j = X_j\beta_{j+}e_j \qquad (1)$$

where $Y_j$ is the natural logarithm of hourly wage with j groups such as A and B (male and female). Then, the wage differential between A and B (male and female) is decomposed using the following equation, which utilizes OB decomposition:

$$\bar{Y}_A - \bar{Y}_B = (\bar{X}_A - \bar{X}_B)\beta_A + \bar{X}_B(\beta_A - \beta_B) + (\bar{e}_A - \bar{e}_B) \qquad (2)$$

According to JMP, the raw wage inequality emerges from three sources: changes in the distribution of individual characteristics ($X$), changes in the prices of the observable characteristics (β), and changes in the distribution of the residual. The above equation has three main terms on the right-hand side. The first and second terms correspond to the endowment and remuneration effects, respectively. JMP adds the third term to the Oaxaca framework and accounts for residual wage distribution. It is called the unobservable effect. In the literature, those three components are named conventionally as differences in endowments (endowment effect), differences in returns to endowments or price discrimination against women (remuneration effect), and differences in unobservable (unobservable effect) (Beblo, Beninger, Heinze and Lasiney, 2003). JMP also makes it tractable to estimate equation (2) for different percentiles as in the below form.

$$\bar{Y}_A^q - \bar{Y}_B^q = (\bar{X}_A^q - \bar{X}_B^q)\beta_A + \bar{X}_B^q(\beta_A - \beta_B) + (\bar{e}_A^q - \bar{e}_B^q) \qquad (3)$$

The raw gender wage inequality is decomposed with respect to 10th, 25th, 50th, 75th, and 90th percentiles in Tables 8 and 9 for 2003 and 2011, respectively. T corresponds to the gender wage gap with reference to male wages. Q and P demonstrate the contribution of differences in observable endowments (endowment) and the contribution of differences in observable prices (remuneration or discrimination), respectively. Finally, contributions from differences in unobservable quantities and prices are denoted by U. Tables 8 and 9 present the outcomes of JMP decomposition.

The first rows of JMP results affirm the findings of descriptive statistics and quantile regression, in some respect, by indicating a decreasing gender wage gap as we move to the upper tails of the wage distribution. Apart from this, there was an apparent decline in the gender wage gap in favor of females for all selected percentiles from 2003 to 2011. The recovery of inequality even reversed in 2011 to the detriment of males for 75th and 90th percentiles. When it is analyzed to reveal the contributors to wage inequality, endowment and discrimination factors come into prominence. In absolute terms, endowment and discrimination effects tended to fall towards the upper tail of wage distribution, which is in contradiction with Günalp et al. (2015). Their period is different, and this discrepancy, or any result, can be specific to the dataset (Koral and Mercan, 2021). Günalp et al. (2015) rationalize lower discrimination for lower percentiles as those groups already earning subsistence-level income. However, relative contributions of endowment and discrimination did not follow a pattern, especially in 2011. The endowment effect became a factor in reducing the gender wage gap in 2003, and the power of reduction surged along the upper tail, yet

not enough to counteract the gender wage gap. On the other hand, price discrimination against women in 2003 was the leading factor for the median and subsequent percentiles. The strength of the unobservable effect varied but mainly drove the gender wage gap to diminish.

**Table 8:** JMP Decomposition in 2003

| | **q10** | **q25** | **q50** | **q75** | **q90** |
|---|---|---|---|---|---|
| $T_{2003}$ | 0.322 | 0.217 | 0.128 | 0.026 | 0.005 |
| | (100) | (100) | (100) | (100) | (100) |
| $Q_{2003}$ | 0.17 | 0.101 | 0.053 | -0.049 | -0.029 |
| | (52.8) | (46.5) | (41.4) | (-188.4) | (-580) |
| $P_{2003}$ | 0.124 | 0.113 | 0.089 | 0.093 | 0.072 |
| | (38.5) | (52.1) | (69.5) | (357.6) | (1440) |
| $U_{2003}$ | 0.028 | 0.003 | -0.014 | -0.018 | -0.038 |
| | (8.7) | (1.4) | (-11.0) | (-69.2) | (-760.0) |

Notes: Numbers in parentheses show the percentage effect of the total wage gap.

In 2011, the general outlook of components of gender wage inequality changed slightly. It is witnessed that price discrimination continued to be the most prominent pulling element for the gender wage gap, remaining as important as for all percentiles. The endowment effect intensified the gender wage gap until the 75th percentile but then transformed into an alleviating source. As in 2003, the endowment effect had a declining trend towards the upper tail. Consequently, improvements in labor characteristics such as education, experience, etc. mitigated gender wage inequality, but the price discrimination against females was still the most critical issue along the wage curve, responsible for more than half of the gender wage gap; thus, "equal pay for equal work" principle cannot be tracked in Turkiye in practice. There are no exemptional percentiles or years where discrimination against males occurred, as in Limanlı (2015). Gender discrimination was inclined to shrink at the upper tail. This outcome verifies Kara (2006) as, in general, employed females had higher education. Therefore, this study presents outcomes that are in opposition to Kaya (2017), as the glass ceiling did not exist. It should be noted that at the upper end of the wage distribution, females were better educated than males, and the absence of the glass ceiling could be attributed to returns to education.

**Table 9:** JMP Decomposition in 2011

| | q10 | q25 | q50 | q75 | q90 |
|---|---|---|---|---|---|
| $T_{2011}$ | 0.27 | 0.183 | 0.124 | -0.019 | -0.075 |
| | (100) | (100) | (100) | (100) | (100) |
| $Q_{2011}$ | 0.093 | 0.055 | 0.015 | -0.096 | -0.102 |
| | (34.4) | (30) | (12) | (505.2) | (136) |
| $P_{2011}$ | 0.168 | 0.117 | 0.117 | 0.093 | 0.053 |
| | (62.2) | (64) | (94.4) | (-489.4) | (-70.7) |
| $U_{2011}$ | 0.009 | 0.012 | -0.008 | -0.015 | -0.026 |
| | (3.3) | (6) | (-6.4) | (84.2) | (34.7) |

Notes: Numbers in parentheses show the percentage effect of the total wage gap.

## Conclusion

The departure point of the study is to inquire into the gender wage inequality that may arise from the unequal treatment of females in the labor market. The sample coverage is carefully determined, and formal and informal wage earners are included. Thus, the results apply to the entire employment. In the first stage, overall and tail inequalities are investigated to take a snapshot of the labor market in terms of inequality. By doing so, evolution patterns of within and between-group inequalities are detected. For both genders, overall inequality decreased from 2003 to 2011, and to some degree, real minimum wage hikes, particularly in 2004, can be seen as a stimulating factor from the institutionalist perspective. However, lower-tail and upper-tail wage inequalities followed distinct paths. The reduction in the lower tail inequality was quite considerable, and males experienced more alleviation than females. Upper tail inequality continued to increase in females while almost remained constant for males. Wage growth rates varied along the wage distribution, but clues about the declining gender wage gap are observed. Except for the interval between the 65th and 80th percentiles, females' wage growth rate exceeded that of their male counterparts.

Returns of human capital and job characteristics are estimated using quantile regression for 10th, 25th, 50th, 75th, and 90th percentiles. The returns are found to be nonconflicting with the literature. Tenure, experience, membership in a union, employment in the public sector, residing in the urban areas, registration to the social security system, and working in larger firms contributed more to the lower end of the wage distribution than the upper end, independent of gender. Returns to educational categories are derived using the outcomes of the quantile regression. Wage premia, in general terms, tended to increase with respect to education level, but the number of exceptions results in questioning the diminishing returns. Although vocational high schooling always had higher returns than high schooling, it surpassed even the university except for the upper tail of males' distribution in 2003. Wage premia increased for females, contrary to males. Over time, lower education levels lost relative importance, and more qualified workers had higher returns, contributing to a milder gender wage gap. The ratio of high school and over increased to approximately 50% and 60% for males and females, respectively. The supply and

demand side changes in the labor endowment played a significant role in determining the returns to education. As we move along the wage curve, wage and inequality dynamics alter; thus, aggregated analyses need to be addressed more carefully.

Finally, applying the counterfactual analysis of the JMP enabled the decoupling of the sources of the gender wage gap. Price discrimination against females maintained its adverse impact on gender wage inequality in favor of males. On the one hand, towards the upper tail of the wage distribution, the gender wage gap started to recede. On the other hand, over time, the gender wage gap was moderated as well because the degree of the remuneration effect fell despite the endowment effect gaining some strength. As a matter of fact, the 75th and above percentiles experienced the gender wage gap in favor of females in 2011, which can be attributed to the higher-educated structure of female employment. Price discrimination was quite salient at the lower end of the wage curve, and probable subsistence-level wages in this region might contribute to this issue. Besides, there is no price discrimination against males during the period at any point in the wage distribution. Incorporating occupational and sectoral composition aspects into the gender wage inequality framework properly will expand our horizons and help us comprehend this timeless theme.

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