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Women's Tertiary Education Masks the Gender Wage Gap in Turkey

Hasan Tekgüç [1,2] · Değer Eryar [3,4] · Dilek Cindoğlu [5,6]

Abstract This paper investigates the gender wage gap for full-time formal sector employees, disaggregated by education level. The gap between the labor force participation rate of women with tertiary education and those with lower levels of education is substantial. There is no such gap for men. Hence, existing gender wage gap studies for Turkey, where we observe lopsided labor force participation rates by education levels, compare two very different populations. We disaggregate the whole sample by education level to create more homogenous sub-groups. For Turkey, without disaggregation, the gender wage gap was 13% in 2011, and women are significantly over-qualified relative to men on observed characteristics. Once we disaggregate the sample by education level, we show that the gender wage gap is 24% for less educated women and 9% for women with tertiary education in full-time formal employment. Observed characteristics only explain 1 % of this gap in absolute terms. We further disaggregate the data by public and private employment. The gender gap is higher in the private

✉ Hasan Tekgüç
htekguc@gmail.com; hasan.tekguc@khas.edu.tr

Değer Eryar
deger.eryar@gmail.com

Dilek Cindoğlu
dilekcindoglu@gmail.com

1   Kadir Has University, İstanbul, Turkey

2   Kadir Has Üniversitesi İİSBF Ekonomi Bölümü, Cibali Kadir Has Caddesi, 34083, Fatih, İstanbul, Turkey

3   İzmir University of Economics, İzmir, Turkey

4   İzmir Ekonomi Üniversitesi İşletme Fakültesi Ekonomi Bölümü, Sakarya Cad. No: 156, 35330, Balçova, İzmir, Turkey

5   Abdullah Gül University, Kayseri, Turkey

6   Abdullah Gül Üniversitesi, İnsan ve Toplum Bilimleri Fakültesi Sümer Kampüs, 38170 Kayseri, Turkey

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sector. However, women with tertiary education in the public sector are significantly better qualified compared to men, and consequently the adjusted gender wage gap is higher for women with tertiary education in the public sector. Our estimates also indicate a rise in the gender wage gap between 2004 and 2011.

Gender wage gaps are persistent phenomena in labor markets, despite many political and legislative initiatives aimed at the elimination of labor market disparities by gender in many parts of the world (Christofides et al. 2013; OECD 2012). One interesting observation is that the raw gender wage gaps in Middle Eastern and North African (MENA) countries are not necessarily higher than in the OECD, despite the fact that almost all MENA countries, including Turkey, have a very low performance in terms of gender equality based on economic, political, educational and health based criteria (WEF 2013; OECD 2012).

Dildar (2015) reports that North Africa, the Middle East and South Asia are generally referred to as the "belt of classic patriarchy" in the sociology literature. MENA countries, especially, are very patriarchal societies where pervasive gender differences exist in many areas of society. For example, the Human Development Report publishes a Gender Development Index based on human development index (HDI) estimates calculated separately for men and women, dividing countries into five groups by absolute deviation from gender parity in gendered HDI values.[1] MENA countries are generally in the 4th or 5th groups implying high levels of disparity despite the fact that many of these MENA countries (including Turkey Iran, Tunisia, Jordan, and Lebanon) are considered in the High Human Development Category. Overall, Arab countries have greater disparities than the Least Developed Countries and are only ranked above South Asia (UNDP 2015: 221–223). Turkey's Gender Development Index value is higher than most of the Arab states (in the 4th category) but still lower than anywhere in Europe, including Europe's lowest performers: Albania, Macedonia and Malta.

According to UNDP (2015), in Europe, women are outperforming men in expected years of schooling (for school age cohorts) and life expectancy at birth. Most of the remaining gender disparity in Europe is the result of two dimensions: differences in mean years of schooling for older cohorts and differences in estimated GNI per capita for men and women. The gender disparity in Turkey is not only greater than all European countries in those two latter dimensions, but what sets Turkey apart is that boys still outperform girls in expected years of schooling in younger cohorts. On this dimension Turkey performs even below Middle Eastern and South Asian countries such as Iran, Jordan, and Sri Lanka. Comparing Turkey with Latin American countries is also instructive: according to UNDP measures Mexico is the lowest performer among

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[1] The Gender Development Index has 4 dimensions: differences in life expectancy at birth; differences in expected years of schooling (for the school age cohorts); differences in mean years of schooling for men and women aged over 25; differences in estimated Gross National Income (GNI) per capita for men and women. Differences in estimated GNI per capita for men and women is a composite measure of differences in labor force participation and the gender wage gap (UNDP 2015: Technical Note 4).

the major economies of Latin America in terms of the Gender Development Index, but Mexico still ranks above Turkey. Even Latin American countries which rank lower than Turkey in overall HDI rank higher on the Gender Development Index.

Yet, the gender wage gap estimates for Turkey and MENA countries shows almost no "raw wage gap" between men and women. One possible explanation is that the small proportions of women who are in wage employment tend to be better educated than their male colleagues in MENA countries (Sweidan 2012). Labor force participation rates for men and women with tertiary education are higher than for the general population in most countries. However, the labor force participation gap between men and women with tertiary education and the rest of the population is very substantial in Turkey and MENA countries (Table 1 in this paper for Turkey; Table 1.1 in World Bank (2013) for a sample of MENA countries; also see Dildar (2015): 42) for a comparison of female labor force participation in OECD countries).

Other empirical studies show that the seemingly low unadjusted wage gaps can be misleading in different contexts in the presence of significant labor force participation gaps. Petrongolo and Olivetti (2008) show that a similar situation exists in Southern European countries: Italy, Greece, Portugal, and Spain had the lowest unadjusted gender wage gap in Europe in 1999 when not accounting for gender differences in labor force participation rates. They show that, in Western Europe, the labor force participation gap between men and women and the gender wage gap are inversely correlated. They conclude that "female participation rates in Catholic countries and Greece are low and concentrated among high-wage women. After correcting for lower participation rates, the wage gap there widens to levels similar to those of other European countries and the United States." (p. 635). Neal (2004) points to a similar situation for the U.S. in 1980 in comparisons by race. The overall wage gap between black and white women is very low, and black women earn more than white women in the South despite the fact that black women are less educated compared to white women and they generally attend inferior schools. Neal (2004) shows that this counter-intuitive finding is the result of the very different characteristics of women who are not in the labor force. Employed black women were significantly more qualified than non-employed black women. Neal (2004) criticizes previous studies on the wage gap between black and white women that do not correct for selection into the labor force.

Table 1 Employment and unemployment by education level, 2011 (20–54 year olds)

Education	Women			Men		
	Women	Employed	Unemployed	Men	Employed	Unemployed
No schooling	18%	23%	1%	5%	62%	12%
Primary	43%	28%	2%	37%	81%	7%
Middle school	10%	25%	4%	16%	81%	9%
High school	17%	29%	7%	25%	76%	7%
Tertiary Ed	11%	63%	11%	16%	85%	7%
All	100%	31%	4%	100%	79%	8%

Source: (TurkStat 2012a)

Although each of these studies focuses on a different context, both Petrongolo and Olivetti (2008) and Neal (2004) emphasize the importance of correction for selection into employment for women. The case of Turkey is similar to Southern Europe. Tertiary education is the most important determinant of wage employment. Currently in Turkey, half of the women employed in salaried jobs have tertiary education degrees, a level almost five times greater than this group's share of the total population in 2011. [2] Moreover, men and women with tertiary education have experienced faster income growth compared to less educated men and women, possibly due to rapid globalization and technological change. Because the share of women with tertiary education in employment is much greater than the share of men, the raw gender wage gap disappeared between 2004 and 2011 in Turkey despite the fact that the gender wage gap actually widened for most educated groups (see Table 2). In other words, the composition of the employed work force is also masking the widening gender wage gap in Turkey.

This paper is the first step taken for Turkey to mitigate the abovementioned problem by carrying out a wage gap analysis for a sample disaggregated by education level. Disaggregating the sample by education level creates more homogeneous groups in unobserved productivity related characteristics (such as skills) which reduces the bias in the gender wage gap estimates (Kunze 2008). Given the need for disaggregation, we use Labor Force Surveys from the Turkish Statistical Institute (TurkStat) for 2004 and 2011 because of the large sample size. First we show that controlling for selection with the Heckman method (but without disaggregating by education level) improve findings only slightly; without disaggregation we find that women are simultaneously over-qualified relative to men and also face high levels of unexplained gender wage gap. Then, we show that the gender wage gap estimates can be substantially improved by disaggregation by education levels compare to studies without disaggregation. Finally, we also investigate the change in gender wage gaps over the first decade of the 2000s for disaggregated groups by educational level and show that, in contrast to raw estimates, the adjusted gender wage gap is actually increasing.

The rest of the paper is organized as follows: the next section discusses the reasons for the significant employment gap between women with tertiary education and less educated women. Following that, we review the literature on the gender wage gap by focusing on the studies that show that comparing more homogeneous groups yields more reliable gender wage gap estimates and on existing gender wage gap studies for Turkey. The next section briefly describes the education system in Turkey, the data and the empirical model. We then present results, discuss findings and conclude the paper.

Employment Gap between Less Educated and Tertiary Educated Women in Turkey

In one of the earliest studies on wage employment and earnings in Turkey, Tansel (1994) documented that in 1987 female university graduates constituted only 2 % of 15–64 years olds but they accounted for 16% of all wage earners (similar figures for

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[2] For the prime working age population (20–54 years old) 11% of women and 16% of men in Turkey have tertiary education degrees in 2011. Men with tertiary education make up roughly one quarter of male wage employees.

Table 2 Full-time formal sector monthly earnings comparison by education level

Education	2011			2004			Change	
	Women	Men	W/M	Women	Men	W/M	Women	Men
No schooling	2.99	3.33	90%	2.54	3.72	68%	18%	-10%
Primary	3.14	3.90	81%	2.78	3.71	75%	13%	5%
Middle school	3.29	4.16	79%	3.24	4.28	76%	1%	-3%
High school	4.68	5.43	86%	4.56	5.23	87%	3%	4%
Tertiary Ed	9.62	10.78	89%	7.75	8.56	91%	24%	26%
Average	6.80	6.14	111%	5.48	5.18	106%	24%	18%

All earnings are in 2011 prices: 1 TL is 0.6 dollar (TurkStat 2005, 2012a)

men were eight and 12% respectively). Even after controlling for age, experience and residence in large cities, Tansel (1994, 2001) still found that the probability of engaging in wage employment increased non-linearly with education: the effect of education was stronger for women and strongest for university educated women. In a follow-up study, Tansel (2002) studied female labor force participation over a longer period of time. Tansel (2002) showed that female labor force participation declined significantly between 1960 and 2000. Most broadly, female labor force participation declined with declines in non-wage farm employment (*unpaid family worker*) in rural areas; however, female employment in urban areas did not increase. Many other developing countries experienced, first, an overall decline in female labor force participation due to rapid urbanization, which reduced share of on-farm employment, and then an eventual increase in overall female labor force participation driven by wage employment in urban areas. Hence the historical record of female labor force participation looks like a U-shaped curve (Tansel 2002). Turkey exhibited only the first half of the U-shaped impact of economic development on female employment along with the decline in rural employment. She attributes this overall decline in female employment to i) increased schooling and hence decline in employment of youngest cohorts; ii) "cultural values" against market work, and iii) the early retirement scheme introduced in the 1980s that allowed women to retire at the age of 50 or after 20 years of service. Tansel (2002) also documented that the employment gap existed between men and women at every level of education (but was lowest for university graduates) and also among urban women.

What are the potential causes of the stubbornly low level urban wage employment of less educated women? In a recent study, Dildar (2015) composes an index for cultural values and directly tests these claims and shows that women who have "internalized the patriarchal gender norms[3]" and are more religious have a lower probability of joining the labor force. Eryar and Tekgüç (2015) show that less educated women are more likely to join the urban labor force if their mothers have also worked in non-agricultural jobs. They also find that mothers' job experience has no effect on the labor force participation of women with tertiary degrees. Without rejecting the abovementioned

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[3] In other words, some women accept and defend patriarchal gender norms that regard men as breadwinner and women as homemaker.

societal roles, İlkkaracan (2012), stresses the importance of demand-side and institutional factors such as gendered labor division in the workplace and the lack of work-family reconciliation measures.

Finally, the sociology of work literature on Turkey and MENA countries indicates that tertiary education has non-pecuniary benefits to women. For example, in many instances, women's physical mobility outside home is strictly regulated by male relatives. Tertiary education gives women an acceptable reason to be outside of the home without being accompanied by male relatives first as students and then as employees (Cindoğlu and Toktaş 2002). Tertiary education also has an impact on women's private realm: women with university education have more control over their lives, including decisions regarding marriage and fertility. For example, women with university degrees have greater autonomy regarding marriage (Cindoğlu and Toktaş 2002) and are also able to exert more control on their fertility within marriage than less educated women (Hacettepe 2014: 41). Increased status within the married household especially allows better educated women to resist "endless demands for more housework" (Cindoğlu and Toktaş 2002: 42).

Royalty (1998) argued that disaggregating female employees according to education level can better account for the decisions of women regarding the labor market. Accordingly, better educated women tend to change jobs more frequently as a result of facing wider wage variation due to the availability of a wide range of lucrative alternatives as compared to less educated women, who are constrained by low paid alternatives. Moreover, Royalty (1998) proposed that certain unobservable characteristics such as "career-mindedness", distinguish better versus less educated women, and added that these unobservable factors justify the utilization of different estimation equations for women according to education level.

Arguments put forward by Tansel (1994; 2002), Dildar (2015), Eryar and Tekgüç (2015), Cindoğlu and Toktaş (2002) point out that the labor force participation decision in Turkey is not only determined by gender but also education level. On the one hand, having tertiary education can raise the earning potential of women; on the other hand, it can also have a differential impact on women's attitude toward working outside the home in the presence of traditional gender norms. In such a case, if we distinguish wages only by gender, the unobserved gender norms variable might interact with both the tertiary education dummy and the dependent variable (female labor force participation), thus biasing the coefficient estimates. Hence, we follow Royalty (1998), decomposing wages not only by gender but also by education level.

The Gender Wage Gap

When accounting for the wage gap between men and women, the primary emphasis has been on observable factors associated with productivity-related characteristics, such as education and experience (Blau and Kahn 2007). Additionally, other sets of observable factors, such as type of occupation and sector of employment are used in order to control for any possible occupational and sectoral segregation associated with the disproportionally low or high numbers of women observed in some sectors and occupational positions (Triventi 2013). The unexplained or residual part may reflect discrimination by gender in the market, although, as Kunze (2008) points out, in the presence of unobserved heterogeneity, may merely reflect unmeasured group

differences. Blau and Kahn (2007) emphasize the same problem by claiming that any approach relying on statistical residuals should also take other possibilities into consideration before identifying the residual part with the labor market discrimination.

Weichselbaumer and Winter-Ebmer (2005), in their comprehensive meta-analysis of the gender wage gap, indicate that, although there has been a significant decrease in the observed wage gap as a result of better educated and trained women, a constant residual wage gap is found in most studies in the period between 1960 and 2000.[4] Blau and Kahn (2003) argue that the institutional settings account for cross-country variation in the gender pay gap. Using micro-data for 22 countries for the 1985–94 period, they conclude that high wage floors associated with highly-centralized, unionized wage setting result in a lower wage gap by raising the relative pay levels of women, who are disproportionally more numerous at the bottom of the wage distributions in each country. Arulampalam et al. (2007) investigate the gender pay gap across the wage distribution for 11 European countries for the period 1995–2001. They find empirical evidence for a growing pay gap at the top of the wage distribution, and indicate that wage-setting institutions, such as those governing collective bargaining and minimum wages, account for the cross-country variation of the gap. Differences in childcare provision across European countries emerge as another factor.

One of the primary findings of Weichselbaumer and Winter-Ebmer (2005) based on their comprehensive meta-analysis is the significant effect of the sample characteristics on the wage gap. The wage gap tends to be smaller if the analysis is conducted for more homogenous groups. Blau and Kahn (2007) also support this finding, suggesting that the effect of gender differences in unmeasured productivity characteristics, such as skills, is minimized in homogenous groups, like new entrants to the labor market, or employees in a single occupation.

In the context of working with more homogeneous groups, there are several studies focusing specifically on the gender wage gap of university graduates. Loury (1997), utilizing a sample of young college educated workers in the US, finds that a significant part of the wage gap can be accounted for by higher market returns to men's skills relative to that of women's skills for a given major. Joy (2003), working with a sample of a more recent wave of US college educated workers, shows that, rather than educational variables, labor market variables, such as job sector, industry and hours worked, have a much larger impact on the wage gap than the educational variables. Similarly, Triventi (2013) finds that employment conditions and work hours play a primary role in explaining the gender pay gap for a sample of university graduates from 11 European countries. Triventi (2013) also indicates that cross-country variation in the unexplained part of the pay gap can be mainly accounted for by the actions of wage setting institutions and family friendly policies.

Although there has been no study with a specific focus on university graduates in Turkey, there are a few studies regarding the overall gender pay gap. Using the 1987 Household Income and Expenditure Survey, Kasnakoğlu and Dayıoğlu (1997) found only a small gap (96% female/male wage ratio) in Turkey, with education and experience being the most important productivity related variables affecting the gap.

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[4] Weichselbaumer and Winter-Ebmer's meta-analysis covers studies mostly from developed countries, and around 75% of all studies are from the USA, Europe and other OECD countries. There is no case study from Turkey in the meta-analysis.

Dayıoğlu and Tunalı (2003) utilized both the 1988 Household Labor Force Survey and the 1994 Household Income Distribution Survey. They found that the ratio of women's to men's wages decreased between 1988 (98%) and 1994 (85%). They concluded that although women in 1994 were better endowed with productive characteristics, this advantage was outweighed by discrimination, as measured by higher returns for the same characteristics for men relative to women.

Using the 1994 Household Expenditure Survey, corrected for selection bias, Tansel (2005) found almost no gap to exist for employees in public administration, whereas the ratio of women's to men's wages were 80% and 76% for State Economic Enterprises (SEE) and the formal private sector, respectively. Additionally, the unexplained gap was largest in the formal private sector, mainly due to higher relative returns to endowments for men in this sector. İlkkaracan and Selim (2007) examined the gender wage gap based on the 1994 Employment and Wage Structure Survey. The ratio of women's to men's wages was around 70%, and the reason for the large magnitude of the gap was considered to be the relatively large share of medium and large scale formal private manufacturing firms in their sample. A recent study investigates the gender pay gap not only at mean wages but across the entire wage distribution. Aktaş and Uysal (2012) use the Wage Structure Survey from 2006, which is limited to firms with at least 10 workers, and therefore their sample covers only half of the employees in the non-agricultural labor market. They find that there is empirical evidence for the glass-ceiling effect, even after controlling for workplace characteristics, such as firm size, collective bargaining status, and occupational position.

Education System, Data Description and Empirical Model

Background Information on Education System in Turkey

A basic feature of Turkish education system is compulsory education that is defined by completion of levels instead of age cut-offs. Consequently, household surveys in Turkey inquire about respondents' highest level of school completion. Until 1997, only five years of primary education was compulsory in Turkey. In 1997, compulsory education was extended to include middle school. The 1997 reform increased net middle school enrollment rates from 55% to almost 90% in five years (WB 2016). In 2012, compulsory education was further extended to include high school. As a result of the 1997 reform, there is a very clear educational difference between younger cohorts (born in 1986 or before) and the rest in Turkey. We limit our empirical analysis to 20–54 years old; only the youngest cohort in 2011 data is affected by the 1997 reform.

In Turkey, admission to university is decided by a compulsory exam (LYS, Turkish acronym) covering all subjects. The exams take place over several weekends in June. We investigate the importance of the differences in likelihood of employment by education level on the gender wage gap; hence the selection into tertiary education is a real issue. Unfortunately, the labor force survey employed in this paper provides cross-section data and, therefore, we do not have any information on the personal histories of respondents, such as the education level or occupation of their parents. Moreover, we do not have any data on the academic aptitude of the respondents such as their LYS scores or their high school GPAs. As a result, we do not control for selection into tertiary education.

In our dataset, more than half of all women and almost half of all men with tertiary education are employed in the public sector. Hence, selection into public employment is also an issue. As of 2011, a majority of public sector employees in Turkey took the Public Sector Selection Exam (KPSS, Turkish acronym). Most of the candidates are offered public sector employment based only on KPSS exam results. Candidates for higher level positions (such as prosecutors, judges, treasury officials) have to score above a minimum on the KPSS and then are subject to specialized exams and interviews. Unfortunately, we do not address selection into the public sector because we have data neither on personal histories of respondents nor KPSS exam scores.

Data Description

TurkStat produces three household micro data sets that contain earnings data. We use the labor force survey among the three because it contains by far the largest sample size (almost 400,000 individuals per year). This survey has been administered with more or less the same methodology since 2004.[5] Since 2009, it has included information about the type of degree for tertiary education graduates. The other available surveys with nationally representative micro data are the Income and Living Standards Survey, collected using a similar methodology to EU-SILC, and annual Household Budget Surveys (HBS).[6] In choosing a dataset, we face a trade-off between sample size and more detailed household income and wealth data. Men and women with higher education, which is the focus of our study, account for a little more than 10% of the total population on average during the last decade. We employ the Labor Force Survey because of its larger sample size (and for the type of degree information since 2009). We further limit our empirical investigation to those between 20 and 54 years of age because there are naturally very few observations for 15–19 year olds for tertiary education, and labor force participation declines significantly after the age of 55 due to retirement (see Fig. 1), especially for women.

Table 1 clearly reveals that labor force participation (employed plus unemployed) of both men and women increases with education level. The employment rate of men is above 75% for all levels of education except no schooling in 2011. However, except for those with higher education, employment rates of women do not exceed 30%. The discrepancy in the labor force participation rates (and also employment rates) of men and women is enormous at every education level, with the exception of higher education graduates. For women, unemployment rate increases with education level, whereas for men the opposite is true. This is probably due to the fact that for women with less than tertiary education attachment to the labor force is weak. Less educated women do not enter the labor force if they anticipate earnings lower than their reservation wage, or they are more likely to make a transition from employment to out of the labor force.

We further focus on formal sector employees to remove men and women working in part-time/informal jobs, because employment choices may differ. We also limit our

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[5] We present a more detailed discussion of Labor Force Survey methodology as well as descriptive statistics of independent variables in Appendix 3.

[6] Dildar (2015) obtains data on patriarchal norms and religiosity from the 2008 Demographic and Health Survey for Turkey (TDHS, 2008). TDHS does not have data on wages.
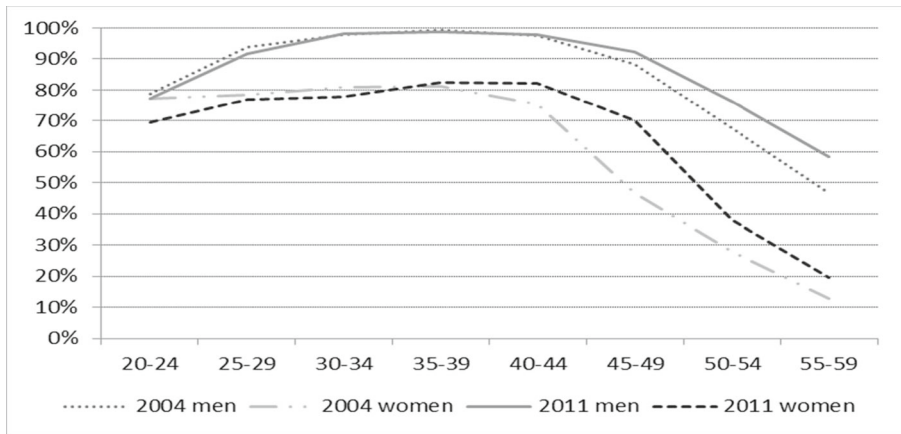
Source: TurkStat (2005) and TurkStat (2012a).

Fig. 1 Labor force participation rate of men and women with tertiary education

discussion to full-time workers.[7] Christofides et al. (2013) point out that focusing on full-time full-year employees can eliminate differential behavior due to quality of job and hours of work.[8] Furthermore, part-time workers may not take on certain responsibilities due to indivisibilities of certain tasks; hence the reduction in their pay may be due to these indivisibilities, rather than gender discrimination. Working part-time is not common in Turkey for university graduates, but it is a bit more common among women. In our data set most of the wage employees in the formal sector are already full-time workers, so eliminating the part-timers did not significantly reduce the sample size. 94 (94) percent of men and 90 (93) percent of women with tertiary education working as salaried employees in 2011 (2004) were in formal, full-time employment, so few observations were lost in tertiary sample. However, the situation is different in the less than tertiary sample: 75 (68) percent of men and 62 (59) percent of women with less than tertiary education working as salaried employees were in formal, full-time employment. Almost 97% of all employees with less than tertiary education work full-time, so the difference is almost totally due to formal-informal employment difference (especially for less than high school graduates). In other words, excluding informal employees actually removes a quite large group of insecure employees from our study, potentially leading to underestimation of wage gap since informal employment is more common among women. Finally, we convert monthly earnings (bonuses and other extras included) to an hourly wage by dividing the reported salary by 4.5 to convert it to weekly wage, and then further divide it by the reported weekly hours worked.[9] In other

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[7] If an interviewee declares that she is part-time employed, we classify her part-time employed. Also, if an interviewee reports that she is enrolled with any social security institution due to her primary job, we classify her as working in the formal sector. There are separate social security institutions for public sector employees, private sector employees, urban self-employed and farmers.

[8] We do not have data on whether the sampled individuals are employed for a full year. Instead, we focus on formal sector employees who enjoy much more job security compared to informal sector employees.

[9] In the tertiary sample, men work on average 46 (43) hours and women work 43 (41) hours in 2011 (2004) per week. In the less educated sample, men work on average 54 (52) hours and women work 50 (49) hours in 2011 (2004) per week.

words, our analysis focuses on hourly wage differences for primary jobs in the formal sector. However, if workers in the informal sector, part-time workers and income from secondary jobs were included, then the actual gender wage gap would probably be higher than reported in the Results section.

Table 2 shows the comparison of hourly earnings according to education level for full-time formal sector employees in the data set. In 2011, the average earnings for all women are higher than men (bottom line). However, we observe that men earn more than women at every level of education, and it becomes clear that the higher overall average earnings for women is a result of a composition effect. As Table 1 shows, women with tertiary education are heavily represented among employees in the full time formal sector (representing a figure almost five times greater than this group's proportion of the population as a whole).

Between 2004 and 2011, per capita GDP growth was 26% (Kibritçioğlu 2013). Table 2 shows that men with tertiary education is the only sub-group that experienced levels of earnings growth similar to the per capita GDP growth. In this sub-group, men's earnings increased faster than women's, suggesting a widening gender wage gap over the period.

Empirical Models

We employ the Oaxaca-Blinder decomposition to study the wage gap between men and women. In studying job mobility in various EU countries Theodossiou and Zangelidis (2009: 567–8) also disaggregate their sample, not only for men and women, but also for better and less educated men and women to account for the omitted variable bias. We follow Theodossiou and Zangelidis (2009) and disaggregate the dataset further not only by gender but also by education level. Furthermore, we follow Heckman's (1979) seminal work on selection, and initially estimate a probit model to determine the likelihood of a person joining employment. In the second step, we incorporate the inverse Mills' ratio estimated from the first step to the log-linear OLS wage determination model. Finally, we perform the Oaxaca-Blinder decomposition to determine the segments that are explained (part of the wage gap attributable to observable factors) and unexplained (gender wage gap that is not attributable to any observed characteristics).

Selection Model[10]

We estimate a probit model for employment where the dependent variable is equal to one if the person is employed and zero if the person is unemployed or out of the labor force. For the whole sample, as well as for each sub-group (tertiary education versus lower education), determinants of employment consist of individual characteristics such as dummies for age-group; dummies for marital status (single, ever married with no children, ever married with one child, ever married with two or more children); dummy for urban area; dummies for region (at NUTS2 level); dummy for the three largest metropolitan cities (Istanbul, Ankara and Izmir); the number of young children at home; natural logarithm of total wages of all other household members, and education level dummies for the full sample model. The Inverse Mills' ratio is estimated from the selection model as usual.

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[10] We use Stata 11.1 Student Edition for all quantitative analysis both for descriptive statistics and for selection and decomposition analyses.

Leung and Yu (1996) point out that the Inverse Mills' ratio and regressors in wage equations can suffer from near collinearity when there are few exclusion restrictions (see Petreski et al. (2014) for a recent example). In the case of near collinearity, the two step estimator will be ineffective and correcting for selection will not change the results in the wage estimations. Leung and Yu (1996: 207) suggest condition numbers (larger than 30 is indicative of collinearity problems) instead of the more popular Variance Inflation Factor (VIF) as a diagnostic criterion. We include *the number of young children at home* and the *natural logarithm of total wages of all other household members* (following Tansel (2001: 354) and Tansel (2005: 458)), only in the selection model.[11] Moreover, we present both the Unadjusted (raw) wage ratio and also the Adjusted [for selection] wage ratios side by side in the Results section. In most cases correction for selection is quite substantial and the wage gap increases significantly after correcting for selection.

Wage Estimation Model

Oaxaca (1973) pointed out that wage gap estimates will differ according to whether the male or female wage structure is chosen as base wage level. Moreover, Oaxaca and Ransom (1994) found that the smallest standard errors are yielded by the pooled (50–50 or relative sample sizes as weights for the nondiscriminatory wage structure) model, which was hence their preferred specification. We also estimate the pooled model and find that the unexplained portion of the wage gap is generally 1 % less than when assuming male wage structure as the base wage structure. Due to this minimal difference, we continue with the more familiar presentation, where the male wage structure serves as the base wage structure.

We estimate log-linear OLS wage models for men and women separately. The dependent variable is the natural log of hourly wage from the main job (some individuals hold second jobs; however, wage data do not exist for such jobs). Determinants are dummies for age-group; dummies for marital status (single, ever married with no children, ever married with one child, ever married with two or more children); dummy for urban area; dummies for region (at NUTS1 level); dummies for the three largest cities; linear and squared values for tenure in the current job; dummy for public sector employees; dummies for the firm size; dummies for type of degree (when applicable); occupation (when applicable); whether the person performs administrative tasks (when applicable); and inverse Mills' ratio. We also apply population weights for wage gap estimations. Then, we calculate the average wage gap as in Eq. 1:

$$Difference\,in\,hourly\,Log\,wages = \hat{R} = \overline{Y}_M - \overline{Y}_W \tag{1}$$
$$= \left(\overline{X}_M - \overline{X}_W\right)'\hat{\beta}_M + \overline{X}_W'\left(\hat{\beta}_M - \hat{\beta}_W\right)$$

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[11] We calculate both the condition number and VIFs for every wage equation and in every case the calculated condition number and VIFs are lower than the respective thresholds. Variance Inflation Factor (VIF) is equal to $1/(1-R^2)$ and VIF values larger than 10 are regarded as indicative of collinearity problems. Condition number is equal to the square root of the ratio of the Eigen value of the first independent variable entered into the model to the Eigen value of the last independent variable entered into the model. Calculated VIFs and condition numbers are available from authors upon request.

where $\overline{Y}_M$ and $\overline{Y}_W$ are mean log hourly wages, $\overline{X}_M$ and $\overline{X}_W$ are vectors with mean characteristics of male and female samples, respectively, and β_M and β_W are vectors with coefficients that determine the expected hourly wages.

Results

Tables 3, 4, 5, and 6 present estimates for the gender wage gap for different sub-groups both for 2004 and 2011. In these tables, each column is a different comparison of the gender wage gap under different conditions.[12] The first row of each table (Unadjusted W/M) presents the women-to-men predicted average earnings ratios by log-linear OLS earning regression when selection is not applied. [13] For example, the first column in Table 3 shows that log-linear OLS wage regressions estimate that women earn on average 4% more than men. As we report in Footnote 7 men work longer hours per week than women, so the overall gender wage gap is even more pronounced. The second row in each table (Adjusted W/M) shows the gender wage gap if selection into employment is taken into account. If the unadjusted and adjusted gender wage gaps are similar, then we conclude that there is no systematic selection into employment. However, our findings show that controlling for selection increases the gender wage gap to women's disadvantage in most cases.

Our findings are in line with expectations in the literature, which predicts that better skilled women are more likely to enter the labor force because they are more likely to earn more than their reservation wage. Hence, on average, women are better qualified than men. So higher earnings for women compared to men in unadjusted estimations, are in fact a reflection that women who enter the labor force have better qualifications/endowment than average men. For example, Column 3 in Table 3 shows that women employed in full-time formal sector jobs are predicted to earn 9% more than men, if not controlled for selection. However, once selection is controlled, women are predicted to earn 13% less than men. Rows 3 and 4 in each table show the Oaxaca decomposition: third row (Explained) refers to the first term, and fourth row (Unexplained) refers to the second term on the right hand side of Eq. 1. When "Explained" values are negative, then this indicates that women are less qualified (in other words have lower endowment) in observable characteristics than men. Negative values for the "Unexplained" row represent the remaining gender gap that cannot be accounted for by the observable differences. The next three rows present sample descriptive statistics and the following four rows describe the observable characteristics included in each regression analysis. We include demographic variables (e.g. age, marital status) and workplace characteristics (e.g. tenure, firm-size, and region) in every regression. We also include education level dummies (primary school graduates (5 years of formal schooling), middle school

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[12] We do not discuss the individual contribution of each variable to selection or wage determination in each model due to space considerations. These estimates are available from authors upon request.

[13] We calculate mean log differences between men and women as usual. In order to make our research results more accessible to non-economists, we convert the mean log differences between men and women to percentages as follows: If ln W − ln M = −0.222 ➔ ln (W/M) = −0.222 ➔ (W/M) = $e^{-0.222}$ = 0.8. i.e. on average women earn 80% of men.

Table 3 Are correcting for selection and disaggregating the sample necessary? 2011

Differential	All sample	ftfs sample	ftfs selection	LE ftfs selection	Tertiary ftfs selection
Unadjusted W/M	104%	109%	109%	90%	89%
Adjusted W/M			87%	76%	91%
Oaxaca Decomposition					
Explained (W - M)	15%	19%	19%	-1%	-1%
Unexplained (W - M)	-10%	-8%	-27%	-23%	-8%
Sample Size	83,462	67,052	67,052	46,008	21,044
Female sample	20,548	15,731	15,731	7869	7862
Female ratio	25%	23%	23%	17%	37%
Marital, urban, metro, region, age, tenure	Y	Y	Y	Y	Y
Firm-size (6), public	Y	Y	Y	Y	Y
Education level dummy	Y	Y	Y	Y	NA
Degree	NA	NA	NA	NA	Y
Inverse Mills' ratio	NA	NA	+ & sign.	+ & sign.	- & sign.

ftfs Full-time formal sector, *LE* Less than tertiary education, *Y* included, *NA* Not applicable (TurkStat 2012a)

Table 4 Robustness: Does adding more detail eliminate unexplained gaps? 2011, full-time formal sector employees with tertiary education

Differential	Tertiary w/o degree	Tertiary + degree (5)	Tertiary + degree (21)	ftfs + degree (21) + potentially endogenous ind. vars.
Unadjusted W/M	89%	89%	89%	89%
Adjusted W/M	91%	90%	91%	93%
Oaxaca decomposition				
Explained (W - M)	-3%	-4%	-1%	-3%
Unexplained (W - M)	-7%	-6%	-8%	-4%
Sample size	21,044	21,044	21,044	21,044
Female sample	7862	7862	7862	7862
Female ratio	37%	37%	37%	37%
Marital, urban, metro, region, age, tenure	Y	Y	Y	Y
Firm-size (4), q-public	Y	N	N	N
Firm-size (6), public	N	Y	Y	Y
Degree	N	5	21	21
Occupation	N	N	N	Y
Admin tasks	N	N	N	Y
Inverse Mills' ratio	- & sign.	- & sign.	- & sign.	- & sign.

ftfs Full-time formal sector, *Y* Included, *N* Not included (TurkStat 2012a)

Table 5 Gender wage gap according to public vs. private employment (ftfs), 2011

Public vs private	Private	Public	Tertiary private	Tertiary public	LE private	LE public
Unadjusted W/M	101%	103%	87%	93%	91%	92%
Adjusted W/M	88%	84%	110%	91%	80%	90%
Oaxaca decomposition						
Explained (W - M)	12%	10%	-6%	6%	1%	1%
Unexplained (W - M)	-22%	-24%	17%	-14%	-20%	-11%
Sample size	47,245	19,807	8465	12,579	38,780	7228
Female SAMPLE	10,097	5634	3244	4618	6853	1016
Female ratio	21%	28%	38%	37%	18%	14%
Marital, urban, metro, region, age, tenure, firm-size(6)	Y	Y	Y	Y	Y	Y
Education level dummy	Y	Y	NA	NA	Y	Y
Degree	NA	NA	Y	Y	NA	NA
Inverse Mills' ratio	+ & sign.	+ & sign.	- & sign.	+ & sign.	+ & sign.	+ & sign.

ftfs Full-time formal sector, *LE* Less than tertiary education, *Y* Included, *NA* Not applicable. (TurkStat 2012a)

Table 6 2004 & 2011 Comparison for full-time formal sector employees

2004 & 2011 comparison	2004 ftfs	2011 ftfs	2004 Tertiary ftfs	2011 Tertiary ftfs	2004 LE ftfs	2011 LE ftfs
Unadjusted W/M	108%	109%	91%	89%	92%	90%
Adjusted W/M	98%	80%	106%	91%	81%	72%
Oaxaca decomposition						
Explained (W - M)	14%	21%	-5%	-3%	-2%	1%
Unexplained (W - M)	-14%	-34%	12%	-7%	-17%	-28%
Sample size	44,500	67,052	10,427	21,044	34,073	46,008
Female sample	8854	15,731	3713	7862	5141	7869
Female ratio	20%	23%	36%	37%	15%	17%
Marital, urban, metro, region, age, tenure	Y	Y	Y	Y	Y	Y
Firm-size (4), q-public[a]	Y	Y	Y	Y	Y	Y
Education level dummy	Y	Y	NA	NA	Y	Y
Inverse Mills' ratio	+ & sign.	+ & sign.	- & sign.	- & sign.	+ & sign.	+ & sign.

ftfs Full-time formal sector, *LE* Less than tertiary education, *Y* Included, *NA* not applicable (TurkStat 2005, 2012a)

[a] In 2011 almost all of the public workers are classified in categories 84 to 99 (security personnel, education etc.) in NACE Rev2 which is corollary to NACE Rev1 category 9 (public, social and personal services) in economic activities classifications. Especially, 87% of all employees with tertiary education in category 9 are public workers (89% for men and 83% for women) and NACE Rev1 category data is available both in 2004 and 2011. Hence, we created a "quasi-public" dummy for 2004 and 2011 where we assume all employees in category 9 are public employees. This is an incomplete measure, and moreover, it is not a very good proxy for people with less than tertiary education: 2011 data set show that roughly 57% of women in category 9 with less than tertiary education actually work in the public sector

graduates (8 years of formal schooling), high school graduates (11 or 12 years of schooling), tertiary education graduates, and no schooling is the omitted category) and the type of degree from tertiary education when applicable. The final line presents the sign and significance of the inverse Mills' ratio (lambda), which is estimated from the first-stage equation and included in the second stage equation to control for selection. A positive and significant lambda means that better skilled women are more likely to choose to enter the labor force, as predicted by the literature.

We believe that the gender wage gap should be estimated both by adjusting for selection into employment, and disaggregated by education level. We also prefer to focus on men and women with full-time formal sector jobs disaggregated by educational level. Hence our preferred models are columns 4 (men and women with less than tertiary education) and 5 (men and women with tertiary education). Findings in columns 4 and 5 are significantly different than Column 3, which shows that employed women are better qualified (largely due to higher education levels). However, the higher educational level of women is countered by unexplained differences, and on balance, the gender wage gap is 13%. Nevertheless, Column 4 shows that (after adjusting for selection into employment), the earnings of women with less than tertiary education is only 76% of those of the men. In addition, the observed characteristics of men (e.g. longer tenure in their current jobs) cumulatively explain only 1 % in absolute terms of the observed difference. The rest of the wage gap is unexplained by observed characteristics. For men and women with tertiary education, the wage gap is lower (9%). Observed characteristics cumulatively explain only one percentage point of the gender wage gap and the rest is unexplained. In short, disaggregation by education level leads to a very different result compared to the all sample results. Our results are closest to those of İlkkaracan and Selim (2007) for the wage gap in Turkey. İlkkaracan and Selim (2007) focused on manufacturing and heavy industry, a less educated but more homogenous group compared to all employed men and women.

Weinberger (1998) points to a general criticism of gender and race wage gap studies, namely, that in addition to hard-to-measure individual differences such as innate ability and self-motivation, most surveys omit even important observable characteristics such as quality of university degree, e.g., length of program or status of university. She proposes a testing strategy where more detailed information about observed characteristics are progressively included into subsequent regressions. If the unexplained part of the wage gap declines progressively with the inclusion of additional or more detailed explanatory variables, then there are grounds for skepticism of an unexplained gender wage gap. Better survey data may enable us to explain away all the difference. We follow her testing strategy for the gender wage gap between men and women with tertiary education, and the results are presented in Table 4. The first column shows gender wage gap estimates when omitting the type of degree obtained in higher education and when we aggregate firm-size data into 4 sub-groups instead of 6 (we merged all employees in firms larger than 50 workers into a single group). Furthermore, we replaced the public sector dummy with a quasi-public sector dummy (see Footnote 14). In this model, women earn 10% less, and 3% of the absolute gap is explained by observable characteristics related to men. In the second column, we replace the quasi-public dummy with the real public sector dummy, and use all the available information

on firm size. TurkStat classifies tertiary education degrees into 21 sub-groups (for example doctors, nurses, mid-wives are all classified as medical degree holders). We further aggregate these 21 degrees into 5 sub-groups (social sciences, engineering, education, management, and professional degrees (law and medicine)). As a result, the gender wage gap stays roughly same, and the explained part increased to 4% of the absolute gap. Hence, adding new and more precise information led to a reduction in the unexplained part. Column 3 is identical to column 2, except we use all the available information on type of degree. The findings are striking; the addition of more detailed type of degree information reduces the gender wage gap (women earn 9% less than men), but the unexplained segment increases despite the availability of more detailed information. As a result, we conclude that the gender wage gap finding for Turkey is not the result of limitations of survey data. Moreover, the inclusion of detailed type of degree information reduces the overall gender wage gap, but fails to reduce the unexplained part of the discrepancy (Column 1 versus Column 3). This finding also contradicts earlier findings concerning the UK and German labor markets (Machin and Puhani 2002), where the researchers concluded that type of degree accounts for as much as 9 to 19% of the unexplained part of the gender wage gap.

In the Column 4, we also control for type of occupation (managers, professionals, sales, office clerks, skilled and unskilled workers), and whether the employee performs administrative tasks. These classifications are probably endogenous. However, İlkkaracan and Selim (2007: 573–574) point out that controlling for type of occupation and administrative tasks can be useful in discovering how much of the unexplained wage gap is accounted for by the tendency to steer women towards certain occupations and non-managerial positions. Indeed, the inclusion of dummies for occupational categories and administrative tasks reduce the overall gap and improves the explained part of the wage gap (because men are more likely to occupy managerial positions and perform administrative tasks). Nevertheless, even after accounting for occupation and administrative tasks, the greater part of the gender wage gap between men and women with tertiary education remains unaccounted for.

Table 5 presents gender wage gap estimates for public versus private employment. In the public sector, both women with tertiary education and less educated women earn approximately 10% less than men. However, decomposition of the wage gap is different; women with less than tertiary education are roughly similarly qualified with men and most of the wage gap is unexplained. However, women with tertiary education in public sector are significantly over-qualified relative to men and consequently the unexplained earnings gap between men and women are larger than the selection adjusted wage gap. If we control for type of occupation and administrative tasks, both the overall gap and unexplained part of the gap is reduced by two-thirds for women with tertiary education.[14]

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[14] As we explain in previous paragraph, we do not prefer to include occupation categories and administrative tasks due to endogeneity in our main results. These results are available from authors upon request.

Less educated women employed in the private sector face the largest wage gap as expected. However, we find that women with tertiary education in the private sector earn more than men once we adjust for selection into employment, despite the fact that men with tertiary education are more qualified than similarly educated women. This unusual finding may result from not controlling for unemployment. Women with tertiary education are not only most likely to be employed but they are also much more likely to be unemployed, whereas women with less than tertiary education are more likely to leave the labor force altogether (see Table 1). Women with tertiary education are three times more likely than women in general to be unemployed whereas no such discrepancy exists for men with tertiary education. And unemployed women with tertiary education (younger and more likely to be single) are more similar to women employed in the private sector than women in the public sector. Unfortunately, our methodology does not allow us to account for differences in employment levels between men and women. Another potential reason can be that national labor force surveys may not adequately sample the highest earners in managerial positions in the private sector. In a recent and more focused study, Ucal et al. (2015) found that among academics the wage gap is highest in private universities in Turkey. And the overall difference is mostly due to a pay gap at the highest level, i.e., due to higher earnings of male professors at administrative positions in private universities.

Finally, Table 6 shows gender wage gap comparisons for 2004 and 2011. The dataset was less detailed in 2004 compared to 2011, so we use only the explanatory variables common in both datasets. The first two columns present gender wage gap predictions for all full-time formal sector employees without disaggregating by education level. These show that the gender wage gap increased between 2004 and 2011. The next two columns present wage gap estimates for employees with tertiary education in 2004 and 2011, respectively, and the final two columns present the same estimates for men and women with less than tertiary education. We also unexpectedly find that women with tertiary education in 2004 earn more than men once we adjust for selection into employment. In 2004, women with tertiary education are almost five times more likely to be unemployed compare to all women. Failure to control for disproportionate unemployment may be distorting our findings for women with tertiary education. When we disaggregate the sample with respect to education level, there is still an increase in the gender wage gap between 2004 and 2011. Moreover, in all three sets of comparisons, the gender wage gap is driven by an increase in the unexplained part.

Discussion of the Main Results and Conclusion

Unless one takes into account the differences in educational level in labor force participation, the gender wage gap is masked. This paper is an attempt to unmask this relationship by disaggregating the sample by education level in Turkey in order to account for potential selection problems. The three main results are;

(1) The overall gender wage gap is 13% without disaggregation, and women seem to be over-qualified compared to men. However, once disaggregated, the gap is 9% for women with higher education and 24% for those without, and both men and women are similarly qualified. It turns out that the initial finding of over-qualified women in employment is the result of employed men and women's different educational composition.

(2) For higher educated women, unexplained differences are larger in public sector jobs, where women with better observable characteristics earn less than men.

(3) The overall wage gap at all levels of education increased between 2004 and 2011, despite the increase in female labor force participation during this time.

Our findings challenge some of the stylized facts about the gender wage gap: for advanced economies, the increased participation of women in the labor force is generally accompanied by a narrowing gender wage gap (OECD 2012). As we show, however, the gender wage gap widened for all women in Turkey during the study period, despite an increase in their urban labor force participation rates. Our findings are most similar to the Petrongolo and Olivetti (2008) findings for Southern Europe in the sense that correcting for selection into employment greatly increases the estimated gender wage gap. They impute wages for the non-employed, hence our results are not directly comparable. Nevertheless, they report "In Italy, Spain, Portugal, and Greece, the median wage gap on the imputed wage distribution ranges between 20 and 30 log points across specifications." (p. 651). A 20 to 30 log point wage gap is equivalent to women earning 74 to 82% of men, which is comparable to our estimates in Table 3.

There are potential problems when trying to estimate labor market discrimination by using the residual part from the regression in O-B decomposition. One source of the problem has been unobserved heterogeneity due to omitted productivity-related variables, such as "career-mindedness". Another potential source can be feedback effects between pre-labor market discrimination and control variables in the regression. We believe that the latter source has been effective in Turkish case. Within Turkish society with prevalent pre-labor market discrimination, most employers are probably hesitant to employ and if employed to promote even highly educated women.[15] Consequently, women expecting little chance of promotion may invest less than men in acquiring skills. Hence, employers' negative gender stereotypes become self-confirming (Altonji and Blank 1999: 3180–81). As a result of these concerns we have so far refrained from calling the unexplained part in the Oaxaca-Blinder wage decomposition as labor market discrimination.

Nevertheless, we have attempted to investigate the labor-market discrimination indirectly. First of all, we focused on prime-age adults (between 20 and 54 years old). Second, we dropped part-time and informal sector employees from our main analysis. Hence, we eliminated women who have to take part-time jobs or retire early in order to care for children or elderly relatives or women who were demoralized because

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[15] There is almost complete absence of state provision of or support for childcare. Additionally, childcare is generally regarded as responsibility of women. Hence women are at a disadvantage for jobs that require overtime or lengthy commutes.

of lack of promotion. Third, we split the dataset between tertiary education graduates and lesser educated in order to account for vast employment gap between these two groups. Fourth, we followed Weinberger's (1998) testing strategy and progressively added controls to our wage regressions, and yet the unexplained part of the wage gap did not decline progressively. In other words, more detailed data do not necessarily eliminate the unexplained part of wage decomposition. Fifth, we further disaggregated our sample by private and public sector. We found that even women with tertiary education face on unexplained wage gap in the public sector. Finally, we investigated changes in the wage gap between 2004 and 2011 and observed that it increased over the period for the whole group as well as the sub-samples. Based on these findings, we believe that the unexplained part of the wage gap reflects, to a significant degree, obstacles faced by women in Turkey's labor market.

Our results should not be taken as a criticism of improved access to higher education. Table 2 shows a substantial earnings premium associated with education, revealing a faster increase in the wages of men and women with tertiary education compared to those with lower levels of education. Moreover, the tertiary education wage premium grew significantly between 2004 and 2011 for Turkey. This wage premium is obvious to many young women, and results in a greater demand for university education as documented in Appendix Table 7. The number of women completing tertiary education increased from 1.2 million to 2.8 million between 2004 and 2012. Tertiary education is a good investment for both young men and women in Turkey and tuition is negligible in public universities in Turkey. As we discussed in the Employment Gap section, tertiary education substantially increases the probability of women entering and remaining in the labor force. Once in the labor force, as expected, men and women with tertiary education earn significantly more than those without. The wage gap between men and women, which is significant at every educational level, is much less for those with tertiary education.

Our paper has implications for future research in Turkey and similarly situated patriarchal countries. There is a need for a detailed understanding of public and private sector work and promotion in the work place processes. While at the entry level, women and men receive the same salary at public sector jobs, it is probably through promotions and appointments, or the lack thereof, throughout their careers where women's earnings are negatively impacted.

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[16] http://www.turkstat.gov.tr/UstMenu/body/bilgitalep/MVKullaniciTalepFormu_ENG.pdf

Appendix 1: Female Population by Education and Employment

Table 7 Female population by education level (15+)

	2004	2005	2006	2007	2008	2009	2010	2011	2012
No schooling	20%	20%	20%	19%	18%	18%	18%	18%	18%
Less than high school	61%	60%	59%	59%	60%	60%	60%	59%	58%
High school	14%	14%	15%	15%	15%	14%	14%	14%	14%
Tertiary education	5%	6%	6%	6%	7%	8%	8%	9%	10%

15+ female population: 24.3 million in 2004 and 27.8 million in 2012

Source: TurkStat web-page labor force survey summary statistics, TurkStat (2015)

Appendix 2: Methodology

Derivation of Wage Estimation Model (Eq. 1)

We calculate the average wage gap as follows:

$$\text{Difference in hourly Log wages} = R = E(Y_M) - E(Y_W) \tag{2}$$
$$= E(X_M)'\beta_M - E(X_W)'\beta_W$$

where $E(Y_M)$ and $E(Y_w)$ are expected mean log hourly wages, $E(X_M)$ and $E(X_w)$ are mean characteristics of male and female samples, respectively, and β_M and β_W are coefficients that determine the expected hourly wages. Threefold decomposition (Jann 2008) can determine the amount of mean outcome difference due to difference in observable characteristics, and the amount due to difference in coefficient estimates:

$$R = [E(X_M) - E(X_W)]'\beta_W + E(X_W)'(\beta_M - \beta_W) + [E(X_M) - E(X_W)]'(\beta_M - \beta_W) \tag{3}$$
$$R = \text{Endowment} + \text{Coefficients} + \text{Interaction}$$

Endowment component refers to the difference between average observable characteristics related to the job market for men and women, such as age, tenure etc. Coefficients (for example, the amount that an extra year of tenure increase one's wages) component measure the coefficients' contribution to hourly wage differences. This component is the measure unexplained part. Finally, the interaction component accounts for the coexistence of simultaneous differences for endowments and

coefficients between the two groups. The estimated decomposition takes on the following format:

$$\hat{R} = \overline{Y}_M - \overline{Y}_W = \left(\overline{X}_M - \overline{X}_W\right)'\hat{\beta}_W + \overline{X}_W'\left(\hat{\beta}_M - \hat{\beta}_W\right) + \left(\overline{X}_M - \overline{X}_W\right)'\left(\hat{\beta}_M - \hat{\beta}_W\right) \quad (4)$$

If we re-arrange endowment and interaction terms, Eq. 3 can be reduced to Eq. 1 in the main text, which is the common presentation in the literature, and corresponds to Eq. 9 in Oaxaca and Ransom (1994), when the male wage structure is assumed to be the base wage structure. We present our empirical results in parallel to Eq. 1 because we note that in our empirical analysis, interaction effects are very close to zero in most of the cases and its combination with Endowment effect leads to no loss of significant information.

Appendix 3: Data

Labor Force Survey is the source of data for official statistics about employment. The survey aims to cover all households in Turkey (institutional population is excluded). Data is collected throughout the year (first week of every month) and the sample size is large enough to produce quarterly employment statistics both at national level as well as urban and rural areas of NUTS2 regions (there are 26 NUTS2 regions in Turkey). As a result, there are 52 strata (26 NUTS2 regions and rural and urban areas within each region). First, each Stratum is divided into clusters and the total number of clusters is 350. Than each cluster is further divided into blocks (containing approximately 100 houses in urban areas or whole villages in rural areas). Finally, each quarter 15 of households in each block is surveyed (TurkStat 2012a). The population of the NUTS2 regions differ widely hence weighting of estimates is necessary for representative results. The sampling weights are provided by TurkStat in the dataset. The response rate to the survey is 87% (TurkStat 2012b: XXII). We use the whole sample for the year in our study.

Appendix Table 8 (for 2011) and Table 9 (for 2004) present descriptive statistics for dependent and independent variables used in the regression analysis disaggregated by gender and education level. As can be seen from both tables single women are over-represented among working women compare to men. Moreover, women with zero children is also under-represented in the sample compare to similar men. These findings are probably due to the fact that women tend to leave labor force once they have children. And women with children who stays in the labor force are more likely to have more secure employment. As expected, women with tertiary education are over-represented in overall sample. Women in the formal, full-time employment are more likely to be younger, reside in urban areas, metropolitan cities (Istanbul, Ankara and Izmir) and western regions (first six regions). Finally, women are more likely to work in medium sized firms, in public sector and they have shorter tenure in in their current employers.

Table 8 Averages of dependent and independent variables in Tables 3, 4 and 5 (for 2011)

Variable	All sample		ftfs sample		LE ftfs		Tertiary ftfs	
	Men	Women	Men	Women	Men	Women	Men	Women
Hourly wages TL	5.674	6.207	6.140	6.795	4.536	3.969	10.783	9.623
Marital status & children								
Single	0.208	0.319	0.194	0.336	0.175	0.316	0.246	0.356
Ever married & zero child.	0.165	0.177	0.162	0.182	0.167	0.198	0.148	0.167
Ever married & one child.	0.198	0.227	0.212	0.241	0.197	0.222	0.257	0.260
Ever married & two + child	0.428	0.277	0.432	0.240	0.461	0.264	0.349	0.217
Final level of education completed								
No schooling	0.030	0.045	0.014	0.017	0.019	0.034	-	-
Primary school	0.315	0.213	0.286	0.150	0.384	0.300	-	-
Middle school	0.165	0.081	0.155	0.070	0.209	0.139	-	-
High school	0.267	0.240	0.288	0.264	0.388	0.527	-	-
Tertiary	0.223	0.422	0.257	0.500	-	-	1.000	1.000
Urban	0.825	0.889	0.846	0.910	0.831	0.892	0.890	0.929
Istanbul & Ankara & Izmir	0.277	0.346	0.292	0.372	0.290	0.368	0.295	0.376
NUTS1 regions								
Istanbul	0.136	0.160	0.142	0.175	0.152	0.195	0.115	0.155
West Marmara	0.066	0.076	0.070	0.079	0.071	0.084	0.067	0.074
Aegean	0.123	0.157	0.130	0.161	0.130	0.171	0.131	0.152
East Marmara	0.104	0.112	0.112	0.118	0.121	0.148	0.087	0.089
Western Anatolia	0.146	0.150	0.154	0.147	0.143	0.111	0.183	0.183
Mediterranean	0.107	0.113	0.100	0.096	0.099	0.088	0.103	0.104
Central Anatolia	0.060	0.043	0.059	0.039	0.059	0.033	0.058	0.045
Western Blacksea	0.060	0.062	0.063	0.061	0.061	0.061	0.069	0.060
Eastern Blacksea	0.049	0.051	0.051	0.055	0.049	0.054	0.058	0.056
North-East	0.044	0.024	0.040	0.024	0.039	0.018	0.041	0.029
Middle-East	0.036	0.020	0.027	0.019	0.024	0.016	0.036	0.023
South-East	0.068	0.031	0.052	0.026	0.051	0.021	0.053	0.031
Age cohorts								
Age: 20–24	0.110	0.162	0.091	0.156	0.100	0.199	0.066	0.114
Age: 25–29	0.179	0.201	0.179	0.216	0.175	0.185	0.192	0.248
Age: 30–34	0.192	0.202	0.201	0.211	0.199	0.193	0.207	0.229
Age: 35–39	0.176	0.173	0.187	0.176	0.182	0.168	0.201	0.184
Age: 40–44	0.149	0.135	0.156	0.130	0.157	0.136	0.154	0.123
Age: 45–49	0.128	0.090	0.127	0.081	0.133	0.089	0.112	0.074
Age: 50–54	0.067	0.037	0.058	0.029	0.055	0.031	0.068	0.028
Tenure in the current job	6.680	5.702	7.475	6.585	6.683	4.791	9.769	8.381
Public	0.236	0.300	0.276	0.358	0.163	0.129	0.604	0.587
Firm size								
Firm size: 0–9	0.324	0.286	0.232	0.180	0.266	0.242	0.133	0.117
Firm size: 10–24	0.120	0.138	0.126	0.139	0.127	0.133	0.122	0.144

Table 8 (continued)

Variable	All sample		ftfs sample		LE ftfs		Tertiary ftfs	
	Men	Women	Men	Women	Men	Women	Men	Women
Firm size: 25–49	0.183	0.206	0.203	0.228	0.194	0.204	0.227	0.252
Firm size: 50–249	0.234	0.235	0.272	0.282	0.265	0.274	0.295	0.290
Firm size: 250–499	0.058	0.055	0.069	0.070	0.066	0.069	0.076	0.072
Firm size: 500+	0.081	0.080	0.098	0.101	0.081	0.078	0.148	0.125
Other hh members' monthly labor income TL	409	1019	420	1090	306	815	751	1366
# of young children in hh (0–11)	0.694	0.431	0.710	0.417	0.725	0.345	0.668	0.489
N	62,914	20,548	51,321	15,731	38,139	7869	13,182	7862

ftfs Full-time formal sector, *LE* Less than tertiary education

Table 9 Averages of dependent and ındependent variables in Table 6 (for 2004)

Variable	ftfs sample		LE ftfs		Tertiary ftfs	
	Men	Women	Men	Women	Men	Women
Hourly wages TL	5.183	5.485	4.399	3.847	8.558	7.752
Single	0.145	0.369	0.136	0.380	0.185	0.354
Marital status & children						
Ever married & zero child.	0.144	0.153	0.144	0.157	0.143	0.148
Ever married & one child.	0.214	0.238	0.203	0.213	0.263	0.272
Ever married & two + child.	0.497	0.239	0.518	0.250	0.409	0.225
Final level of education completed						
No schooling	0.011	0.012	0.014	0.021	-	-
Primary school	0.346	0.172	0.427	0.297	-	-
Middle school	0.137	0.062	0.169	0.108	-	-
High school	0.317	0.334	0.390	0.575	-	-
Tertiary	0.188	0.419	-	-	1.000	1.000
Urban	0.819	0.873	0.807	0.858	0.872	0.893
Istanbul & Ankara & Izmir	0.304	0.385	0.311	0.400	0.273	0.365
NUTS1 regions						
Istanbul	0.172	0.214	0.180	0.232	0.139	0.189
West Marmara	0.049	0.068	0.049	0.077	0.048	0.056
Aegean	0.164	0.182	0.166	0.199	0.154	0.158
East Marmara	0.140	0.136	0.146	0.160	0.111	0.103
Western Anatolia	0.100	0.108	0.095	0.083	0.125	0.142
Mediterranean	0.089	0.089	0.086	0.077	0.103	0.106
Central Anatolia	0.045	0.026	0.044	0.018	0.053	0.037
Western Blacksea	0.095	0.072	0.096	0.065	0.091	0.081
Eastern Blacksea	0.032	0.039	0.029	0.036	0.043	0.044

Table 9 (continued)

Variable	ftfs sample		LE ftfs		Tertiary ftfs	
	Men	Women	Men	Women	Men	Women
North-East	0.029	0.022	0.027	0.018	0.037	0.027
Middle-East	0.041	0.022	0.040	0.020	0.045	0.026
South-East	0.045	0.022	0.043	0.015	0.050	0.031
Age cohorts						
Age: 20–24	0.088	0.212	0.096	0.265	0.056	0.138
Age: 25–29	0.180	0.238	0.179	0.213	0.186	0.273
Age: 30–34	0.200	0.196	0.199	0.169	0.206	0.232
Age: 35–39	0.188	0.162	0.189	0.149	0.182	0.179
Age: 40–44	0.180	0.112	0.186	0.122	0.152	0.098
Age: 45–49	0.113	0.060	0.104	0.059	0.149	0.062
Age: 50–54	0.051	0.021	0.047	0.024	0.068	0.018
Tenure in the current job	8.960	7.041	8.566	6.085	10.656	8.365
Quasi-public	0.356	0.470	0.284	0.295	0.667	0.712
Firm size						
Firm size: 0–9	0.203	0.145	0.226	0.183	0.104	0.092
Firm size: 10–24	0.109	0.125	0.104	0.113	0.134	0.142
Firm size: 25–49	0.189	0.233	0.171	0.181	0.266	0.306
Firm size: 50+	0.499	0.496	0.500	0.523	0.495	0.459
Other hh members' monthly labor income TL	260	808	211	681	475	983
# of young children (0–11) in hh	0.800	0.426	0.819	0.366	0.717	0.508
N	35,646	8854	28,932	5141	6714	3713

ftfs Full-time formal sector, *LE* Less than tertiary education

References

Aktaş A, Uysal G (2012) Explaining the gender wage gap in Turkey using the wage structure survey. Working Papers 005, Bahcesehir University, Betam

Altonji JG, Blank RM (1999) Race and gender in the labor market. In: Ashenfelter O, Card D (eds) Handbook of labor economics volume 3. Elsevier, Amsterdam, pp 3143–3259

Arulampalam W, Booth AL, Bryan ML (2007) Is there a glass ceiling over Europe? Exploring the gender pay gap across the wages distribution. Ind Labor Relat Rev 60:163–186

Blau FD, Kahn LM (2003) Understanding international differences in the gender pay gap. J Labor Econ 21(1): 106–144

Blau FD, Kahn LM (2007) The gender pay gap: have women gone as far as they can? Acad Manag Perspect 21:7–23

Christofides LN, Polycarpou A, Vrachimis K (2013) Gender wage gaps, 'sticky floors' and 'glass ceilings' in Europe. Labour Econ 21:86–102

Cindoğlu D, Toktaş Ş (2002) Empowerment and resistance strategies of working women in Turkey: the case of 1960-70 graduates of the girls' institutes. Eur J Women's Stud 9(1):31–48

Dayıoğlu, M, Tunalı, I (2003) Falling behind while catching up: Changes in the female-male wage differential in urban Turkey, 1988 to 1994. In Annual Meeting of the Population Association of America Minneapolis, MN. May 1–3, 2003

Dildar Y (2015) Patriarchal norms, religion, and female labor supply: evidence from Turkey. World Dev 76: 40–61

Eryar DS, Tekgüç H (2015) Maternal employment and female labor force participation: a case study from Turkey. Izmir University of Economics working paper no 1501. http://phoenix.ieu.edu. tr/betanix/uploads/cms/eco.ieu.edu.tr/124_1438330632.pdf

Hacettepe University Institute of Population Studies (2014) Turkey demographic and health survey, 2013. Hacettepe Üniversitesi Nüfus Etütleri Enstitüsü, Ankara

Heckman JJ (1979) Sample selection bias as a specification error. Econometrica 48(1):153–161

İlkkaracan İ (2012) Why so few women in the labor market in Turkey? Fem Econ 18(1):1–37

İlkkaracan İ, Selim R (2007) The gender wage gap in the Turkish labor market. Labour 21(3):563–593

Jann B (2008) The blinder-oaxaca decomposition for linear regression models. Stata J 8(4):453–479

Joy L (2003) Salaries of recent male and female college graduates: educational and labor market effects. Ind Labor Relat Rev 56:600–621

Kasnakoğlu Z, Dayıoğlu M (1997) Female labor force participation and earnings differentials between genders in Turkey. In: Rives JM, Yousefi M (eds) Economic dimensions of gender inequality: a global perspective. Praeger, Westport

Kibritçioğlu A (2013) Türkiye'nin gayrisafi yurtiçi hasılası 2002-2012'de ne kadar büyüdü? [How much GDP increased in Turkey between 2002-2012]. İktisat ve Toplum 33-34:7–17 http://www.iktisatvetoplum. com/wp-content/uploads/aykut-kibritcioglu-turkiyenin-gayrisafi-yurtici-hasilasi-s33-34.pdf

Kunze A (2008) Gender wage gap studies: consistency and decomposition. Empir Econ 35:63–76

Loury LD (1997) The gender earnings gap among college-educated workers. ILR Review, 50(4):580–593

Leung SF, Yu S (1996) On the choice between sample selection and two-part models. J Econ 72:197–229

Machin S, Puhani PA (2002) Subject of degree and the gender wage differential: evidence from the UK and Germany. IZA Discussion Paper No. 553

Neal D (2004) The measured black-white wage gap among women is too small. J Polit Econ 112:S1–S28

Oaxaca RL (1973) Male-female wage differentials in urban labor markets. Int Econ Rev 14(3):693–709

Oaxaca RL, Ransom MR (1994) On discrimination and the decomposition of wage differentials. J Econ 61:5–21

Organisation for Economic Co-operation and Development. (2012). Closing the gender gap: act now. OECD

Petreski M, Blazevski NM, Petreski B (2014) Gender wage gap when women is highly inactive: evidence from repeated imputations with Macedonian data. J Lab Res 35:393–411

Petrongolo B, Olivetti C (2008) Unequal pay or unequal employment? A cross-country analysis of gender gaps. J Labor Econ 26(4):621–654

Royalty AB (1998) Job-to-job and job-to-non-employment turnover by gender and education level. J Labor Econ 16(2):392–443

Sweidan M (2012) "Male-Female Pay Differençes, Jordanian Case, UNECE Working Paper, No 23, Conference on European Statisticians, Economic Commission for Europe, Geneva 12–14 March

Tansel A (1994) Wage employment, earnings and returns to schooling for men and women in Turkey. Econ Educ Rev 13(4):305–320

Tansel A (2001) Self-employment, wage-employment, and returns to schooling by gender in Turkey. In: Salehi-Isfahani D (ed) Labor and human Capital in the Middle East: studies of markets and household behavior. Ithaca Press, Reading, pp 637–667

Tansel A (2002) Economic development and female labor force participation in Turkey: time series evidence and Cross-Province estimates. In: Bulutay T (ed) Employment of women. State Institute of Statistics, Ankara, pp 111–151

Tansel A (2005) Public-private employment choice, wage differentials, and gender in Turkey. Econ Dev Cult Chang 53:453–477

Theodossiou I, Zangelidis A (2009) Should I stay or should I go? The effect of gender, education and unemployment on labour market transitions. Labour Econ 16(5):566–577

Triventi M (2013) The gender wage gap and its institutional context: a comparative analysis of European graduates. Work Employ Soc 27(4):563–580

TurkStat (2005) Household labor force micro data set, 2004. Accessed May 2016 http://www.tuik.gov. tr/MicroVeri/Hia_2004/english/meta-data/method/index.html

TurkStat (2012a) Household labor force micro data set, 2011. http://www.tuik.gov.tr/MicroVeri/Hia_2011 /english/meta-data/method/index.html

TurkStat (2012b) Household labor force statistics 2011. Ankara. http://www.tuik.gov.tr/Kitap.do?metod= KitapDetay&KT_ID=8&KITAP_ID=25

TurkStat (2015) Labor force summary statistics by education level http://tuik.gov.tr/PreTablo.do?alt_id=1007. Accessed July 2015

Ucal M, O'neil ML, Toktas S (2015) Gender and wage gap in Turkish academia. J Balkan Near East Stud 17(4):447–464

United Nations Development Programme (2015) Human development report 2015. http://hdr.undp.org/sites/default/files/2015_human_development_report.pdf

WB (2016) World DataBank education statistics Accessed Aug 2016. http://databank.worldbank.org/data/reports.aspx?source=education-statistics-~-all-indicators

Weichselbaumer D, Winter-Ebmer R (2005) A meta-analysis of the international gender wage gap. J Econ Surv 19(3):479–511

Weinberger CJ (1998) Race and gender wage gaps in the market for recent college graduates. Ind Relat 37(1):67–84

World Bank (2013) MENA Development Report: Opening Doors Gender Equality and Development in the Middle East and North Africa. Washington DC : World Bank. Accessed August 2015 http://documents.worldbank.org/curated/en/338381468279877854/Main-report

World Economic Forum (2013). The global gender gap report 2013. Geneva Switzerland. Accessed August 2015 http://www3.weforum.org/docs/WEF_GenderGap_Report_2013.pdf