



Gender Inequalities in Informal Employment and Wage Gap in Turkish Manufacturing

Gülay TOKSÖZ¹

Emel MEMİŞ²

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Abstract

The demand for women employees as a “cheap” source of labor has been on the rise ever since the export-oriented industrialization model has been adapted in the late 1970's. Due to increasing informal employment of female workers and even when formally employed their concentration in low wage industries makes gender wage gap an important issue in labour market inequalities. Turkey presents in this respect no different example than other newly industrialized countries. Using the 2004-2016 data from Household Labor Force Surveys, this study presents the differences in informal employment and hourly wages according to gender on the sub-branch level in the manufacturing sector in Turkey. Informality and gender wage gap in the sectors that are characterized with export-orientation and relatively high concentration of women's labor (namely the food products, textiles, and garment manufacturing industries) are examined in the manufacturing sector. The results obtained reveal that in the industries with relatively high degree of export orientation and women's employment; gender gap in hourly wages are larger.

Keywords: Economic development, gender, manufacturing, Turkey.

JEL Codes: O10, J16, L60.

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¹ Faculty of Political Sciences, Labour Economics and Industrial Relations Department, Ankara University, Ankara, Turkey. Email: gulay.toksoz@gmail.com  <http://orcid.org/0000-0003-3461-4193>

² Corresponding author. Faculty of Political Sciences, Department of Economics, Ankara University, Ankara, Turkey. Email: ememis@politics.ankara.edu.tr  <http://orcid.org/0000-0002-9087-4726>

Özet

Kayıtdışı İstihdamda Toplumsal Cinsiyet Eşitsizlikleri: İmalat Sanayinde Cinsiyet Ücret Açığı

“Ucuz” işgücü kaynağı olarak görülen kadın emeğine olan artan talep, ihracata dayalı sanayileşme modelinin 1970'lerin sonlarında benimsenmesinden bu yana devam etmektedir. Kadınların kayıtdışı istihdamda daha yüksek oranda yer alıyor olması ve ayrıca düşük ücretli sanayi üretiminde kayıtlı istihdam edildikleri durumda dahi cinsiyet ücret açığı ile karşı karşıya kalmaları sebebiyle, cinsiyet ücret açığı; emek piyasasındaki toplumsal cinsiyet eşitsizliklerinin temel bir meselesi olmuştur. Türkiye, bu açıdan diğer yeni sanayileşmiş ülkelerden farklı bir örnek teşkil etmemektedir. Bu çalışmada 2004-2016 dönemine ait Hanehalkı İşgücü Anket verileri kullanılarak, imalat sanayi alt sektörlerinde kayıtdışı istihdamda saatlik ücretlerdeki cinsiyet ücret açığı analiz edilmiştir. İhracat ve kadın istihdam oranı nispeten yüksek seçili sektörlerde (gıda, tekstil ve hazır giyim imalatı), kayıtdışılık ve cinsiyet ücret farkı ilişkisi araştırmanın odak sorusudur. Elde edilen sonuçlar, ihracat yönelimi ve kadın istihdamı nispeten yüksek olan ancak ücret düzeyinin görece olarak düşük olduğu sektörlerde cinsiyet eşitsizliğinin yüksek düzeyde varlığını sürdürdüğünü göstermektedir.

Anahtar Kelimeler: İktisadi kalkınma, cinsiyet ücret açığı, imalat sanayi, Türkiye.

JEL Kodları: C32, C51, E24, E65.

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1. Introduction

The persistence and upsurge of informal employment practices have been a grave issue in the labor markets in a globalized world. The size of informal employment i.e. the number of people not covered by basic social and legal protections through their work, is rising faster than formal employment in many countries. Following the economic crises all over the world, informal employment is on the rise even in the developed regions despite the benefits of their sustained growth. In the peripheral countries that have gone through structural adjustment policies and export-led industrialization since the 1980s, women have been utilized as a cheap source of labor, which led to their widespread informal and low-wage employment. At least a part of the multifaceted complex underlying reasons behind this phenomenon are the gendered relations within and outside the labor markets. Unpaid care responsibilities of women within the

households, insufficient public and private support and provisioning care services create major constraints on women's choices regarding their participation in the labor market and their access to formal employment opportunities (ILO, 2018). There is ample research conducted by the International Labour Organization (ILO) on informal economy and informal employment, which plays a critical role in promoting international labor standards, universalization of minimal workers' rights across the globe (ILO, 2002, 2003, 2007 and 2013, 2018).

Chant and Pedwell's (2008) review of a number of ILO sponsored studies on women, gender, and informal employment found that while lack of social security is one of the research priorities of the ILO, the problem of gender wage disparities in the informal sector is rarely visited. As will be reviewed in Section 1, among the limited number of studies on earnings gap between genders, most of the comparisons are made based on employment statuses at aggregate level, with a few exceptions where sectoral and occupational comparisons are conducted. A number of studies that focus on the wage gap between workers employed in formal and informal sectors generally lack a gender lens.

One such example is Turkey, a middle-income country that adopted an export-led industrialization strategy by the beginning of the 1980s. In Turkey, informal employment is far more common for women in the nonagricultural sectors. Only a handful studies focus on earnings gap between women and men who are informally employed, and none among those explore the gender wage gap at the sectoral level. Our paper looks at the gender differences in informality and wages in the Turkish manufacturing sector at the disaggregated level, with a special focus on the export-oriented subsectors.

Gender wage gap in Turkey has been explored either for a single year or for the economy as a whole without any emphasis on sectoral differences. To this end, here we use the micro data for selected sub-sectors of manufacturing sector from Household

Labor Force Surveys (HLFS) conducted by Turkish Statistical Institute (TurkStat) from years 2004-2016 in order to analyze the gender wage gap. We define informality based on the registration status of employment to the social security system and conduct our analysis by decomposing at the sub-sectoral level in order to uncover heterogeneity between sub-sectors. We specifically focus on the sectors that are characterized with export-orientation and relatively more concentrated in terms of women's labor (namely the food products, textiles, and garment manufacturing industries), which helps disentangle the potential interlinkages between export expansion and gender wage gap among the informal workers in Turkish manufacturing.

The main contribution of this study is twofold. First, we go beyond the decomposition of the mean gender wage gap and extend our analysis to the entire wage distribution. Second this study shifts the focus of gender wage gap discussions to the informal employment with a more disaggregated analysis at the sectoral level in Turkish labor market showing significant variations across wage distributions in the selected sub-sectors and consequently highlighting the role of gender inequalities in Turkey's export-led growth model.

Section 2 presents a brief conceptual discussion of the informal sector, the informal economy, and informal employment focusing to the role of women's labor within this context. The remainder of the study is organized as follows: We first review earlier studies on gender-based wage and earnings differentials in informal employment, then provide a synopsis of the earlier studies that discuss women's employment in informal sector in Turkey. In Section 2 we also present summary indicators on gender differences under informal employment in Turkish manufacturing sector over a period of ten years beginning with 2004. The next two sections present the empirical methodology and the data we use. Finally, we provide the estimation results and discuss our findings.

2. Women in informal sector, informal economy, informal employment

Due to neoliberal economic restructuring after the economic crises during the 70's and the rapid globalization of the world economy, free movement of goods, services and capital created an environment that is conducive to de-regularization in the labor markets, expanding informal and precarious forms of employment. Informal self-employment and paid-employment are characterized by the lack of secure contracts, worker benefits, and social protection (Carr and Chen 2002, 2004).

In many of the countries there are mainly two reasons behind the fact that women are employed informally with a greater ratio outside the informal sector compared to men: the first is the widespread employment of women in the service sector in relation to domestic and care work. Domestic work as a form of informal employment has been studied intensively, especially regarding its links to immigrant labor (Ehrenreich and Hochschild, 2003; Lutz, 2007; Beneria 2008, ILO 2010; Trimikliniotis and Fulas-Sourroulla 2013 just to mention a few). The second reason is the export-led industrialization model imposed as a way out of the economic crisis by international financial institutions in the late 1970's. While the poor countries needed women's labor especially in textile and garment manufacturing industries, middle income range countries continued to utilize women's labor in their investment in electrical equipment and electro-technical industries (Joekes 1987). The increased exports of labor-intensive products, particularly textiles and garments, by many countries with similar comparative advantages have limited the improvement of wages and working conditions in the related sectors. In this way the rise in women's participation in the labor force and employment became essentially a result of increasing flexibility of the global economy at the midst of 1980's and the early 1990's, and the decline of the share of formal sector enterprises that are characterized by regular and orderly employment practices in the total employment while the informal economy and informal employment practices were becoming widespread. A broad literature exists regarding

women's informal and flexible employment lacking job or social security (Standing 1989 and 1999; Pearson 1992; Joekes 1999; Beneria 2003, Carr and Chen et.al. 2004,).

2.1 Wage Gap in the Informal Sector

In general, the gender wage gap seems to be wider under informal employment compared to formal employment. As mentioned above, this is due to the fact that lower status of women in employment compared to men, as well as the gender-based differences between the quality of activities self-employed workers carry out. According to a study on Latin America, in 1998 women on average earned 64% of what men did in the formal sector, while the same ratio falls to 52% in the informal sector (Silveira and Matosas, 2003: 5). In Peru female employers earns 65% of what men earns in the informal sector; while women who are self-employed only earn 56% of their male counterparts' income. Female paid-workers receive 87% of what men receive as wages (Bravo 2003, as cited in Chen et.al. 2004:46). A study that compares Bangladesh and Tanzania reports that in Bangladesh self-employed men earn more than threefold of what self-employed women do, while male employers earn more than fourfold of their female counterparts. Again, the difference is much smaller for paid-workers, male workers receive 17% more of what female workers get. In Tanzania, the difference is the same for paid-workers at 17%, but the gap is much lower for other types of employment (Dasgupta and Barbattini 2003, as cited in Chen et.al. 2004:46). In India, women who are temporarily employed in the agricultural sector earn 28% less than men, in the non-agricultural sectors the average they get is 35% less. In fact, gender-based wage gap is much larger in India compared to the caste-based wage gap, which is another major source of discrimination in the country (Deininger et.al. 2013:137).

While the scale of informal employment tends to be lower in the transitional economies of Central and Eastern Europe compared to the developing countries, it is on the rise in some countries of the region. In 2004, 9.6% of all Poland's workers were informally employed, either in full-time or temporary positions, 37% of which were

women. Although women employees had a higher level of education on average, they still only earned 79% of what men earned. A 2007 analysis shows that gender-based earnings gap in the country is wider in the informal sector (Ruzik and Rokicka, 2010). In Ukraine, women employed in the informal sector were paid only 67% of what men were paid according to 2005 data (Williams et. al., as cited by Ruzik and Rokicka, 2010:7). A study on Serbia reports that the ratio of informal employment has risen from 28% to 35% between 2002 and 2007, while the share of women has remained at 40% in the same period. Informal employees used to earn 8% less than formal employees in 2002; the difference have increased to 43% by 2007. The share of paid-workers among the informally employed have risen from 11% to 20% during the same period; by 2007 informal paid-workers were paid 22% less than formal paid-workers. The study does not include a gender-based comparison, and claims that gender has no significant role in the growing income inequality experienced in the country (Kristic and Sanfey, 2010).

2.2 Informal Employment of Women in Turkey and the Gender-Based Wage Gap

Small-scale enterprises and self-employment is quite common in Turkey, both in rural and urban areas. Before 1980, most of the small-scale manufacturing and services were provided by the informal sector. With the adoption of export-led industrialization after 1980, the informal sector and informal employment practices flourished through sub-contracting and contract manufacturing (Özşuca and Toksöz, 2003). Export-led industrialization as a strategy prioritized the manufacturing sector in development; at the beginning of the process basic consumption goods manufacturing such as textiles, garments, and food products gained momentum; later on, automotive and durable consumer goods sub-sectors also grew in the manufacturing sector. However, due to low levels of investment in the industrial sector on a macro level the employment opportunities remained limited, forcing newly urbanized populations towards informal employment. In manufacturing, especially in the small-scale enterprises informality has been the dominant character of employment (Toksöz, 2011).

In the manufacturing sector, especially in textiles and garments, the international competitiveness has been achieved through the flexibility that low wages and informal employment of female labor provide. The unpaid labor of women working for family owned subcontracting enterprises at their homes and the cheap labor of pieceworkers have a vital role in this sort of flexibility (Çınar 1994, Eraydın 1998, Dedeoğlu 2008). A study about informally employed women in food production, textiles, and services in Western Turkey reflects that most of these women start working at a very early age; they face a high level of worker turnover; receive lower than minimum and irregular wages; suffer long working hours, unpaid and mandatory overtime, sexual harassment and abuse by their employers and co-workers. Again, most of them have no health insurance or a retirement plan, and even if they do they cannot retire since their premiums are not paid in a regular way to the social security institutions (Kümbetoğlu et.al., 2012). On the other hand, other studies on home-based work reflect that women who are forced to work from home as pieceworkers due to patriarchal control and lack of child care services also face problems of low/irregular pay and non-continuation of jobs (Dedeoğlu 2010, Atasü-Topçuoğlu 2010, Durusoy-Öztepe 2013).

In 2017 ratio of informality in Turkey is 44.6 % for women and 29.2 % for men, according to the Household Labor Force Survey. Informality is quite common in the agricultural sector, reaching to 94.2% for women, and 74.4% for men. These high numbers reflect the prevalence of self-employment among men and unpaid family worker status among women in agriculture. Outside agriculture, while paid-working is the dominant status for both genders, for men self-employment is also quite common especially in the services sector. The informality ratios are 32.3% for women and 16.2% for men in the industrial sector, 23.2% and 19.9% in services; women have a higher ratio in both of these sectors.

Studies on the gender-based income gap in Turkey generally utilizes household income and consumption expenditure surveys or budget surveys; they point out a great degree of income inequality according to gender regardless the formality or informality

of employment, of which discrimination is a major factor (Dayıođlu and Kasnakođlu 1997, Tansel 2004, Cudeville and Gurbuzer 2007, Dayıođlu and Bařlevant 2012). On the other hand, according to two other studies that are based on Household Labor Force Survey data, the gender-based wage gap is very small in urban areas. This is due to the fact that labor force participation by women is very low in urban areas (19% in 2010); women who participate on average have a higher level of education than their male counterparts and they are represented in high qualification and high pay occupations with greater ratios (Dayıođlu and Tunalı 2004, Dayıođlu and Sural, 2011). Another study focusing on the gender wage gap among formal sector employees clearly demonstrates that the high share of women with tertiary education compared to men masks the widening gender wage gap in Turkey. Using HLFS data they find that the gender wage gap which amounts to 13 percent in 2011 without disaggregation increases to 24 percent for less educated women and 9 percent for women with tertiary education after disaggregation by education level. Other finding of the study is the higher qualification of women with tertiary education in the public sector (Tekguc et al 2017).

There are only a few studies dealing with the gender-based wage gap in both formal and informal sectors; the first of such studies was by Tansel (2000). Tansel's research utilizes the data from the 1994 Turkish Household Expenditure Survey which includes private sector employees with or without social security coverage as well as self-employed laborers. The study reports "For covered wage earners, men's expected wages are about twice women's wages. For uncovered wage earners, men's wages are near parity with those of women. These results suggest segmentation for men along the formal and informal lines and substantial discrimination against women in the covered private sector." (Tansel 2000:6). Another study regarding the productivity differences in formal and informal enterprises states that the gap between the wages of formal and informal firms is 35% in manufacturing, and up to 55% in services; these gaps are even deeper for female employees (Taymaz 2009:30). One other study focuses on wage differences between formal and informal sector enterprises, both agricultural and non-agricultural, utilizing data from Household Labor Force Surveys from 1988 and 2007;

the study reports a 14% gender-based wage gap in the informal sector for 2007. The wage gap between formal and informal sectors is reported to be wider than the gender-based wage gap: (Aydın et.al. 2010:14, 19).

2.3 Employment and Wages in Turkish Manufacturing

Studies on informal employment primarily utilizes data from household labor force surveys; generally being outside the coverage of social security system is taken as an indication of informal employment in these studies (ILO 2013:3). In this study, we also perform our empirical analysis using nationally representative micro-level data obtained from Household Labor Force Surveys (HLFS) conducted by Turkish Statistical Institute (TurkStat) and use non-registration to the social security institution as the indicator of informality. The beginning year for TurkStat data, which allows comparison over the years is 2004. For some indicators below we provide the statistics only for the beginning year and for the year 2009 which is the year of economic crisis and all years between 2011-13 data as this three-year period offers comparable sub-sectoral level analysis. TurkStat made major revisions in sampling design and methodological data compilation of LFS data in year 2014 along with conceptual changes in definitions of Provinces and urban/rural distinction in Turkey. The table below displays numbers of daily/weekly wage workers in manufacturing according to formal/informal status and gender; all data is derived from HLFS micro data. While informality seems to enter a downward trend after 2006, it still remains to be an acute problem for male and female workers in Turkey.

For women, informality ratio among the weekly/daily wage workers was 31 %in 2004; in 2016 it was 20 % a 11-point fall. For men with the same employment status, there have been a 9 -point decline, from 23% in 2004 to 14% in 2016. One of the primary reasons behind the difference between female and male employees is the fact that women tend to be employed in labor-intensive industries and mostly in small-scale enterprises, in which informality is quite common. However, this is hardly the only

reason; the gender-based division of labor in the society, as well as the commonly held belief that most female employees are merely temporary workers who are going to quit employment after getting married also play an important role.

Table 1 Informality of Wage Employment in Manufacturing, 2004-2016 (Thousands)

Years	All	Informal Emp. Rate (%)	Women	Informal Emp. Rate (%)	Men	Informal Emp. Rate (%)
2004	2,884	25%	586	31%	2,298	23%
2005	3,155	27%	618	35%	2,536	25%
2006	3,245	28%	634	37%	2,612	25%
2007	3,318	24%	652	32%	2,666	22%
2008	3,474	20%	650	24%	2,824	19%
2009	3,282	23%	681	33%	2,602	21%
2010	3,595	22%	763	32%	2,832	20%
2011	3,765	21%	799	30%	2,966	19%
2012	3,841	18%	839	26%	3,002	16%
2013	4,009	16%	882	23%	3,128	14%
2014	4,246	16%	995	20%	3,251	14%
2015	4,281	15%	990	18%	3,290	14%
2016	4,243	15%	982	20%	3,260	14%

In the manufacturing sector, the share of female employees did not change significantly over the years: 20% in 2004 and 23% in 2016. Women have a share well above the industry average in three sub-sectors; in clothing their share increased from 43% in 2004 to 49 % in 2016, in textiles it increased slightly from 30 % to 31% between 2004 and 2016, and finally in food processing their share increased dramatically from 14 % to 27 % during the same period. The total number of female employees in these three sub-sectors made up 72 % of all female employees in the manufacturing sector in 2004; for men the same ratio was 37%. The corresponding figures in 2016 were 66% for females and 34% for males. Despite the downward trend over the years, these high shares indicate the relative heftiness of basic consumer items in Turkish manufacturing. However, it is clear that men tend to be employed more diversely in terms of sub-sectors, compared to women. In the three major sub-sectors mentioned above, informal employment practices are quite widespread, even though there seems to be a downward trend. The clothing sub-branch has the greatest ratio of informality, followed by textiles and food processing. In 2004 45% of women and 43%

of men were informally employed in clothing; the corresponding ratios were 31% and 30% in 2016, in other words almost one-third of women and men were informally employed. In textiles, 52 % of women and 15% of men were informal employees; in 2016 the corresponding figures were 23% and 7%. In food processing the ratios decreased from 26 % to 19 % for women and from 25% to 18 % for men during the period in question.

Table 2 Informal Rate of Employment by Gender in Manufacturing, 2004-2016

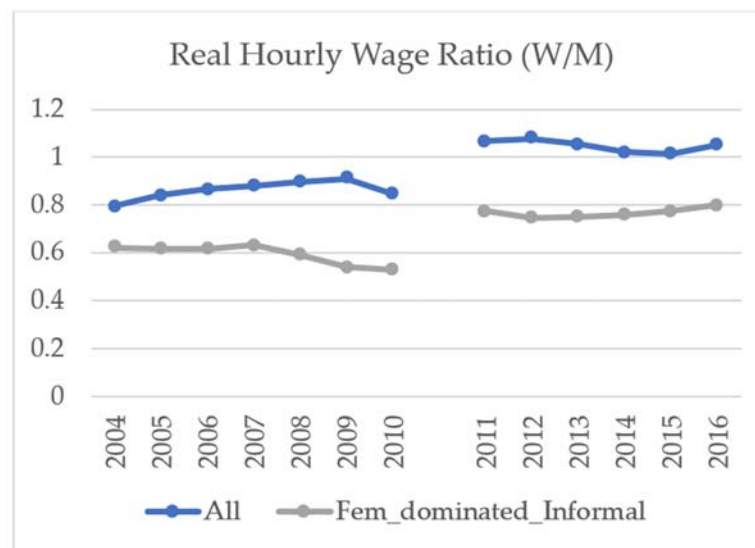
Years	Food Women	Men	Textiles Women	Men	Clothing Women	Men
2004	26%	25%	52%	15%	45%	43%
2005	33%	29%	45%	18%	49%	47%
2006	37%	30%	45%	18%	53%	49%
2007	35%	24%	40%	16%	50%	45%
2008	31%	24%	38%	12%	39%	37%
2009	28%	23%	39%	11%	44%	40%
2010	25%	21%	39%	11%	45%	37%
2011	25%	20%	38%	10%	41%	36%
2012	22%	18%	36%	9%	34%	32%
2013	23%	17%	30%	8%	31%	29%
2014	17%	18%	32%	9%	26%	34%
2015	15%	18%	22%	6%	27%	32%
2016	19%	18%	23%	7%	31%	30%

On the other hand, in the sub-sectors where relatively fewer women are employed, the informality rate is much smaller: In 2004 the ratios were 24% for men and 18% for women, in 2013 11% for both genders. These figures highlight the importance of more detailed exploration on the informal employment in these three subsectors.

Looking at the wage differences between informal and formal employees in the three sub-sectors of interest, namely clothing, textiles, and food processing; Figure 1 below reflects that the average wage of informal employees is lower than that of formal workers. This is true for both genders, but informality seems to effect women more severely compared to men. In clothing, textiles, and food processing sub-sectors, the wage-gap favors men even among the formal employees; which is not observed in other subsectors of the manufacturing sector. However, the gap is wider for informal

employees compared to the formal employment. For example, in 2012 formal female employees in the food products manufacturing received 97% of the wages their male counterparts got on average; the corresponding figure was 82% for informal employees. The greatest impact of informality on the gender wage gap was observed in textiles; in 2016 formal female workers received 89% of the wages formal male workers got; informal female employees only earned only 45% of what informal males were paid in this sub-branch. One of the reasons behind this discrepancy in textiles might be the differences in the educational and skill levels of the employees. Another one might be the sharper gender-based division of labor in the sub-sector in question resulting in lower pay for women.

Figure 1 Mean Hourly Wage Ratios in Manufacturing vs. Informal Workers in Selected Manufacturing Sectors (Food, Textiles and Clothing), 2004-2016



3. Methodology

The empirical literature on gender wage gap explores the underlying factors behind the gap by controlling the demographic factors between genders. In general, decomposition analyses are used to complement the analysis of raw gender wage gap. Whether the differences in observed distributions result from differences in individual

characteristics by women and men or from the difference in remunerations paid to women and men with the same characteristics are explored. The observed wage gap is assigned into two components as the difference in the individual characteristics and difference in the wage returns to the individual characteristics with the remaining as the residuals or due to unexplained characteristics. It has been documented that the extent of the observed gender wage gap that can potentially be explained by individual characteristics such as education and work experience differ significantly between formal and informal employment. Its size changes also over the distribution of wages.

A standardized method used for decomposition has been an Oaxaca (1973) and Blinder (1973)-type decomposition where the gender wage gap is evaluated at the average characteristics of men to find out how much of the gap could be considered as an outcome of discrimination. In this approach often the difference in mean wage level for women and men is decomposed into two parts one attributable to differences in demographic characteristics and second capturing the differences in wages/returns despite no difference in characteristics which is called the unexplained part of wage differences, a measure of wage discrimination. The following equation illustrates the equation for estimation in Oaxaca-Blinder decomposition:

$$\overline{w}_m - \overline{w}_w = (\overline{X}_m - \overline{X}_w)\widehat{\beta}_m - \overline{X}_m(\widehat{\beta}_m - \widehat{\beta}_w) \quad (1)$$

where \overline{w}_j is the mean log wage and \overline{X}_j is the vector of average characteristics of workers and $\widehat{\beta}_j$ stands for the the estimated vector of returns to the characteristics. The first term on the right-hand side of equation (1) corresponds to the difference in characteristics whereas the second term shows the difference in the estimated coefficients. Beyond the standard approaches recent discussions in this literature emphasize the varying degree to which the gender wage gap varies across the wage distribution not just at the mean level of the wages. Research, though limited highlights different estimates of wage gap at various wage percentiles. Oaxaca-Blinder decomposition method enables decomposition of the gap at the mean of the two wage distributions. However as will

be shown in the following (figure 3) the level of average wage gap may significantly vary from the levels observed at different quantiles particularly when analyzing the wage gap among informal workers gap at the lower end of the wage distributions matters more.

A comprehensive number of studies use quantile decompositions of wage gap via quantile regressions, see Fitzenberger et al. (2001) and Koenker and Hallock (2001) for surveys. Utilizing this approach here we also use the quantile decomposition technique proposed by Machado and Mata (2005) that is an alternative procedure combining quantile regression with a bootstrap approach.

The MM method can be briefly summarized as follows. Let $Q^\alpha(w^i|X^i)$ denote the log of real wage of individual i with characteristics X which leaves behind a fraction α of individuals with the same characteristics where w^i is the log of real wage and X^i is a vector of covariates representing his individual characteristics. The model specifies the α quantile of the conditional distribution of given the log real wage as a linear function of the covariates.

The real wage gap can be decomposed as follows:

$$Q^\alpha(w^m) - Q^\alpha(w^w) = \{Q^\alpha(X^{im}\hat{\beta}^{m\alpha}) - Q^\alpha(X^{iw}\hat{\beta}^{m\alpha})\} + \{Q^\alpha(X^{iw}\hat{\beta}^{m\alpha}) - Q^\alpha(X^{iw}\hat{\beta}^{w\alpha})\} + residual \quad (2)$$

The first term on the right hand side shows wage differentials as the outcome of the differences in characteristics between women and men at the quantile α . The second term shows the share in total wage gap due to differences in coefficients i.e. differences in returns despite given the same characteristics. After estimating these coefficients at each quantile requires first drawing random samples $M=10,000$ for each percentile α and for women and men separately $Q^\alpha(w^i|X^i) = X^i\hat{\beta}^\alpha$. Then a random sample of

size M is created from covariates X for women and men. These data sets are random samples of $M \times 99$ observations from the marginal wage distributions of log real wage which is consistent with the linear model in equation (2). Lastly the counterfactual hypothetical log real wage is calculated for women first assuming if they had the same characteristics of men but paid their own wages $\{Q^\alpha(w^i|X^i) = X^{im}\hat{\beta}^{w\alpha}\}$ and secondly the hypothetical log real wage for women if they had the same returns to the characteristics as for men $\{Q^\alpha(w^i|X^i) = X^{if}\hat{\beta}^{m\alpha}\}$.

Thus using the generated coefficients and characteristics, we estimate the wage gaps at different quantiles of the constructed wage distributions. We run our regressions of log hourly wages on a comprehensive set of control variables including marital status, age and tenure (as quadratic), education dummies, employment size dummies, whether the workplace is regular or not, usual weekly work hours, subsector dummies, year and region dummies. So, we control for a wide range of demographic, workplace related, and fixed effects regional characteristics.

Given the diversity of informal employment and potentially larger variation in wage distribution of informally employed, we use a wage decomposition technique that enables the evaluation of the gap across the whole wage distribution. We conduct a combination of Oaxaca-Blinder decomposition as well as a quantile distribution wide decomposition method based on Machado-Mata technique in order to isolate the degree of wage gap that can be explained by gender differences in demographic individual characteristics such as age and education across the distributions. We decompose gender wage gap not only at the mean but also across the wage distribution. In this regard, the current study is unique, and we believe it covers the gender wage gap and informality discussions in the Turkish manufacturing sector in more depth.

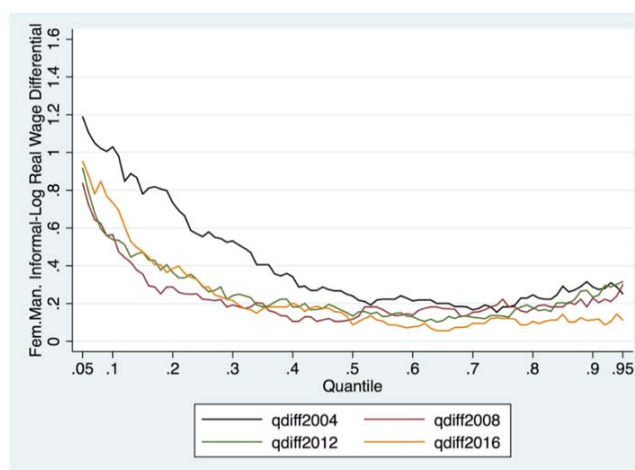
4. Data and Empirical Analysis

Official statistics on employment, unemployment, wages and earnings are calculated based on these nationally representative micro level HLFS datasets. Here we use yearly data from 2004 to 2016 in order to have a sample size which is large enough for our estimations on informal employment in the selected manufacturing subsectors. The wage data is constructed based on the declarations made by the interviewed rather than other records by the employers or administrators. Monthly wages are recorded as the net total after taxes. In order to remove wage differences that result from different working hours, it is reasonable to make the comparisons based on hourly wages. While net wages are presented on a monthly basis, total hours worked are recorded on a weekly basis. The hourly wage rate is calculated by dividing monthly net wage by the hours worked in a month; and the working hours in a month is found by multiplying the weekly work hours by 4.3, which is a common practice in the literature. Finally, the wage variable is deflated using the GDP deflator and converted into real wage levels. In order to test the association between real wage levels and trade related changes in the selected sectors we calculated the sectoral imports and exports share in total manufacturing based on foreign trade database compiled by TurkStat.

Figure 2 below shows the distribution of real hourly wages for women and men starting from the beginning year -2004, 2008, 2012 and the end year-2016 for informal employment in the four manufacturing sub-sectors. Wage estimations for all years are provided in the appendix. Significant raw gender wage gap is observed in the figure with the male wage density that is placed rightward with respect to the female wage distribution. Over the period of analysis, the gap appears to be widened with male density function more squeezed in the middle and to the right of the distribution. The raw gender wage gap as a function at quantiles of the wage distributions is shown in figure 2. The gap is distributed unequally across the wage distribution. The wage gap lies above its mean (0.41 for 2004, the mean level for 2016 is 0.21) at low wages, drops below the mean around the 35th percentile and keeps on falling until the 70th percentile.

We observe rises in wage gap over the years particularly at the lower end of the distribution. In 2016 at the lower end of the distribution wage gap is significantly higher than its level in 2008. Following a decline in all years, at the higher end above the 70th percentile wage gap slightly rises again. The rise is more significant in 2012 than in 2016 and 2008.

Figure 2 Raw gender wage gap at quantiles, 2004, 2008, 2012 and 2016



The dataset features 87 industries, which we focus here 3 of the manufacturing industries determined according to their shares in employment and exports in manufacturing. Sector categories are classified based on the standardized NACE Rev.2 rules. We include the type of workplace variable, firm size, 12 regional dummy variables (at the NUTS1 level) as dummy variables in order to capture workplace related differences between employed women and men and to control for potential regional variations in terms of gender wage gap patterns. Our main wage variable corresponds to after-tax hourly earnings excluding bonuses and other pecuniary benefits. The firm size variable stands for number of employees in the interval 1–9, 10–24, 25–49, 50–249, 250–499, and, finally, 500 and above. Education is represented by 6 dummy variables as follows: no degree, primary school, secondary school, high school, vocational high school, and college and above. We control for workers' age and

age as a quadratic polynomial. We also construct dummy variables for marital status as married as the first group and others grouped in one.

Table 3 reports the summary statistics for women and men separately. In our unweighted sample, we have 33,573 observations who are informally employed in the selected manufacturing subsectors (coded 10, 13, and 14)—16,212 of whom are men. The summary statistics are obtained as weighted with the relevant frequency weights. The majority of the informally employed women and men (almost 48 percent) are employed by size-1 firms, while around 17 percent of women workers are employed by firms with 50 workers or more, for men this figure is lower at 15 percent. Almost all informal male workers are working at a regular workplace, whereas 20 percent of women work in land, garden, home or marketplaces.

Table 3 Summary Statistics

Variable	Men				Women			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Logrwage	-4.28	0.51	-8.53	-0.45	-4.57	0.72	-8.15	-1.84
Usual weekly work hours	58.0	11.89	2.00	99	48.23	15.07	1.00	97
Observation #	16,212				12,977			
	Proportions	Std. Dev.	Min	Max.	Proportions	Std. Dev.	Min	Max.
Regular workplace	99.7	0.000	0	1	79.6	0.004	0	1
Full-time	98.0	0.001	0	1	85.0	0.003	0	1
Employment Size								
1-9	48,0	0.004	0	1	47,9	0.004	0	1
10-24	19,3	0.003	0	1	16,9	0.003	0	1
25-49	17,9	0.003	0	1	18,0	0.003	0	1
50 and above	14,8	0.003	0	1	17,3	0.003	0	1
Education level								
No degree	11.7	0.003	0	1	17.7	0.004	0	1
Primary	45.3	0.005	0	1	45.2	0.005	0	1
Secondary	30.3	0.004	0	1	25.4	0.004	0	1
High School	6.9	0.002	0	1	6.1	0.002	0	1
Vocational High	4.0	0.002	0	1	4.1	0.002	0	1
College and above	1.5	0.001	0	1	1.3	0.001	0	1
Marital Status								
Single and other	48.5	0.004	0	1	55.2	0.005	0	1
Married	51.4	0.004	0	1	44.7	0.005	0	1

There is also a significant asymmetry between women and men in terms of educational attainment. Around 56 percent of informal male workers have at most a primary degree, while the corresponding figure for women is 63. Only 1.3 (1.5) percent of female (male) informal workers have college degree or above. For formal workers,

in the same subsectors however, 7 percent of male workers and 10 percent of females have college and degree or above.

Table 4 presents the summary of quantile regression estimation results at the subset quantiles of the distribution with t-ratios in parentheses. We estimate equations for female and male informal workers separately. Regarding the results we observe that the demographic variables have in general the expected signs for both women and men with informal jobs in selected manufacturing industries in Turkey. That is, the wage level increases with age but for elderly falls by age, it rises if the workplace is regular, influenced positively also by the employment size both for women and men. The effects of education dummies and marital status show different impacts by gender. While men's wage earnings are higher if married it is the opposite case for women in Turkey. The education level matters selectively, higher education has positive and significant effect on wages both for women and men. The comparison of the male and female OLS coefficients shows that the effects of the individual characteristics are slightly smaller for women except for marital status but for the latter the signs also differ. Moreover, the estimated quantile regression (QR) coefficients for the individual characteristics generally vary across the distribution and differ from the OLS estimates by size though carry the same sign. Regarding the trade related variables, we observe import share in total manufacturing imports is associated negatively with the hourly wage for women whereas we observe an opposite impact on male wages. Particularly in the lowest quantile of female hourly wage the impact is higher and significant. Over the period of analysis, we observe that in textiles and clothing, the imports' share in total manufacturing show a rising trend while the exports' shares has declined (Table A1). While in clothing sector the rising imports share indicates a rise in competition particularly due to the rising trade with China. The increase in the imports share in textiles reflects a transition to production with a higher technology and hence the higher wages for the "skilled" workers majority of whom are male workers in manufacturing.

Table 4 Estimation Results-OLS and Quantile Regressions

Log hourly wage	OLS- Men	OLS-Women	Quantile-Women			Quantile- Men		
			q25	q50	q75	q25	q50	q75
VARIABLES			+	+	+	+	+	+
Controls for Age, Region, Education, Marital Status, Usual work hours, Year	+	+						
Regular Workplace	0.372*** (0.0542)	0.981*** (0.0183)	1.277*** (0.0343)	1.122*** (0.0267)	0.810*** (0.0297)	0.695*** (0.184)	0.331*** (0.0939)	0.152 (0.105)
Employment Size								
10-24	0.0682*** (0.00908)	0.0651*** (0.0155)	0.0778*** (0.0160)	0.0364*** (0.0121)	0.0243** (0.0114)	0.0743*** (0.00722)	0.0407*** (0.00744)	0.0315*** (0.00924)
25-49	0.0634*** (0.00934)	0.0777*** (0.0151)	0.0914*** (0.0161)	0.0422*** (0.0118)	0.0279*** (0.00853)	0.0538*** (0.00870)	0.0246** (0.00979)	0.0279*** (0.00847)
50 and over	0.121*** (0.00995)	0.130*** (0.0152)	0.111*** (0.0169)	0.0764*** (0.0117)	0.0591*** (0.0103)	0.0954*** (0.00909)	0.0540*** (0.0101)	0.0672*** (0.0109)
Exports share	-0.163 (0.151)	-0.304 (0.298)	-0.321 (0.259)	-0.274 (0.234)	-0.154 (0.206)	0.0535 (0.137)	0.217 (0.137)	0.131 (0.185)
Imports share	1.407*** (0.448)	-2.649*** (0.570)	-2.933*** (0.813)	-1.246* (0.694)	-0.851 (0.560)	1.698*** (0.362)	0.822*** (0.282)	1.128** (0.462)
Full-time employed	0.236*** (0.0245)	0.220*** (0.0215)	0.339*** (0.0358)	0.296*** (0.0343)	0.275*** (0.0365)	0.404*** (0.0347)	0.336*** (0.0415)	0.102*** (0.0384)
Constant	-4.348*** (0.0642)	-4.865*** (0.0580)	-5.419*** (0.0457)	-4.975*** (0.0462)	-4.441*** (0.0443)	-5.030*** (0.185)	-4.380*** (0.0985)	-3.763*** (0.0951)
Pseudo R ²			0.3988	0.3124	0.2236	0.2640	0.2530	0.2374
N	16,033	12,522	12,522	12,522	12,522	16,033	16,033	16,033
R ²	0.397	0.473						

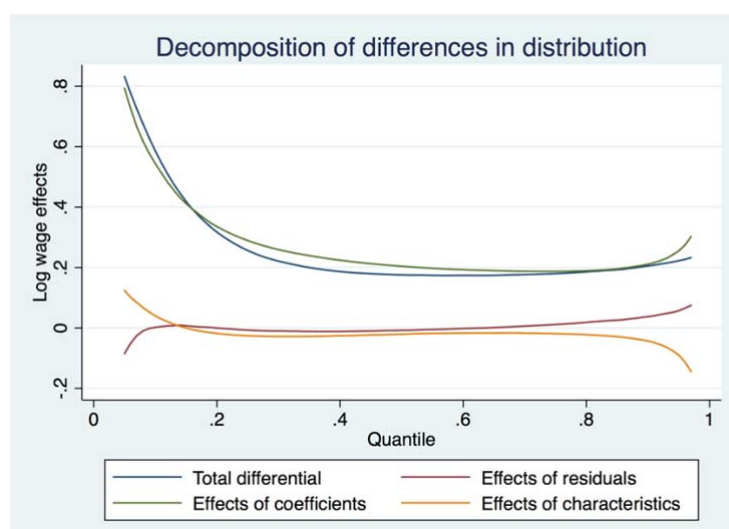
Note: The year, regional dummies, age-group dummies, education level, marital status and are included in all estimations, *t*-statistics are provided in parentheses.

Table A2 presents OB decomposition results, which shows that the largest part (64 percent) of the observed mean wage gap (0.28) is unexplained (0.182) while 36 percent corresponds to the explained part (0.103) of the mean gender wage gap. If women and men have the same individual characteristics even including education level and job experience, women would earn 18 percent less than men on average. By contrast, the differences in returns to individual characteristics such as education and experience are the smallest part of the gap. This result implies that on average, women would receive even lower wages if they had the same endowment of individual characteristics as male workers in the informal sectors we analyze here.

When differences in characteristics is decomposed into three as demographic, work-related characteristics and trade related variables, we observe that 73 percent of

the explained part corresponds to work related variables (employment size, regular workplace, usual weekly hours worked) rather than demographic characteristics (including age, education and marital status). The trade related variables correspond to as high as 35 percent of the unexplained portion of the wage gap, termed as the gender wage gap due to discrimination. As the sectors' trade share in total manufacturing increases, the wage differential among informal workers also rise. This provides opposing evidence against the neoclassical predictions on the impact of trade on gender wage gap. As put by Becker (1959), discrimination, which is costly for the employer is expected to decline with increased competitiveness due to rising trade. However, discrimination is consistent with the non-neoclassical approach including the segmented labor market theory given the women are segregated into low-paying jobs and occupations even in the same sector. Gender wage gap and discrimination could be used as cost-cutting measure when competition gets more severe with rising trade.

The quantile regression is a more informative approach for wage gap analysis in informal employment. Similar to the Oaxaca-Blinder decomposition results, the decomposition using the estimated quantile regression coefficients shows that the contribution of the difference due to differences in individual characteristics is smaller across the whole wage distributions (Figure 3). The extreme quantiles are not shown due to unrobust results. Accordingly, the effect of the individual characteristics part gets even smaller and turns to negative as the quantiles increase. The part due to difference in the returns to the characteristics that include work related factors vary strongly along with the distribution and have largest impact on the wage gap across the distributions. This effect first decreases as the quantiles increase but we also observe a slight increase after the 70th percentile, which indicates women though holding same individual characteristics as men have lower bargaining power than men particularly at lower quantiles. This effect even though declines along with the quantiles, it shows a slight rise again at higher quantiles.

Figure 3 Quantile decomposition estimation results

Around the 45th percentile the effects of coefficients get larger than the total wage gap which indicates that if women's endowments or individual characteristics were not higher or stronger than men, the wage gap due to different remuneration effect would be much higher. To the left of this 45th percentile men have higher educational degree or higher number of tenure years in terms of individual characteristics. In contrast after that level women have better individual endowments i.e. compared with male employees, above the 45th percentile of the wage gap women holds higher education degrees and/or have more years of job tenure or their age profile gets older than men.

These estimated results of Oaxaca-Blinder decomposition of the mean gender wage gap and the decomposition of the gap across the whole distribution both indicate the tendency for women into the lower paying jobs in the informal employment. Women seem getting much less compared to men in other words participate less to the gains in their workplace than their male counterparts. This is the source of the largest part of the wage gap in informal employment in selected manufacturing industries.

These findings are strongly supported when considered together with the decomposition results for registered workers i.e. formally employed in the same

manufacturing sub sectors in Turkey. The results for formal workers present a completely different picture than informally employed we provide here. Unlike our findings, the effect of individual characteristics matters more and its share rises across the wage distribution in the formal sector. The workplace and work-related factors appear to be very important in explaining wage differentials between women and men particularly so for informal employment.

In general, decomposition techniques are used to complement the analysis of raw gender wage inequality. The difference in the wage returns unexplained by the individual characteristics i.e. the residual wage gap indicates discrimination, as introduced in Becker's model. In the literature, studies that discuss the impact of technological change or the changes in the international trade on wage inequality explored the relation between the residual wage gap and the changes in the trade related indicators. Likewise, here, we also explored the association between the residual wage gap and the trade related indicators isolating the extent of the observed gender wage gap that can potentially be explained by individual characteristics such as education and work experience for our purposes.

Berik, Rodgers and Zveglic (2003) explores how the residual gender gap, which is commonly used in the literature as a proxy for gender wage discrimination, is affected by trade openness measures in the manufacturing sector. In a similar vein, we need a model to test the association of wage inequality at the sectoral level with the sectoral changes in trade. For this purpose, we first estimate the residual gender wage gap using an extended Mincer-type equation to estimate the logarithm of hourly wage at the separately for men. As we already obtain the residual wage gap we explore the association between increased imports and exports share by industry with the residual wage gap obtained in the first step. Our empirical model tests the degree of association between increased trade as indicated by rising imports and exports share of the sector in total manufacturing and the residual wage gap.

One challenge in exploring the relation between differences among industries in terms of trade changes and industry level wage gaps is to isolate the impact of differences in participation in trade from other differences such as the changes in the industries market structure and employment characteristics. Using the pooled LFS data (2004-2016), we first estimate the wage gap for each industry and year by controlling both workers and work-related characteristics. The educational attainment, age, marital status are controlled for differences among workers in terms of human capital. The type of employment, workplace and other work-related variables the usual work hours, employment size, region and the type of industry are also controlled for the differences among industries.

In order to calculate the residual wage gap, we first run the regression against natural log of real male wages. The observable characteristics include the type of workplace variable (regular, temporary, irregular or market place), firm size, 12 regional dummy variables (at the NUTS1 level) as dummy variables in order to capture workplace related differences between employed women and men and to control for potential regional variations in terms of gender wage gap patterns. Our main wage variable corresponds to after-tax hourly earnings excluding bonuses and other pecuniary benefits. The firm size variable stands for number of employees in the interval 1–9, 10–24, 25–49, 50–249, 250–499, and, finally, 500 and above. Education is represented by 6 dummy variables as follows: no degree, primary school, secondary school, high school, vocational high school, and college and above. We control for workers' age and construct dummy variables for marital status as married as the first group and others grouped in one.

We estimate predicted log wages for male and female workers are then calculated using coefficients from the male wage regression. The difference between actual log wages and predicted log wages yields residual wages, and the difference between male and female residual wages yields the residual gender wage gap. Finally, we test the association between the estimated residual wage gap and the trade variables i.e. sector's

export and import share using fixed effects estimation technique. Panel data estimation tests are implemented and to control for potential heteroskedasticity, robust standard errors are used. According to the estimation results as presented in Table 5, we find a positive and significant association between the lagged exports share in total manufacturing exports and the unexplained portion of the gender wage gap in informal employment.

Table 5 Fixed Effects Estimates (2004-2016)

	Residual wage gap
Exports share (-1)	2.807* (0.757)
Imports share (-1)	3.162 (5.166)
Constant	-0.850*** (0.0669)
Observation #	36
R-squared	0.231

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Gender based wage penalties are more significant and large at the lower end of the wage distributions in informal employment. This finding is line with the results by Heinze (2010) obtained for Germany, and the findings provided by Bargain and Kwenda (2009) for multiple country cases including South Africa, Brazil and Mexico. Gender differences in individual characteristics including education and job experience have small effect on gender-based wage gap in informal employment.

5. Conclusion

Turkey was a late-comer in the export-driven industrialization trend with limited investment in the industrial sector mainly concentrated in the production of basic consumer goods. The number of women employed have been on the rise in the labor intensive sub-sectors, where women traditionally have a relatively greater presence. However, women's share of employment in manufacturing have not changed much

over the years. The sub-sectors with relatively larger number of female employees are also characterized by small-scale enterprises, subcontract manufacturing, and low wages.

In this paper, we explore gender-based wage gaps among informally employed workers in chosen sub-sectors of the manufacturing sector using the labor force survey data from 2004 to 2016 in Turkey. Informally employed women tend to receive much less than their male counterparts, especially in textiles and clothing sub-sectors. These results significantly differ from the findings of the limited number of studies on the subject that focus solely on formal employees; such studies report the gender-based wage gap in Turkey to be smaller. Benefiting from the sample size for informal employment over time, we focus on the lower part of the wage distribution and were able to decompose the wage gap observed among the informally employed. Evidence found present a gap as high as 28 percent observed even in the sectors where the share of female employment is high among the manufacturing sub-sectors. In line with the literature, work-related factors comprise the biggest part of the gender-wage gap where employment conditions are worse for both genders unlike the formal employment.

In addition to the work-related factors, here we explicitly test the association between trade-related changes with the wage gap when isolated from the impact of demographic as well as work-related factors. Our quantile estimation results present that the size of the gender-based gap does not vary from one quantile to another suggesting presence of wage gap through the wage distribution of informally employed. Secondly, evidence is found for the potential role of macro level changes underlying behind the widening gender-wage gap. The rising share of imports in total manufacturing leads to a rise in men's wages while suppressing women's wages at the lowest tail of the wage distribution. Import competition appears to be associated with higher gender-based wage gap among the informal workers in Turkey. The results also show that the unexplained portion of the gender-based wage gap proxied with the residual wage gap is positively associated with rising export shares. The study reveals

the strong linkages between gender-wage inequality, informality in employment and changes in trade structure that highlights the need for a holistic approach in policy-making targeting gender equality in the labor market in Turkey.

Finally, it can be stated that in a country like Turkey where gender inequality remains strong, encouraging employers to hire women is insufficient; it is also necessary for the newly created jobs to provide social security benefits, for all employed have basic rights of association, and equal pay for equal work principal. Policies that firmly protects and promotes gender equality and basic labor rights designed from a macroeconomic perspective are urgently needed.

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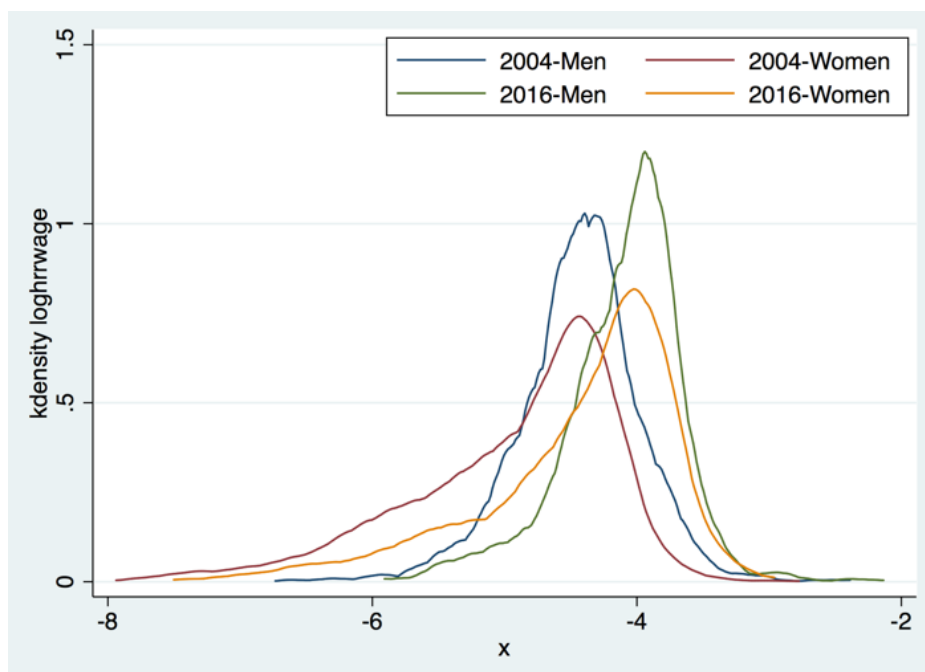
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Appendix A

Figure A1 Wage densities by sex, 2004 and 2016



Note: Kernel density wage (hourly real wage in logarithmic form) estimation of men and women uses Epanechnikov kernel function.

Table A1 Sector's share in total manufacturing exports and imports (2004-2016)

Years	Food		Textiles		Clothing	
	Exp. share	Imp. share	Exp. share	Imp. share	Exp. share	Imp. share
2004	5,6%	2,9%	13,4%	2,9%	15,7%	1,4%
2005	6,2%	3,1%	12,7%	3,1%	14,4%	1,5%
2006	5,4%	3,0%	11,5%	3,2%	12,7%	1,5%
2007	5,1%	2,8%	10,7%	3,0%	11,7%	1,4%
2008	5,2%	2,9%	9,0%	3,1%	9,2%	1,3%
2009	6,2%	2,7%	10,0%	3,7%	10,1%	1,5%
2010	6,4%	2,4%	10,4%	4,2%	10,1%	1,6%
2011	7,1%	2,6%	10,3%	3,9%	9,2%	1,6%
2012	6,6%	2,5%	9,3%	3,4%	8,3%	1,3%
2013	7,5%	2,0%	10,4%	4,0%	9,0%	1,0%
2014	7,6%	2,2%	10,5%	3,8%	9,4%	0,9%
2015	7,6%	2,2%	10,1%	4,2%	9,3%	0,7%
2016	7,4%	2,4%	10,1%	4,7%	9,3%	0,7%

Table A2 Oaxaca Decomposition Results

	(1)	(2)	(3)
VARIABLES	Differential	Explained	Unexplained
Men	-4.278*** (0.0421)		
Women	-4.563*** (0.0598)		
Difference	0.2854*** (0.07322)		
Demographic variables		0.0145*** (0.0319)	0.2202*** (0.0125)
Education		0.00301 (0.00059)	0.0005 (0.0126)
Work related variables		0.0753*** (0.0544)	1.2475*** (0.1912)
Trade related variables		0.0133*** (0.00110)	0.0639* (0.0334)
Total		0.1036*** (0.0641)	0.1818*** (0.0058)
Constant			-1.35*** (0.1961)
Observations	28,555	28,555	28,555

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$