

BEYOND AVERAGES: HETEROGENEOUS EFFECTS OF GENDER WAGE DISPARITIES ON WOMEN'S EMPLOYMENT IN TÜRKİYE¹

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Abstract

This study analyses how inter-occupational wage inequalities in Turkey during the period 2014–2023 are related to female employment, and how this relationship varies across the employment distribution. A quantile regression approach, estimated using a Panel Fixed Effects Model with (HAC) standard errors, was employed. It was found that occupational wage inequalities did not show a significant relationship at the mean level, but became positive and statistically significant at the median and upper quantiles ($\tau = 0.50$ and $\tau = 0.75$); whereas no significant relationship was found in the lower quantile ($\tau = 0.25$). These findings indicate that wage inequalities have more pronounced and heterogeneous effects, particularly in occupations with high levels of female employment. Whilst an upward trend in female employment has been observed in the post-pandemic period, it has been demonstrated that women remain under-represented in high-skill and managerial positions. Moving beyond average effect analyses, a distribution-based approach is presented, providing evidence of structural and occupational segregation in the labour market.

Keywords: Gender-Based Pay Inequality, Female Employment, Occupational Segregation, Quantile Regression, Panel Data, The Turkish Labour Market

Jel Codes: J31, J16, J21, C23, C21

ORTALAMALARIN ÖTESİNDE: TÜRKİYE'DE TOPLUMSAL CİNSİYETE DAYALI ÜCRET EŞİTSİZLİKLERİNİN KADIN İSTİHDAMI ÜZERİNDEKİ HETEROJEN ETKİLERİ

Özet

Bu çalışmada 2014–2023 döneminde Türkiye’de meslekler arası ücret eşitsizliklerinin kadın istihdamı ile nasıl ilişkilendiği ve bu ilişkinin istihdam dağılımı boyunca nasıl farklılaştığı analiz edilmektedir. Panel Sabit Etkiler Modeli ve (HAC) standart hataları ile tahmin edilen kuantil regresyon yaklaşımı kullanılmış, mesleki ücret eşitsizliklerinin ortalama düzeyde anlamlı bir ilişki göstermediği, ancak medyan ve üst kantillerde ($\tau = 0.50$ ve $\tau = 0.75$) pozitif ve istatistiksel olarak anlamlı hale geldiği tespit edilmiştir; buna karşılık alt kantilde ($\tau = 0.25$) anlamlı bir ilişki bulunmamaktadır. Bu bulgular, ücret eşitsizliklerinin özellikle kadın istihdamının yüksek olduğu mesleklerde daha belirgin ve heterojen etkiler yarattığını göstermektedir. Pandemi sonrası dönemde kadın istihdamında artış eğilimi gözlenirken, kadınların yüksek beceri ve yönetici pozisyonlarda hâlen yetersiz temsil edildiği ortaya konulmaktadır. Ortalama etki analizlerinin ötesine geçilerek dağılım temelli bir yaklaşım sunulmakta, işgücü piyasasındaki yapısal ve mesleki ayrışmaya ilişkin kanıtlar sağlamaktadır.

Anahtar Kelimeler: Cinsiyete Dayalı Ücret Eşitsizliği, Kadın İstihdamı, Mesleki Ayrışma, Kuantil Regresyon, Panel Veri, Türkiye İşgücü Piyasası

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1. Introduction

Gender inequality in labor markets remains one of the most persistent structural challenges confronting modern economies. Despite significant progress toward gender equality in education and legal frameworks, disparities in employment opportunities, wages, and career advancement continue to disadvantage women globally (Blau and Kahn, 2017). Historically, the gender wage disparities has not only represented an issue of fairness but also a macroeconomic inefficiency that constrains overall productivity and growth (Klasen and Lamanna, 2009; Cuberes and Teignier, 2016). While early studies framed the problem within the human capital perspective-arguing that wage differences reflected variations in education, skills, and experience (Becker, 1964; Mincer, 1974)-more recent research highlights that structural, institutional, and cultural factors play a decisive role in shaping gendered labor outcomes (North, 1990; Rubery, 2015). Consequently, the gender wage disparities has evolved from being seen as an individual labor market phenomenon to being recognized as a critical determinant of macroeconomic efficiency, inclusiveness, and sustainable development. In emerging economies such as Turkey, where structural reforms coexist with traditional norms, understanding how wage inequality interacts with female employment dynamics has become increasingly vital for designing inclusive labor and growth policies.

The core problem addressed in this study lies in the persistence of gender-based wage disparities and their heterogeneous impact on female employment across occupational groups. Although extensive empirical literature has examined gender wage differentials, fewer studies have investigated how these disparities influence women's participation decisions when both occupational heterogeneity and temporal dynamics are considered. Previous research in Turkey has mainly analyzed aggregate wage disparities (e.g., Duman, 2023) or sector-specific cases (e.g., Kartal and Çoban, 2018; Çiçen et al., 2020), without fully capturing how these gaps operate differently across the employment distribution. Moreover, traditional econometric methods, such as standard panel fixed effects models, estimate average effects and may obscure substantial heterogeneity among occupations with differing employment intensity. This methodological limitation constrains policy interpretation, as average effects fail to reveal whether the wage disparities deters female employment uniformly or only within certain employment segments. Addressing this empirical gap requires a distribution-sensitive approach that accounts for occupational structure, institutional changes, and temporal shifts in female labor market participation.

In response to these limitations, this study provides a comprehensive analysis of the relationship between occupational gender wage disparities and female employment in Turkey from 2014 to 2023. Employing both the Panel Fixed Effects Model and Quantile Regression with Heteroskedasticity and Autocorrelation Consistent (HAC) standard errors, the study captures not only the average relationship but also the distributional variations across employment quantiles. This dual-method approach allows for a deeper understanding of how wage disparities affect female employment in occupations with differing employment densities. The results reveal that while the occupational wage disparities has no significant average effect on female employment, it becomes statistically significant and positive at the median and higher employment quantiles, suggesting heterogeneous responses across occupational categories. By integrating theoretical insights from the human capital, institutional, and occupational segregation frameworks, the study contributes to bridging the gap between micro-level labor supply behavior and macroeconomic labor market dynamics. Ultimately, the research advances the understanding of gendered employment structures in emerging economies and provides evidence-based insights for policymakers seeking to promote equitable and efficient labor market participation.

However, the scope of the study entails certain limitations. In particular, institutional and cultural factors-such as access to care services, prevailing gender roles, the strength of union representation, and employment protection regulations-could not be quantitatively measured; therefore, their indirect effects remain outside the scope of the analysis. Consequently, the study primarily relies on measurable economic indicators to evaluate the relationship between the gender wage disparities and female employment. Thus, while the findings effectively capture the underlying economic mechanisms, they reflect the influence of social and institutional determinants only indirectly. To ensure a clear understanding of the scope of this study, it should be specifically noted that, rather than establishing causal links between occupational pay differentials and female employment, this study focuses on identifying conditional relationships. Accordingly, this study adopts a dual-method approach: a panel fixed effects model to estimate the average relationship, and quantile regression to uncover distributional heterogeneity across occupational groups. This framework is particularly suitable for capturing the uneven structure of female employment across occupations, which cannot be adequately explained by mean-based estimators alone.

In the context of Türkiye, these dynamics are closely linked to the structural transformation of female employment, characterized by a shift from agricultural to service-sector employment, persistent informality, and strong occupational segmentation. These structural features imply that female employment is not only quantitatively limited but also

qualitatively heterogeneous, making a distribution-sensitive empirical approach particularly relevant.

Accordingly, this study contributes to the literature in three main ways. First, it moves beyond mean-based approaches by examining the relationship between gender wage disparities and female employment across the distribution, thereby uncovering heterogeneous effects across occupational groups. Second, it employs an occupation–year panel structure, allowing for the joint analysis of cross-sectional differences and temporal dynamics in female employment. Third, by combining panel fixed effects and quantile regression approaches, the study provides a more comprehensive empirical framework that captures both average relationships and distributional heterogeneity in a structurally segmented labor market such as Türkiye.

2. Theoretical Framework

In macroeconomic analysis, labor market dynamics constitute a fundamental determinant of economic growth, income distribution, and social welfare. Gender-based wage disparities are not merely a microeconomic issue of individual labor decisions but also a macroeconomic concern that affects aggregate labor supply, productivity, and potential output. The level and composition of female employment directly influence an economy's productive capacity and total factor productivity. Therefore, understanding how gender wage inequality affects labor market participation has become a critical element of contemporary macroeconomic research (Klasen and Lamanna, 2009; Cuberes and Teignier, 2016).

The neoclassical human capital framework posits that wage differentials reflect variations in productivity-related characteristics such as education, experience, and skills (Becker, 1964; Mincer, 1974). Within this framework, the gender wage disparities acts as a rational price signal influencing labor supply decisions. However, when wage disparities systematically disadvantage women, they increase the opportunity cost of labor market participation, thereby reducing aggregate female labor supply. This contraction in participation can have broader macroeconomic implications, including lower potential output, reduced total factor productivity, and slower economic growth. Consequently, the gender wage disparities should not be interpreted solely as a matter of equity, but as a critical determinant of macroeconomic efficiency and sustainable development.

Beyond market-based explanations, the persistence of wage disparities is often rooted in institutional and structural factors. The institutional economics approach argues that labor market outcomes are not governed solely by supply and demand forces but also by institutional arrangements such as legal frameworks, social norms, labor market policies,

unionization, and the education system (North, 1990; Rubery, 2015). Women's participation in the labor force is shaped not only by wage incentives but also by the institutional environment that facilitates or constrains their economic engagement. Maternity leave regulations, access to childcare, pay transparency, job security, and flexible working conditions are key institutional variables influencing female employment. From this perspective, gender equality-enhancing reforms are not merely social interventions but also essential components of macroeconomic stability and growth strategies.

A complementary explanation is provided by the occupational segregation framework, which highlights the structural distribution of women across sectors and occupations. According to this theory, women tend to be concentrated in specific, often lower-paid occupations due to historical, cultural, and social norms (Reskin and Roos, 1990; Blau and Kahn, 2017). This gendered occupational distribution reduces the overall efficiency of labor allocation in the economy. When female labor is disproportionately represented in low-productivity sectors, aggregate output remains below its potential level. Occupational segregation therefore generates not only micro-level inequality but also macro-level inefficiency, as it limits the economy's capacity to utilize human capital optimally.

Integrating these theoretical perspectives reveals that gender wage disparities shape employment dynamics through both microeconomic incentives and macroeconomic mechanisms. Increasing female labor force participation enhances aggregate demand, productivity, and public revenues, thereby contributing positively to long-term growth (Aguirre et al., 2012; IMF, 2018). Consequently, reducing gender wage disparities is not only an equity-oriented policy objective but also a macroeconomic imperative for inclusive and sustained growth.

In summary, the theoretical foundation of this study combines the human capital, institutional economics, and occupational segregation approaches to explain the multidimensional relationship between gender wage inequality and female employment. This integrated framework acknowledges that gender wage disparities are driven not only by individual productivity differences but also by institutional structures, labor market regulations, and the broader dynamics of economic growth. It conceptualizes female employment as an integral component of macroeconomic performance and positions gender equality as a key determinant of sustainable development and economic resilience.

3. Literature

The literature on gender-based wage inequalities and female employment has evolved from explanations based primarily on human capital towards a broader framework that also incorporates institutional, structural and socio-cultural determinants. In this context, to ensure a coherent understanding of the Turkish case, it is necessary first to examine the country-specific empirical literature and then to relate this framework to international findings. Furthermore, policy-oriented studies such as the World Bank (2009) emphasise that the persistently low rates of female labour force participation in Turkey can be explained not only by individual labour supply decisions, but also by the combined effect of structural transformation, institutional constraints and socio-cultural norms.

Within the Turkish context, there is a well-established body of literature examining female labour force participation and gender-based wage inequalities. Tansel (1994) demonstrates that significant wage differentials persist even when human capital variables such as education and experience are controlled for, thereby highlighting that this situation points to structural and institutional factors beyond differences in human capital. Expanding on this approach, Tansel (2001) highlights the importance of structural transformation by demonstrating that women's labour force participation is closely linked to economic development and regional differences. Similarly, Dayıoğlu and Tansel (2003) demonstrate that the rise in women's educational levels has not fully translated into equal outcomes in the labour market, showing that persistent inequalities in employment and wages continue. From an institutional perspective, İlkaracan (2012) emphasises that low female labour force participation in Turkey is closely linked to the burden of unpaid care, inadequate childcare services and traditional gender roles, and demonstrates that labour supply decisions are shaped within broader socio-economic constraints. Kartal and Çoban (2018) examined the gender-based discrimination faced by women working in the textile sector in Kahramanmaraş. The findings indicate that overt discrimination in recruitment and wage-setting processes has decreased over time, but a persistent 'glass ceiling effect' continues to exist in promotion processes. This result is consistent with the occupational segregation theory, which posits that women are concentrated in low-paid and low-status jobs and face institutional barriers when transitioning to higher-level positions. Çiçen et al. (2020), in their study of women working in the tourism sector in Edirne, found that overt discrimination in recruitment and pay processes was limited, but that moderate levels of socio-cultural discrimination persisted. These findings demonstrate that legal equality alone is insufficient to eliminate structural inequalities and that social norms continue to shape labour market behaviour. In his analysis using microdata from the Turkish Household Labour Force Survey, Duman (2023) has demonstrated

that forms of temporary and informal employment lead to significant wage losses for women, particularly at lower income levels. These findings indicate that labour market flexibility works to the detriment of women and that wage inequality is structurally reproduced. When these country-specific findings are considered together, it becomes clear that female employment in Turkey is determined not only by wage differentials but also by structural constraints such as occupational segregation, informality and care responsibilities; consequently, the qualitative dimensions of employment are of great importance. This approach is also supported by İlkaracan (2010), who demonstrates that the increase in female employment is not merely a social objective but also a key determinant of economic growth.

The structural transformation of female employment in Turkey is frequently discussed in the literature within the framework of the ‘U-shaped curve’. According to this approach, female employment, which is high in the agricultural sector during the early stages of economic development, declines during the industrialisation process and rises again with the expansion of the services sector (Tansel, 2001; World Bank, 2009). In Turkey, particularly in the post-1980 period, the migration of female labour from the agricultural sector to urban areas led to a significant proportion of women remaining outside the labour force, as insufficient industrial employment was created (World Bank, 2009). During this process, female employment has largely concentrated in female-dominated sectors such as the service sector, public sector employment, education, health and retail (World Bank, 2009; İlkaracan, 2012). However, the prevalence of informal employment, coupled with the higher incidence of low-paid and insecure working conditions among women, has created a distinct segmentation within the labour market (İlkaracan, 2012). Furthermore, there is a strong correlation between educational attainment and female labour force participation; in particular, the participation rates of highly educated women are notably higher (Dayıoğlu and Tansel, 2003). These structural characteristics demonstrate that female employment in Turkey exhibits a heterogeneous structure not only in quantitative terms but also in qualitative terms.

In a meta-analysis examining gender-based wage inequalities in former Soviet countries, Khitarishvili (2019) found that wage gaps in these countries were higher than in developed economies. Whilst an increase in educational attainment was found to partially reduce wage gaps, it is noted that institutional and cultural factors continue to play a decisive role. Similarly, Beneito and Gómez (2022), in their study comparing women’s and men’s wages across different sectors in Spain, demonstrate that women have historically worked for lower wages and that occupational segregation lies at the root of these disparities. Adamus and Mikušková (2024), in their experimental study conducted in Slovakia, found that women systematically received lower wage offers for the same positions. These findings indicate that wage inequalities are shaped not only by economic factors but also by social norms and perceptions.

Stansbury et al. (2024), using the example of South Korea, demonstrate that a significant portion of wage gaps is linked to care responsibilities, and that childcare and elderly care, in particular, limit women's participation in the labour force.

The female labour force participation rate in Turkey is among the lowest in OECD countries. Whilst male employment indicators are similar to those of countries such as Spain and Italy, the gender gap is quite high. According to neoclassical theory, as expected wages rise, labour force participation also increases; consequently, women's lower wage expectations reduce their motivation to participate in the labour force (Blau and Kahn, 2017). In economies such as Turkey, where household income is largely provided by men, low female wages increase the opportunity cost of labour force participation and may lead to women withdrawing from the labour force (ILO, 2020a). From an institutional perspective, this situation is reinforced by structural factors such as high care costs, job insecurity and limited trade union representation. Given that women earn approximately 84 per cent of men's wages (Ayvaci, 2024; ILO, 2020a), it is clear that this inequality points to a systematic and institutional problem rather than individual differences.

Taken as a whole, whilst the existing literature provides significant findings on gender-based pay inequalities and female employment, it fails to adequately demonstrate how this relationship varies across the employment distribution and how it has evolved over time. This shortcoming becomes particularly pronounced in economies such as Turkey, where the dynamics of structural transformation, institutional constraints and labour market segmentation are intertwined. Generally speaking, the literature points to a framework that combines the human capital approach with institutional economics and occupational segregation theories, and examines female employment as a result of the dynamic interactions between economic growth, productivity and institutional structures.

4. Data and Method

4.1. Data

This study examines the impact of occupational gender pay gaps on female employment across various occupational groups in Turkey (including managers, professionals, technicians, clerical support workers, service and sales workers, skilled agricultural workers, craft and related trades workers, plant and machine operators, and elementary occupations) during the period 2014–2023. The analysis utilises data on female employment and gender pay gaps (measured as a percentage) obtained from the International Labour Organisation (ILO). This study uses data obtained from the International Labour Organization (ILO) rather than directly from the Turkish Household Labor Force Survey (HLFS). Although HLFS is an important primary microdata source for labor market analysis in Türkiye, this study relies on

ILO data because the latter provide harmonized occupational indicators that are readily comparable across years and directly suited for the occupation-year panel framework employed here. The main reason for this preference is that the ILO database provides harmonized and internationally comparable indicators at the occupational level, allowing the construction of a consistent occupation-by-year panel for the period 2014–2023. Since the empirical design of this study focuses on the association between occupational gender wage disparities and female employment across occupational groups over time, the ILO data offer a directly usable and standardized structure for this purpose. Although HLFS constitutes a rich primary microdata source, the ILO database was preferred in this study because it provides a more readily comparable and harmonized occupational framework suitable for panel analysis. Descriptive statistics for the variables used in the study are presented in Table 1.

Table 1. Descriptive statistics

Variables	Mean	Min	Max	Std error	Skewness	Kurtosis
occupation wage disparities (owg)	11.9989	-29.2000	33.2000	1.0770	-0.8183	2.3037
ln occupation female employment (lofe)	13.5447	12.0926	14.6810	0.0797	-0.2394	-1.3898

The results of the Shapiro–Wilk, D’Agostino K^2 , Jarque–Bera and Anderson–Darling normality tests conducted for the variables are presented in Table 2. For the owg variable, all tests yielded p-values below 0.05; this indicates that the null hypothesis of normality has been rejected and points to the presence of skewness and kurtosis effects. Similarly, for the lofe variable, all tests revealed significant deviations from normality, leading to the rejection of the normality assumption.

Table 2. Normality tests

Tests	owg	lofe	Error term
Shapiro W	0.9518	0.9113	0.9333
Shapiro W (p value)	0.0022***	0.0000***	0.0002***
K²	17.1179	71.4849	17.2914
K² (p value)	0.0002***	0.0000***	0.0002***
JB	26.4354	7.9696	-
JB (p value)	0.0000***	0.0186***	-
AD stat	0.9239	2.9636	1.2941
AD 5% critical value	0.7560	0.7560	0.7560
Refuse for 5%	true	true	true

Note: $n = 90$ for both owg and lofe variables.

Diagnostic tests indicate the presence of heteroskedasticity and serial correlation in the error terms, as well as deviations from normality. These findings justify the use of robust estimation techniques. Detailed test results are reported in Appendix A.

4.2. Method

The empirical strategy of this study is designed to capture both the average and distributional effects of occupational gender wage disparities on female employment. While traditional mean-based estimators provide useful insights into the overall relationship, they may conceal substantial heterogeneity across occupational groups with differing employment structures. Given that female employment in Türkiye is characterized by strong occupational segmentation and uneven distribution across sectors, a single-equation average model may fail to adequately reflect these structural differences. Therefore, a dual-method approach is adopted. First, a panel fixed effects model is employed to estimate the average relationship while controlling for unobserved time-invariant heterogeneity across occupations and common time effects. Second, quantile regression is utilized to uncover how this relationship varies across different points of the employment distribution. This combined framework allows for a more comprehensive and distribution-sensitive analysis, aligning the econometric methodology with the structural characteristics of the labor market under investigation.

Overall, this empirical strategy is designed to provide a robust and distribution-sensitive analysis of the association between occupational wage disparities and female employment, rather than establishing strict causal inference.

Accordingly, differences between mean-based and quantile-based results are expected and interpreted as evidence of heterogeneous relationships rather than model inconsistency.

4.2.1. Panel Fixed Effects Model with HAC Standard Errors

The panel fixed effects model relies on several key assumptions. First, it assumes that unobserved heterogeneity across occupational groups is time-invariant and can be captured through fixed effects. This is particularly relevant in the present study, as occupational characteristics such as skill requirements, sectoral structure, and gender composition are likely to remain relatively stable over time. Second, the model assumes strict exogeneity, meaning that the explanatory variable (*owg*) is not correlated with the idiosyncratic error term. While this assumption may be restrictive in practice, the estimates are interpreted as conditional associations rather than causal effects. Finally, the fixed effects approach is preferred over alternative specifications, such as random effects, due to the likelihood that unobserved

occupational characteristics are correlated with the explanatory variables. Moreover, given the structural nature of occupational differences in Türkiye, the fixed effects specification provides a more reliable framework for controlling for unobserved heterogeneity compared to pooled or random effects models.

To estimate the average relationship between occupational wage disparities (*owg*) and female employment (*lofe*), a panel fixed effects model is employed as the baseline specification. Occupational and year dummy variables are included in the model to capture fixed effects, allowing the estimation to control for unobserved heterogeneity across occupations and common time-specific shocks. This specification accounts for unobserved heterogeneity across occupational groups and over time by incorporating both occupation and year fixed effects (Baltagi, 2005). However, standard panel estimators rely on the assumptions of homoskedasticity and the absence of serial correlation in the error terms—assumptions that were violated in the present dataset. Diagnostic tests indicated the presence of non-normal residuals, heteroskedasticity, and first-order autocorrelation.

To correct for these violations, Heteroskedasticity and Autocorrelation Consistent (HAC) standard errors, specifically the Newey–West estimators, were utilized in the fixed effects framework (Newey and West, 1987). This adjustment allows for consistent and efficient inference even under conditions of heteroskedastic and serially correlated disturbances (Wooldridge, 2010). The choice of HAC standard errors is further supported by diagnostic test results indicating heteroskedasticity and serial correlation (see Appendix A).

The coefficient β_1 captures the marginal effect of occupational gender wage disparities on female employment, conditional on occupation-specific and time-specific fixed effects. The panel fixed effects model with HAC robust standard errors is specified as follows:

$$lofe_{it} = \beta_0 + \beta_1 owg_{it} + \alpha_i + \gamma_t + \varepsilon_{it} \quad (1)$$

Where:

$lofe_{it}$: log of female employment for occupation group *i* at time *t*

owg_{it} : occupational wage disparities for occupation group *i* at time *t*

α_i : occupation-specific fixed effect capturing time-invariant unobserved heterogeneity

γ_t : year-specific fixed effect controlling for common temporal shocks

ε_{it} : error term, adjusted for heteroskedasticity and autocorrelation (HAC-adjusted)

4.2.2. Quantile Regression with HAC Standard Errors

While the panel fixed effects model provides estimates of the average effect of *owg* on *lofe*, it does not account for potential heterogeneity in the relationship across the conditional distribution of the dependent variable. To address this limitation, quantile regression techniques were employed to estimate the impact of *owg* at different points of the *lofe* distribution—specifically at the 25th, 50th, and 75th percentiles (Koenker and Bassett, 1978). The quantiles $\tau = 0.25, 0.50$, and 0.75 are selected to represent low, median, and high levels of female employment across occupations. This choice allows for a balanced examination of distributional heterogeneity without focusing excessively on extreme tails, and follows a commonly adopted approach in the empirical literature.

Given the presence of non-normality, heteroskedasticity, and autocorrelation in the residuals, the quantile regression models were estimated using Heteroskedasticity and Autocorrelation Consistent (HAC) standard errors, following the Newey–West correction (Newey and West, 1994). This approach ensures robust and consistent inference across conditional quantiles, providing a more comprehensive understanding of distributional effects (Koenker, 2005). This correction is particularly important in the present study, as the panel structure is relatively short in the time dimension but exhibits potential serial dependence across years within occupational groups.

The quantile regression model with HAC is specified as:

$$Q_{\tau}(lofe_{it} | owg_{it}, \alpha_i, \gamma_t) = \beta_{0(\tau)} + \beta_{1(\tau)}owg_{it} + \alpha_{i(\tau)} + \gamma_{t(\tau)} \quad (2)$$

Where Q_{τ} denotes the τ -th conditional quantile of *lofe*. Separate models are estimated for $\tau = 0.25, 0.50$, and 0.75 .

Unlike mean-based estimators, quantile regression does not impose a constant marginal effect across the distribution, allowing the impact of wage disparities to differ between low-, medium-, and high-employment occupational groups.

5. Results

According to the results obtained from the panel fixed effects estimation, the occupational wage disparities (*owg*) variable is found to be statistically insignificant ($p = 0.3483$) when occupation- and time-specific fixed effects are incorporated and heteroskedasticity as well as autocorrelation are corrected for using Newey–West Heteroskedasticity and Autocorrelation Consistent (HAC) standard errors (Table 4). This suggests that variations in occupational wage disparities do not exert a significant influence on female employment levels after controlling for unobserved heterogeneity.

The estimated fixed effects for occupational groups and years are presented as coefficients in the model output. These coefficients reflect the effects of each category relative to their respective reference groups-clerical services for occupation and 2014 for year. Accordingly, the year dummy coefficients represent the average change in female employment in a given year relative to 2014, holding other factors constant. The significant positive coefficients observed for the years 2017 through 2023 indicate a steady increase in female employment compared to the base year, with the largest effects occurring in the post-2020 period. This pattern likely captures structural and policy-related shifts in the labor market, as well as potential recovery effects following the COVID-19 pandemic. The statistical significance of most year fixed effects suggests that time-specific shocks, such as macroeconomic fluctuations, employment policies, and pandemic-related disruptions, exerted a considerable influence on female employment dynamics during the study period.

Table 4. Panel fixed effects estimation results (with HAC)

	Coef	Std error	t stat	p value
intercept	13.4588***	0.0517	260.4693	0.0000
owg	0.0027	0.0029	0.9441	0.3483
service and sales staff (dummy)	0.7029***	0.0589	11.935	0.0000
unqualified occupations (dummy)	0.7336***	0.025	29.3566	0.0000
qualified agricultural, forestry and aquaculture workers (dummy)	0.5396***	0.1023	5.2735	0.0000
professional occupation (dummy)	0.5350***	0.0428	12.4864	0.0000
craftsmen and related trades (dummy)	-0.6231***	0.0374	-16.6631	0.0000
technician (dummy)	-0.5949***	0.0405	-14.6739	0.0000
plant and machine operators and assemblers (dummy)	-1.0630***	0.0372	-28.5505	0.0000
manager (dummy)	-1.2150***	0.0697	-17.4241	0.0000
year 2015 (dummy)	0.0417	0.0384	1.0849	0.2816
year 2016 (dummy)	0.0882*	0.0477	1.8478	0.0688
year 2017 (dummy)	0.1434***	0.0519	2.7645	0.0073
year 2018 (dummy)	0.1718***	0.0514	3.3454	0.0013
year 2019 (dummy)	0.1783***	0.0488	3.6527	0.0005
year 2020 (dummy)	0.1369**	0.0562	2.4336	0.0175
year 2021 (dummy)	0.2174***	0.0551	3.9437	0.0002
year 2022 (dummy)	0.3084***	0.0585	5.2695	0.0000
year 2023 (dummy)	0.3372***	0.0651	5.1798	0.0000

Note: Heteroskedasticity and autocorrelation are corrected using Heteroskedasticity and Autocorrelation Consistent (HAC) standard errors based on the Newey–West adjustment. Statistical significance levels are denoted as * $p < 0.01$, $p < 0.05$, and $p < 0.10$. Occupational and year dummy variables are included to control for occupation-specific and time-specific fixed effects. The reference categories are “clerical services” for occupations and “2014” for years. A positive coefficient indicates higher female employment relative to the reference group, while a negative coefficient indicates lower employment.

The occupational dummy coefficients represent the relative differences in female employment levels across occupational categories compared to the reference group, which is clerical services. For instance, the coefficient of -1.2150 for the management occupation implies that, *ceteris paribus*, female employment in managerial positions is significantly lower than in clerical occupations when measured in logarithmic terms. The statistical significance of all occupational fixed effects indicates that unobserved occupation-specific characteristics play a substantial role in explaining variations in female employment. These findings suggest a persistent occupational segregation in the Turkish labor market, where women remain concentrated in certain job categories, reflecting structural and institutional constraints that shape gendered employment patterns. This highlights the need for targeted policy interventions aimed at enhancing women's participation in high-skill and managerial occupations.

The quantile regression results reveal that the effect of the occupational wage disparities (*owg*) on female employment varies significantly across different points of the conditional distribution of employment levels ($\tau = 0.25, 0.50, 0.75$) (Table 5). While the coefficient of *owg* is statistically insignificant at the lower quantile ($\tau = 0.25$), it becomes positive and statistically significant at the median and upper quantiles ($\tau = 0.50$ and $\tau = 0.75$), indicating that the wage disparities exerts a stronger influence in occupations characterized by higher female employment levels. This finding suggests the presence of heterogeneous effects that cannot be adequately captured by mean-based estimators such as the fixed effects model.

Table 5. Quantile regression estimation results (with HAC)

	Coef ($\tau = 0.25$)	p value	Coef ($\tau = 0.5$)	p value	Coef ($\tau = 0.75$)	p value
const	13.398***	0.0000	13.4247***	0.0000	13.4186***	0.0000
owg	0.0002	0.2282	0.0050***	0.0053	0.0093***	0.0000
service and sales staff (dummy)	0.7041***	0.0000	0.6565***	0.0000	0.5886***	0.0000
unqualified occu- pations (dummy)	0.7135***	0.0000	0.7565***	0.0000	0.7662***	0.0000
qualified agricul- tural, forestry and aquaculture work- ers (dummy)	0.4692***	0.0000	0.5479***	0.0000	0.6854***	0.0000
professional occu- pation (dummy)	0.4858***	0.0000	0.5269***	0.0000	0.5606***	0.0000
craftsmen and re- lated trades (dummy)	-0.5965***	0.0000	-0.6385***	0.0000	-0.06747***	0.0000
technician (dummy)	-0.634***	0.0000	-0.5945***	0.0000	-0.5815***	0.0000

Table 5. Quantile regression estimation results (with HAC) (Continue)

	Coef ($\tau = 0.25$)	p value	Coef ($\tau = 0.5$)	p value	Coef ($\tau = 0.75$)	p value
plant and machine operators and assemblers (dummy)	-1.0469***	0.0000	-1.0839***	0.0000	-1.1225***	0.0000
manager (dummy)	-1.3306***	0.0000	-1.1834***	0.0000	-1.0987***	0.0000
year 2015 (dummy)	0.068	0.1246	0.0272	0.546	0.0247	0.5323
year 2016 (dummy)	0.1388***	0.0023	0.0832*	0.0679	0.08260*	0.0528
year 2017 (dummy)	0.2153***	0.0000	0.1686***	0.0004	0.1345***	0.0036
year 2018 (dummy)	0.2494***	0.0000	0.185***	0.0001	0.1677***	0.0001
year 2019 (dummy)	0.2271***	0.0000	0.197***	0.0000	0.1716***	0.0000
year 2020 (dummy)	0.1513***	0.0018	0.1349***	0.0049	0.1611***	0.0002
year 2021 (dummy)	0.2427***	0.0000	0.2274***	0.0000	0.2217***	0.0000
year 2022 (dummy)	0.3293***	0.0000	0.3595***	0.0000	0.3272***	0.0000
year 2023 (dummy)	0.3785***	0.0000	0.3389***	0.0000	0.3981***	0.0000

Note: $\tau = 0.25, 0.50, 0.75$ gives the effect of the variables on observations with low female employment level, the effect on observations with average structure in terms of female employment and the effect on observations with high female employment level, respectively.

Furthermore, the quantile regression framework uncovers structural differences in female employment across occupational and temporal dimensions. Occupational dummy coefficients remain highly significant across all quantiles, confirming persistent gender-based occupational segmentation in the Turkish labor market. In contrast, the year dummy coefficients indicate a consistent upward trend in female employment, particularly after 2020, reflecting recovery and transformation effects following the COVID-19 pandemic. The varying magnitude and significance of coefficients across quantiles demonstrate that these structural and temporal effects are not uniform but instead differ across the employment distribution, emphasizing the importance of distribution-sensitive estimation techniques in gender employment analysis.

Figure 1 illustrates the estimated occupational dummy coefficients across the 25th, 50th, and 75th quantiles ($\tau = 0.25, 0.50, 0.75$). The results indicate that the influence of occupational categories on female employment is not uniform across the distribution, suggesting the presence of considerable heterogeneity. At lower quantiles ($\tau = 0.25$), the effects of several occupational groups appear relatively moderate or statistically insignificant, implying limited variation in employment outcomes among lower-employment segments. However, as the quantile level increases ($\tau = 0.75$), the magnitude and direction of the coefficients become more pronounced. This pattern suggests that certain occupational groups exhibit stronger positive or negative associations with female employment at higher employment levels, highlighting the structural segmentation of women's labor market participation across occupations.

Figure 1. Occupation dummy coefficients

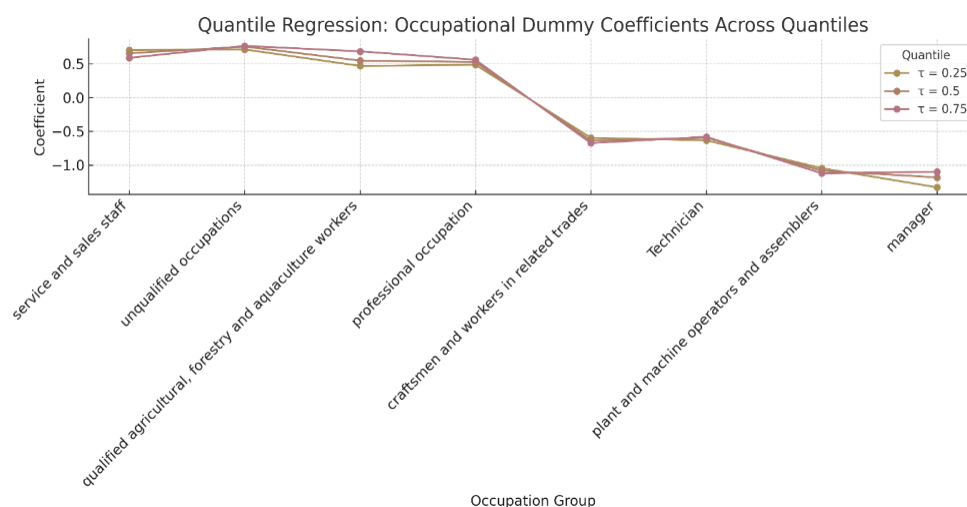


Figure 2. Year dummy coefficients

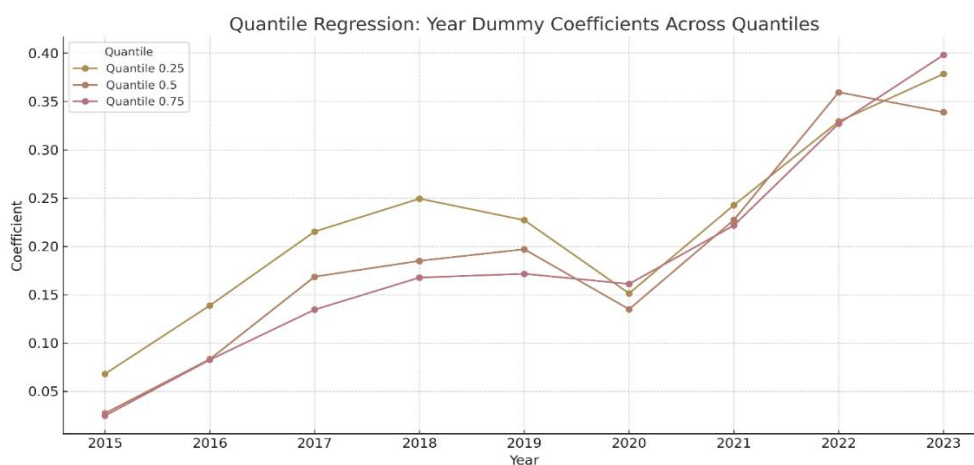


Figure 2 presents the estimated year dummy coefficients, capturing the temporal dynamics of female employment across quantiles. The results reveal a consistent upward trajectory in female employment from 2014 onwards, observable across all quantiles. This finding implies that the increase in female labor force participation has been a broad-based phenomenon, not confined to a specific employment segment, though the magnitude of change varies across quantiles. The post-2019 period, in particular, shows more substantial positive coefficients, indicating an acceleration in female employment possibly driven by post-pandemic

labor market adjustments and structural reforms. Overall, the temporal fixed effects confirm that time-specific shocks - such as macroeconomic conditions, policy interventions, and the COVID-19 pandemic - have played a significant role in shaping the evolution of female employment in Türkiye.

Taken together, the results presented in Figures 1 and 2 highlight the heterogeneous and dynamic nature of female employment patterns across occupational and temporal dimensions in Turkey. The quantile - specific estimates underscore that the effects of the occupational wage disparities and structural characteristics differ substantially along the employment distribution, indicating that women's labor market outcomes are shaped by both occupational segmentation and evolving macroeconomic conditions. While lower quantiles capture employment inertia and structural rigidity, higher quantiles reflect stronger positive responses to institutional and policy - driven improvements, particularly in the post-pandemic period. The upward shift in year effects across all quantiles suggests that recent financial and labor market reforms have contributed to a broad-based expansion of female employment. Overall, the distributional evidence confirms that gendered employment dynamics cannot be fully understood through average-effect models alone, and that quantile-based approaches provide a more nuanced understanding of labor market heterogeneity and the differential impact of structural reforms. This pattern should not be interpreted as inconsistency between estimation methods; rather, it reflects the presence of systematic heterogeneity across the employment distribution. While the fixed effects model captures only the average relationship, the quantile regression framework reveals that the association becomes stronger and more pronounced at higher employment quantiles.

The increasing magnitude of coefficients across quantiles indicates a structured and non-random pattern, suggesting that the observed heterogeneity is driven by underlying labor market segmentation rather than estimation instability.

6. Discussion and Conclusion

The findings of this study provide significant empirical insights into the relationship between occupational gender wage disparities and female employment dynamics in Turkey from 2014 to 2023. The results, when interpreted within the combined framework of human capital theory, institutional economics, and occupational segregation, underscore the complex and heterogeneous mechanisms through which gendered labor market structures influence employment outcomes.

The panel fixed effects estimation indicates that, after controlling for occupation- and time-specific heterogeneity, the occupational wage disparities does not exert a statistically

significant average effect on female employment. This finding implies that variations in occupational wage differentials alone do not determine women's labor force participation when structural and temporal fixed effects are considered. From a theoretical standpoint, this aligns with institutional economics, which emphasizes that labor market behavior is not solely driven by monetary incentives but also by non-wage institutional factors such as job security, childcare access, and social norms constraining women's economic agency (North, 1990; Rubery, 2015). The insignificant aggregate relationship thus reflects the embeddedness of female employment within institutional and social frameworks that moderate or even offset direct wage-related responses.

Beyond the baseline results, several noteworthy empirical patterns emerge from the analysis that warrant further interpretation. First, the year fixed effects are consistently positive and statistically significant for nearly all years after 2016, indicating a sustained upward trend in female employment relative to the base year. This pattern suggests that female employment in Türkiye has experienced a structural increase over time, particularly in the post-2019 period, which may reflect the combined effects of labor market adjustments, policy interventions, and post-pandemic recovery dynamics. Second, while occupational wage disparities do not exhibit a statistically significant average effect in the fixed effects model, the quantile regression results reveal a clear and systematic pattern of heterogeneity. The effect becomes positive and statistically significant at the median and upper quantiles, indicating that wage disparities are more strongly associated with female employment in occupations where women are already more concentrated. In this context, the lower quantile ($\tau = 0.25$) represents occupational groups with relatively low levels of female employment, the median quantile ($\tau = 0.50$) reflects occupations with moderate or average employment intensity, and the upper quantile ($\tau = 0.75$) corresponds to occupations where female employment is relatively high. This finding points to a segmented labor market structure, where wage-related incentives operate differently across employment strata. Finally, the persistent and significant occupational fixed effects confirm the existence of strong occupational segregation, with women remaining underrepresented in high-skill and managerial positions. Taken together, these results highlight that female employment dynamics in Türkiye are shaped not by a single uniform mechanism, but by the interaction of structural transformation, occupational segmentation, and distribution-specific responses to wage disparities.

Nevertheless, the significant fixed effects across occupational and temporal dimensions provide strong evidence of persistent structural segmentation in the Turkish labor market. The negative and statistically significant coefficients for managerial, technical, and industrial occupations confirm the existence of occupational segregation, whereby women remain concentrated in lower-wage and service-oriented sectors. These findings resonate with earlier

studies emphasizing structural and cultural barriers to occupational mobility (Kartal and Çoban, 2018; Khitarishvili, 2019; Beneito and Gómez, 2022). From a macroeconomic perspective, such patterns indicate allocative inefficiency in human capital utilization, leading to productivity losses and constraining potential output - an outcome that supports the theoretical view that gender inequality is not merely a social injustice but a macroeconomic inefficiency (Klasen and Lamanna, 2009; Cuberes and Teignier, 2016).

The quantile regression analysis provides a more nuanced understanding of this relationship by revealing substantial heterogeneity across the employment distribution. While the occupational wage disparities remains insignificant at the lower quantile ($\tau = 0.25$), it becomes positive and statistically significant at the median and upper quantiles ($\tau = 0.50$, $\tau = 0.75$). This distributional heterogeneity suggests that in occupational groups characterized by higher female employment, wage differentials have a more pronounced and positive association with female participation. This outcome may be interpreted through the lens of the human capital framework, which posits that women with higher educational attainment and skill levels - who are more prevalent in upper quantiles - respond more elastically to wage incentives (Becker, 1964; Mincer, 1974). In contrast, women in lower employment strata may face stronger institutional and socio-cultural constraints that dampen their responsiveness to wage differentials. Importantly, the divergence between the average (fixed effects) and quantile regression results should not be interpreted as a lack of consistency, but rather as evidence of distributional heterogeneity. The absence of a significant average relationship alongside significant effects at higher quantiles indicates that mean-based estimators may mask important structural differences across occupational groups.

The findings become more meaningful when the structural characteristics of the Turkish labour market are taken into account. In particular, the fact that wage inequalities only become significant in the middle and upper quintiles is closely linked to the sectoral and qualitative segmentation of female employment. Women in the lower employment quintiles in Turkey are predominantly concentrated in informal, low-skill jobs with limited wage flexibility, and these groups exhibit lower sensitivity to wage differentials. In contrast, women in the middle and high employment quintiles are predominantly employed in the education, health, public sector and skilled services sectors, and these groups become more responsive to wage incentives. While this aligns with the predictions of the human capital approach, it also highlights the decisive role of structural segmentation and sectoral differentiation in the Turkish labour market on female employment. Consequently, the heterogeneous effects observed should be interpreted not only as economic but also as a reflection of institutional and sectoral dynamics.

The year fixed effects further reveal a robust upward trend in female employment, particularly after 2020, indicating a structural transformation in the Turkish labor market in the post-pandemic period. This is consistent with global evidence showing that recovery phases often amplify women's participation in flexible, service-oriented, or remote occupations (ILO, 2020b; Stansbury et al., 2024). The increasing year effects across all quantiles point to macroeconomic and policy-driven improvements - such as enhanced labor market reforms, increased digitalization, and growing public attention to gender - inclusive employment policies - that have facilitated broader participation among women. These temporal dynamics confirm that gender wage inequality interacts with macroeconomic shocks and institutional change in shaping employment outcomes over time.

Taken together, the results support an integrative interpretation: while wage disparities alone may not explain aggregate female employment variations, they interact with institutional and structural factors that condition women's labor supply responses across different occupational and temporal contexts. The evidence from the quantile regression framework corroborates the theoretical argument that gender inequality operates through multidimensional channels-economic, institutional, and cultural - whose combined effects vary across the employment distribution. These findings align with the broader literature suggesting that reducing gender wage disparities and occupational segregation is not only a matter of social justice but also a prerequisite for enhancing macroeconomic efficiency, productivity, and long-term growth (Aguirre et al., 2012; IMF, 2018).

This study contributes to the empirical and theoretical understanding of gendered labor market dynamics by analyzing the occupational wage disparities-employment nexus in Turkey through both average-based and distribution-sensitive approaches. The findings indicate that while the occupational wage disparities has no significant average effect on female employment, the relationship is heterogeneous across the employment distribution and becomes more salient in higher-employment occupations. Moreover, persistent occupational segregation and significant year effects underscore the central role of institutional and macroeconomic factors in shaping women's employment trajectories.

From a policy perspective, these results highlight the need for multi-dimensional interventions that address both wage and structural barriers to female employment. Policies promoting pay transparency, gender-sensitive collective bargaining, expanded childcare infrastructure, and flexible working arrangements can enhance women's effective labor participation. Additionally, sectoral diversification policies aimed at increasing female representation in managerial and technical occupations could mitigate the structural inefficiencies arising from occupational segregation.

In macroeconomic terms, the evidence suggests that gender equality should be viewed as a growth - enhancing strategy rather than a purely social objective. Reducing the gender wage disparities and promoting inclusive labor market participation would not only improve equity outcomes but also strengthen aggregate productivity and economic resilience. Future research could extend this analysis by incorporating firm-level data, exploring nonlinear macroeconomic interactions, or evaluating the long-run growth effects of gender wage convergence. Overall, this study reaffirms that achieving gender equality in labor markets is fundamental to realizing Turkey's potential for sustainable and inclusive economic development.

It should be noted that the relationship between occupational gender wage disparities and female employment may be inherently bidirectional. While the empirical specification examines the impact of wage disparities on female employment, it is also plausible that the distribution of female employment across occupations influences wage structures themselves. For instance, a higher concentration of women in certain occupations may exert downward pressure on wages or reinforce existing wage differentials. This potential reverse causality implies that the estimated relationships should be interpreted as conditional associations rather than strictly causal effects.

It should be acknowledged that the relationship between the gender wage disparities and female employment may be bidirectional. Lower levels of female employment can reinforce wage disparities by limiting women's bargaining power and concentrating them in low-wage sectors, thereby perpetuating structural inequality in the labour market. This bidirectional mechanism suggests that wage inequality and female labor participation may mutually reinforce one another over time. Therefore, future research could focus on empirically identifying the direction and strength of this reciprocal relationship by employing causality - oriented econometric models, such as structural VAR or panel Granger causality frameworks, to provide a deeper understanding of the dynamic interaction between gender wage disparities and female employment.

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Appendix A.**Table A1.** Ramsey RESET test results

F test	p value
7.6695***	0.0072

Table A2. Diagnostic test results

Tests	LM statistic	p-value
Breusch–Pagan	50.5828***	0.0001
Breusch–Godfrey	45.9717***	0.0000