

DOI: 10.26468/trakyasobed.1702094

Trakya University Journal of Social Sciences, 27(2), 273–285, 2025

Gender-Based Income Inequality and Financial Vulnerability in the Turkish Labor Market: A Comparative Analysis Across Stem, Care, and General Sectors (2015–2023)

Türkiye İşgücü Piyasasında Toplumsal Cinsiyet Temelli Gelir Eşitsizliği ve Finansal Kırılganlık: Stem, Bakım ve Genel Sektörler Arasında Karşılaştırmalı Bir Analiz (2015–2023)

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ABSTRACT

This study investigates gender-based income inequality and informal employment in Türkiye's labor market from 2015 to 2023, focusing on sectoral, educational, and occupational differences. Utilizing model-based estimates from the International Labour Organization, it employs descriptive statistical analysis to examine hourly wage gaps and informality rates between male and female workers. Findings reveal that women are predominantly employed in low-paying care sectors while being marginally represented in high-paying Science, Technology, Engineering, and Mathematics fields. Despite rising educational attainment, women earn less across all fields and are more likely to work without formal protections when compared with men. These trends highlight a persistent form of gender inequality rooted not only in earnings but also in employment quality and access to social protection. This study argues that such disparities worsen the financial vulnerability of women and limit their broader financial inclusion. It concludes that addressing gender inequality requires a holistic approach—one that goes beyond employment rates to include wage justice, formalization, and inclusive economic policy reform.

Keywords: Gender, income inequality, informal employment, Science, Technology, Engineering, and Mathematics, care sector, financial vulnerability



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Received/Geliş Tarihi: 19.05.2025

Accepted/Kabul Tarihi: 24.10.2025

Publication Date/Yayınlanma Tarihi: 26.12.2025

To cite this article/Atıf: Çalışkan, MMT. (2025). Gender-based income inequality and financial vulnerability in the Turkish labor market: A comparative analysis across stem, care, and general sectors (2015–2023). *Trakya University Journal of Social Sciences*, 27(2), 273–285.



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ÖZ

Bu çalışma, 2015–2023 yılları arasında Türkiye işgücü piyasasında toplumsal cinsiyete dayalı gelir eşitsizliği ve kayıt dışı istihdamı sektör, eğitim düzeyi ve meslek temelli farklılıklar üzerinden incelemektedir. Uluslararası Çalışma Örgütü sağladığı model tabanlı tahminlere dayanan bu analiz, kadın ve erkek çalışanlar arasındaki saatlik ücret farklarını ve kayıt dışılık oranlarını betimsel istatistiksel yöntemlerle karşılaştırmaktadır. Bulgular, kadınların düşük ücretli bakım sektörlerinde yoğunlaştığını ve yüksek ücretli bilim, teknoloji, mühendislik ve matematik alanlarında yetersiz temsil edildiğini ortaya koymaktadır. Tüm eğitim düzeylerinde ise kadınlar erkeklerden daha az saatlik ücret almakta ve sosyal güvenceden yoksun bir şekilde çalışma olasılıkları daha yüksektir. Bu eğilimler, yalnızca ücret eşitsizliğini değil, aynı zamanda iş kalitesi ve ekonomik güvenlik ile ilgili daha geniş sorunları da vurgulamaktadır. Çalışma, kadınların finansal kırılganlığının hem ücret farkları hem de istikrarlı istihdam ve sosyal haklara sınırlı erişimle şekillendiğini öne sürmektedir. Toplumsal cinsiyete dayalı eşitsizlikler, bireysel refahın yanı sıra ekonomik istikrar ve kapsayıcı kalkınma açısından da risk oluşturmaktadır.

Anahtar kelimeler: Toplumsal cinsiyet, gelir eşitsizliği, kayıt dışı istihdam, bilim, teknoloji, mühendislik ve matematik, bakım sektörü, finansal kırılganlık

EXTENDED ABSTRACT

Gender-based labor market differences have been persistent structural barriers to economic equality over time. This research examines gender-based income inequality and financial susceptibility in the Turkish labor market during the 2015–2023 period, focusing on three key segments: Science, Technology, Engineering, and Mathematics (STEM), care services, and the entire labor force. Utilizing model-based estimates from the International Labour Organization (ILO), this research employs a multi-dimensional framework to examine earnings gaps and informal employment rates by gender, industry, and level of education.

This paper's primary purpose is to empirically investigate the structural causes and forms of gender-differentiated labor market inequalities in Türkiye and their consequences for financial exclusion. The paper differs from mainstream approaches that measure labor force participation as an overview indicator of women's and men's inclusion. Instead, it pays special attention to wage equalities, occupation sorting, and access to formal employment as more discriminative indicators of gender equality. Toward this end, it shows how wage differentials and informality signal more than distributional inequality of earnings and, more importantly, contribute to entrenching women's financial exclusion and vulnerability over time. This paper assumes special significance in a global context that considers gender equality as a matter of social justice and an economic imperative for sustainable development.

Utilizing descriptive statistical analysis on ILO Statistical Database's model-based estimates, this research examines gender-based income inequality and financial susceptibility in the Turkish labor market during the 2015–2023 period. Key indicators include average hourly wages and informal employment rates, disaggregated by gender, sector, occupation, and educational attainment. Three focal comparisons structure the analysis i.e., (1) general labor market wage disparities, (2) sectoral contrasts between male-dominated STEM and female-dominated care services, and (3) wage differences across educational levels. Informality rates are also examined as proxies for employment precarity and social security exclusion. The gender pay ratio (female-to-male earnings) and absolute wage gaps are calculated annually and illustrated graphically to identify trends and inflection points over time.

The findings reveal that qualitative inequalities persist despite increased female labor force participation over the analyzed period. In the general labor market, although some years exhibit parity or even a marginal female advantage in hourly wages, these outcomes are inconsistent and often reflect temporary shifts in employment composition rather than structural equity. In STEM fields, male workers consistently earn more than their female counterparts, except for a single year (2017) when parity was briefly achieved. However, this was followed by a return to significant gender wage gaps, suggesting that the equalization was anomalous and not indicative of sustained change.

The wage gap in care services is even more pronounced. In these traditionally female-dominated sectors, women earn significantly less than men, only 70% to 75% of male earnings across most years. This persistent undervaluation is interpreted not merely as a wage disparity but as a form of structural devaluation of women's labor, particularly in sectors associated with emotional and reproductive work.

EXTENDED ABSTRACT

Furthermore, informal employment disproportionately affects women. Throughout the 2015–2023 period, female informal employment rates consistently exceeded those of men by 2 to 5 percentage points, peaking at a 5.6-point difference in 2017. Informality limits women's access to essential social protections, such as pensions, unemployment benefits, and healthcare, thereby worsening their economic vulnerability, especially in later life.

When controlling for education, gender-based wage gaps remain evident across all levels of educational attainment. Even among Ph.D. holders, women earn less than men, although the gap narrows. This challenges assumptions that education alone can rectify wage inequality and points to the enduring influence of institutional discrimination, glass ceiling effects, and occupational gender stereotyping.

This research highlights the structural and persistent nature of wage-based gender inequality and financial vulnerability in Türkiye. Even as progress is noted in women's educational attainment and labor force participation, they remain subject to systemic imbalances that educational policy cannot remedy entirely. The evidence reveals that the wage gaps might be conditioned by the wider institutional framework of labor markets, particularly in terms of how distinct types of labor are socially valued and economically rewarded.

From a financial inclusion perspective, this research significantly contributes to an understanding of how wage discrimination, combined with high rates of informal work, limits women's ability to accumulate savings, secure credit, and make decisions about their financial futures over more than one year. These limitations not only impact personal financial security but also have negative spillover effects on aggregate demand and financial system growth, potentially creating macroeconomic vulnerabilities for the system overall.

In this age of digitization, gender inequality also manifests in the form of unequal online visibility and representation. Women in high-prestige sectors, such as STEM, are increasingly visible on social networking platforms, while women employed in precarious care-related jobs have a lower digital presence. This reflects the phenomenon of algorithmic invisibility, in which algorithm-based platforms tend to privilege already visible groups while marginalizing others. As a result, feminized forms of low-paying and insecure labor remain largely unseen in the digital space, reinforcing existing gendered hierarchies of work (Duffy & Hund, 2019; Fotopoulou, 2017).

Introduction

Gender equality is not only a fundamental human right but also a key factor in reducing poverty, accelerating economic growth, and achieving the goals of sustainable development. Studies by the Organisation for Economic Co-operation and Development (OECD, 2012) and the World Bank (2011) emphasize that improving gender equality generates economic benefits not only for individuals but for society as a whole. The position of women in the labor market is closely linked not only to their participation status but also to the sectors in which they are employed, the conditions under which they work, and the level of income they receive. Wage inequality, informal employment, and sectoral gender segregation are among the main indicators of the structural inequalities women face in the labor market. In the Turkish context, studies have shown that women are predominantly employed in low-knowledge, service-based sectors, where gender-based wage disparities tend to deepen further (Aktaş & Uysal, 2016; Tansever, 2022). Similarly, international literature highlights that women's concentration in low-wage jobs is not incidental but rather the outcome of structural, gender-based barriers (Blau & Kahn, 2017).

Although women's participation in Türkiye's labor force increased during the 2015–2023 period, the gender wage gap remained pronounced, and the risk of informal employment for women stayed consistently high. Research has shown that women are predominantly employed in low-wage and insecure sectors, a pattern that significantly contributes to higher rates of informality (Aktaş & Uysal, 2016; Tiryaki-Yenilmez, 2023). Moreover, Varışlı (2021) and Şahin and Develi (2021) emphasize that women's labor—particularly in rural areas and service sectors—is often performed without access to social protection, reinforcing informality as a structural domain of inequality for women.

The concentration of women in low-wage and insecure sectors such as care services is a clear indicator of horizontal gender segregation in the labor market. In Türkiye, women are predominantly employed in traditional sectors, such as education, healthcare, and social services, which not only exacerbates wage disparities but also reinforces economic insecurity (Gözüm, 2024). Conversely, women remain markedly underrepresented in Science, Technology, Engineering, and Mathematics (STEM) fields, often linked to male dominance

and higher pay, further deepening sectoral gender inequality (Uysal & Erbilin Üçışık, 2025). International studies similarly indicate that the channeling of women into lower-paying occupations systematically contributes to both income disparities and social exclusion (Blau & Kahn, 2017; England, 2010). Although higher education levels have encouraged women to enter the workforce, empirical research shows that this progress has not translated directly into wage parity. Even at the level of higher education, women in Türkiye earn less than men and face limited opportunities for advancement (Aktaş & Uysal, 2016). Similarly, international studies reveal that despite achieving higher educational attainment, women still encounter persistent wage gaps due to the glass ceiling, overwork culture, and discriminatory promotion practices (Blau & Kahn, 2017; Cha & Weeden, 2014).

Gender inequality should not be assumed solely as a matter of social justice; it must be recognized as a structural issue that directly impacts individuals' financial well-being, income sustainability, and economic vulnerability. The literature consistently shows that women's concentration in low-wage sectors and their limited access to financial inclusion are among the primary factors undermining their personal savings capacity, long-term economic security, and overall welfare (Ghosh & Vinod, 2017; Klasen, 2004; Seguino, 2010). Employment in low-wage and informal settings restricts women's income levels, impairs their ability to save, limits their access to the formal financial system, and weakens their integration into social protection schemes. This situation undermines women's financial autonomy at the individual level and constitutes a structural barrier to achieving financial inclusion goals at the societal level (Demirgüç-Kunt et al., 2018; Ghosh & Vinod, 2017; Sioson & Kim, 2019).

This study aims to conduct a comparative analysis of gender-based wage inequality and differences in informal employment in Türkiye during the 2015–2023 period, focusing on key determinants such as sector, occupational group, and educational level. Using data published by the International Labour Organization (ILO), the analysis evaluates wage gaps and informal employment rates between female and male workers over time, both in the overall labor market and specifically within STEM and care sectors. It also examines how hourly earnings vary by gender across different educational levels, thereby providing an empirical foundation for discussions on equal opportunity. The core objective of the study is to examine the deepening structural inequalities between women's labor force participation and financial autonomy in Türkiye through a multi-dimensional lens and to highlight how these inequalities influence broader goals related to sustainable development and social justice. In doing so, the study seeks to contribute to data-driven awareness for policymakers, scholars, and civil society actors working to address gender-based economic disparities.

Literature Review

Labor market inequalities on gender grounds have been adequately established within both domestic and international literature for several decades. Various studies reveal that inequality within the labor market is not solely explicable by variations within participation; instead, this is multi-dimensional and requires analysis through wage differentials as its analytic lens. This holds true for Türkiye. Aktaş and Uysal (2016) reveal that women are concentrated in low-paying services and that their wage differentials are on an upward trajectory. More recently, Gökten and Küçük (2023) emphasize that women's employment remains highly precarious, shaped by both low wages and the persistence of informality. Similar global patterns are also observed, as Blau and Kahn (2017) demonstrate that structural barriers in occupational segregation, as well as persistent discrimination, continue to maintain wage differentials, even among highly educated women.

This STEM-care divide is further a constituent factor of sex segregation by occupation. While men hold a dominant presence in high-paying STEM occupations, women are disproportionately represented in undervalued caring professions (England, 2010; Sassler et al., 2016). Such undervaluing is sustained by more than mere market forces, as strongly pervasive social norms interconnecting unpaid domestic work and caregiving work exist (ILO, 2018). Such occupations are poorly paid and systematically excluded from formal protections and benefits, which results in women becoming financially precarious (England et al., 2002; Folbre, 2006; Razavi, 2007).

Feminist theorists Federici (2012) and Fraser (2016) provide theoretical frameworks for understanding gender-based inequality in labor as simultaneously economic, social, and cultural. Both Federici's "invisible labor" and Fraser's "social reproduction" frameworks reveal that women's unpaid and low-paid labor, particularly caregiving labor, is inherently undervalued even though its very economic value is significant. These types of inequalities are similarly perpetuated by systems of institutions and policy omissions that fail to recognize the divisions of labor based on gender.

Informal labor contributes to further deepening labor-based gender inequalities. Findings from Tiriyaki-Yenilmez (2023) and Varışlı (2021) reveal that women in Türkiye persistently remain more engaged in informal activities and are employed in informal segments that lack benefits such as healthcare, pensions, and labor protections. The ILO (2022) holds that informal labor disproportionately affects women, particularly in services and agricultural sectors in rural areas, and subjects them to poverty and exclusion in the formal financial system.

Besides labor market segmentation and informality, financial exclusion is yet another aspect of inequality. Financial exclusion is more pronounced among women due to their weak savings rates, limited income levels, and constrained asset holdings (Demirgüç-Kunt et al., 2018; Ghosh & Vinod, 2017). Such circumstances restrain women's ability to achieve financial security in the long term, amass retirement wealth, or get affordable credit, further perpetuating cycles of vulnerability.

Seguino (2010) and OECD (2012) extend the implications to macroeconomics and demonstrate that gender-based discrimination in pay and job holding not only hampers individual well-being but also potentially curbs household savings, stifles aggregate demand, and impedes financial system deepening. Therefore, gender equality is more than a social justice imperative; it is an economic growth policy.

Financial vulnerability is commonly understood not only as exposure to income instability but also as limited access to formal financial services, savings mechanisms, and social protection. Studies emphasize that households with unstable earnings, weak integration into financial markets, and inadequate social safety mechanisms are more likely to experience persistent financial fragility (Lusardi et al., 2011; Stiglitz & Weiss, 1981). In this sense, gender-based income disparities and informality in the labor market constitute structural determinants of household financial vulnerability in emerging economies.

The connection between education and equal pay is also complex. While higher education is associated with greater earnings, various studies have reported that women remain less compensated than men at all educational levels (Hunt, 2016; Kabeer & Natali, 2013). As proposed by Cha and Weeden (2014), highly educated women and men still experience persistent wage gaps due to embedded organizational norms, overwork norms and practices, and sexist leadership stereotypes. Ceci et al. (2014) also point out that women pursuing technical and academic careers face glass ceilings and structural promotion challenges even with similar qualifications.

With digitization as their backdrop, media sites are new sites of labor inequality expression and negotiation. In Türkiye, the hashtags #eşitücret (equal pay) and #kadıngücü (women's power) have been used to communicate workplace experience and to draw attention to cries for justice. While hashtags explicitly criticizing women's labor exploitation have been shared in online platforms (Duffy & Hund 2019; Fotopoulou 2017), algorithmic discrimination and platform dynamics also frame online visibility and render invisible women in low-status occupations like caregiving.

Given these results, numerous studies recommend gender-sensitive policy interventions that go beyond employment

rates to ensure wage justice, financial inclusion, and social protection. Comparison studies point out that nations with active care policies, regulations on transparency in wages, and inclusive financial structures, such as in the Nordic countries, have achieved significant improvements in closing the gender gaps (OECD, 2012; United Nations Entity for Gender Equality and the Empowerment of Women, 2021). In all of these aspects, financial innovations through fintech are gradually emerging as tools for promoting financial inclusion for otherwise excluded groups, including women, through credit reduction barriers, savings barriers, and payment system barriers (Sioson & Kim, 2019). These technologies need to be developed equitably so that existing biases are not reinforced.

More recent country-specific studies also emphasize that reducing gender inequality in Türkiye demands more nuanced and data-driven efforts. For example, Kılınç and Işık (2023) reveal significant regional heterogeneity in the gender wage gap figure, and Gözümlü (2024) highlights institutional and occupational barriers that still hinder women's performance in the labor market. Building on these examples, the evidence presented in this paper adds to the existing debate on gender equality and calls for an integrated policy framework addressing labor rights, earnings distribution, and access to financial services.

Methodology

This research uses an integrated approach to examine gender-based earnings inequality and informal job differences in the Turkish labor market while considering sectoral and demographic differences. This study's data rely on model-based estimates produced by the ILO, spanning from 2015 to 2023 and providing high international comparability. The data were accessed through the ILO (2024), ILOSTAT database and contain socioeconomic disaggregation by gender, sector, occupation group, level of educational attainment, and employment contract type.

Data Source and Indicators

This research's primary data source consists of labor force statistics published through the ILO's Modelled Estimates system, which include gender-disaggregated data for Türkiye. The dataset covers the 2015–2023 period and enables annual, comparative analysis of average hourly earnings and informal employment rates for male and female workers. The data are disaggregated by sector and occupational group, allowing for a more detailed examination of gender-based differences.

For this study, the key indicators were carefully selected to enable a multi-dimensional comparison of the position of male and female workers in the labor market. In the first stage, overall average hourly earnings for women and men were used to assess

basic wage disparity. In the second stage, two contrasting sectoral structures, strongly shaped by gender roles, were examined: the STEM sector, which is high-paying and male-dominated, and the care services sector, which is low-paying and predominantly female. Third, the impact of educational attainment on women's earnings was analyzed by comparing hourly wages across different education levels. Finally, informal employment rates were assessed by gender as a proxy for job insecurity and limited access to social protection. These indicators allow for an evaluation not only of employment levels but also of women's economic agency and financial independence.

Method of Analysis

Descriptive statistical techniques were employed to analyze the data used in this research. For each indicator, annual observations for male and female workers were systematically extracted for the 2015–2023 period. First, the ratio of women's average hourly earnings to men's was calculated, and changes in this ratio over time were illustrated graphically. Additionally, the absolute wage gap (male minus female earnings) and its percentage equivalent were computed to estimate the magnitude and direction of wage inequality.

Likewise, informal employment rates were calculated separately by gender, making it possible to establish the extent to which women are more likely to be employed informally compared to men. The evolution of this gap over time served as a key indicator for analyzing women's vulnerability in the face of limited social protection.

All analyses were supported by line and bar graphs, and comparative annual tables were used to present sectoral and gender-based disparities. The primary aim of these analyses was to demonstrate how gender inequality manifests structurally not only in employment rates but also in wage differences and access to social protection mechanisms (Kabeer & Natali, 2013; Seguino, 2010).

Descriptive analytical methods were employed for this study because the dataset, characterized by time-series structure and categorical differences, is best suited for identifying trends and distribution-based disparities through such techniques. While descriptive analysis was deemed most appropriate, exploratory inferential tests were also conducted. Detailed discussions are provided in the Study Limitations section.

Study Limitations

Since the data used in this study are based on modeled estimates developed by the ILO rather than official administrative records, they may exhibit a certain degree of predictive error, particularly in areas such as informal employment. Missing observations were noted for specific variables in some years, limiting

the scope of year-to-year comparative analysis for certain subgroups. Moreover, as the ILO data are annual model-based estimates and micro-level datasets are not accessible, descriptive statistical methods were preferred over advanced econometric techniques. Accordingly, the findings are interpreted through statistical patterns and observable differences, and assessments of structural inequality are made with caution and within a limited analytical scope. Nevertheless, the overall integrity and comparability of the data across the 2015–2023 period were largely preserved. The dataset's detailed socio-demographic breakdowns enabled the implementation of comprehensive gender-based analyses.

Furthermore, independent samples t-tests were applied to identify whether the observed gender-based wage differences in selected sectors (e.g., care services and STEM) were statistically significant. The results did not reach conventional thresholds for significance ($p > 0.05$), likely due to the small number of annual observations and considerable within-group variance. Therefore, these tests were not emphasized in the main findings section; instead, descriptive trends were prioritized. This limitation underscores the need for future research to utilize richer micro-level datasets to validate these sectoral disparities with greater statistical rigor.

Findings

This section presents an empirical analysis of gender-based differences in income and informal employment in the Turkish labor market during the 2015–2023 period. This study compares average hourly earnings and informal employment rates between female and male workers across four domains: the overall labor market, STEM fields, care services, and educational attainment levels. This multi-dimensional breakdown aims to reveal not only sectoral segregation but also qualitative disparities in employment. The findings are supported by comparative tables and visual graphics that illustrate how gender-based differences have evolved. The results indicate that women are not only paid less than men but are also disproportionately employed in insecure, informal, and unprotected sectors. The following subsections provide a detailed thematic evaluation of these disparities.

Wage Inequality in the General Labor Market (2015–2019)

From 2015 to 2019, the average hourly earnings of male and female workers remained relatively close in the Turkish labor market, although fluctuations were observed from year to year, sometimes favoring men and at other times women. In 2015, the average hourly wages for women and men were virtually identical—6.16 TL for women and 6.15 TL for men. The gender pay ratio for that year was calculated as 1.00, and the absolute wage difference was negligible at –0.003 TL (Table 1).

Table 1. Gender-based hourly earnings

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023
Female	6.16	7.03	7.20	7.51	8.93	12.04	13.40	17.20	33.77
Male	6.16	6.84	6.98	7.60	8.93	10.95	13.52	17.64	35.27
Gender pay ratio (F/M)	1.00	1.03	1.03	0.99	1.00	1.10	0.99	0.97	0.96
F/M = Female/Male									
Source: ILO Statistical Database, 2024									

In 2016 and 2017, women's earnings surpassed those of men. In 2016, women earned an average of 7.03 TL per hour, while men earned 6.84 TL, resulting in a female-to-male pay ratio of 102.7% and a wage advantage of 0.18 TL for women. Similarly, in 2017, women's hourly earnings increased to 7.20 TL compared to 6.98 TL for men. The fact that during these two years, women had higher hourly earnings than men may suggest that female employment was relatively concentrated in higher-paying sectors at the time. Such a shift could be explained by a temporary increase in the representation of women in sectors with higher wage averages. Indeed, Kricheli-Katz and Regev (2016) note that women may benefit from more favorable pricing under specific market conditions, while the ILO (2022) emphasizes that such differences are often the result of temporary shifts in sectoral and temporal labor force composition. The reemergence of male-favored wage differentials in subsequent years suggests that the earlier advantage for women was likely driven by short-term compositional factors rather than genuine structural wage equality. Similarly, Kılınç and Işık (2023) argue that gender-based wage parity in the Turkish labor market is rarely sustainable and often shaped by sectoral and regional employment variations.

By 2018, a slight wage gap reemerged in favor of men: Women earned 7.51 TL per hour, while men earned 7.60 TL. Although the difference was minimal—only 0.09 TL—the gender pay ratio dropped to 0.988, indicating that women had lost their previous earnings advantage. In 2019, the earnings ratio returned to a state of parity, with both genders earning approximately an average of 8.93 TL per hour.

These findings indicate that during the 2015–2019 period, no dramatic wage gap between male and female workers in the general labor market was observed; however, the gender pay ratio fluctuated from year to year, likely influenced by sectoral, institutional, or regional differences. Similarly, Şentürk and Demir (2022) observe that wage inequality in Türkiye differs significantly by sector and region. Apparent female advantages in average earnings during certain years may reflect statistical distortions caused by the overrepresentation of women in low-wage and flexible jobs. As Doğan (2022) points out, such averages can create a false impression of equality because the sectors in which women are overrepresented tend to be

structurally underpaid. Şentürk and Demir (2022) further note that women in Türkiye are often channeled into low-status and informal positions, particularly in the service and trade sectors. Therefore, wage distributions that appear equal, or even favorable to women, should not be taken at face value, as they may reflect temporary effects rather than long-term structural shifts. Examining inequalities within gender-coded sectors, such as STEM and care services, is necessary for revealing structural disparities that general statistics may conceal. Indeed, Doğan (2022) emphasizes that gender roles push women into low-paying and devalued occupations, while Şentürk and Demir (2022) demonstrate that female labor is often concentrated in informal and low-status jobs within services and commerce.

Gender-Based Earnings Disparities in STEM Occupations

STEM occupations are typically associated with high-wage, skilled employment and are often perceived as male-dominated sectors. As shown in Table 2, a comparison of the hourly earnings of men and women employed in STEM fields in Türkiye during the 2015–2019 period reveals that gender-based wage disparities appear to be systematic and noteworthy.

In 2015, male employees in STEM fields earned an average of 10.71 TL per hour, while female employees earned 10.12 TL, resulting in a gap of nearly 0.60 TL. This difference indicates that women earned only 94.4% of men's earnings. Although the ratio improved to 96.6% in 2016, women's average hourly earnings remained lower than those of men. Interestingly, 2017 marked the only year in which the wage gap between men and women nearly equalized: Both genders recorded an average hourly wage of 11.19 TL, the gender pay ratio reached 1.00, and the wage gap was effectively eliminated.

However, the equalization of hourly earnings between male and female STEM employees in 2017 proved to be a temporary development, as this parity was disrupted in the following years. In 2018, women earned an average of 11.71 TL per hour, while men earned 12.15 TL, resulting in a wage gap of 0.44 TL. This indicates that women earned only 96% of men's wages that year. In 2019, the gap grew even wider: Men's hourly earnings averaged 14.26 TL and women's averaged 13.22 TL, a gap of 1.04 TL. These statistics increase the likelihood that the wage equality achieved in 2017 was atypical and that subsequent

Table 2. Gender-based earnings gap in the STEM sector

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023
Female	10.12	10.89	11.19	11.71	13.22	15.08	19.58	24.12	49.12
Male	10.71	11.27	11.19	12.15	14.26	16.47	21.19	27.76	54.25
Gender pay ratio (F/M)	0.94	0.97	1.00	0.96	0.93	0.92	0.92	0.87	0.91

Source: ILO Statistical Database, 2024

resurgences of male-favored wage gaps could be interpreted as continuing structural imbalances in the sector based on trends observed. As Sassler et al. (2016) note, STEM wage gaps by gender do not exist solely due to individual merit but also due to structural factors, including sectoral structure, leading gender norms, and women's underrepresentation.

To account for latent explanations for such imbalances, it is crucial to consider structural elements that define women's experience within STEM fields. The revelation that women within STEM fields are underpaid relative to men with equivalent qualifications and abilities cannot be explained by individual explanations alone. Instead, this is more closely tied to discriminatory pay practices within the industry and the unequal regime of promotions, as well as the pervasive impacts of the glass ceiling (Ceci et al., 2014). For instance, Sassler and Mayerhofer (2023) observe that women in computer science earn less than their male counterparts, a disparity influenced by family concerns and human capital attributes. Invisible barriers that keep women from being as widely represented as men in high-paying technical fields do not result from personal deficiencies but from institutional prejudice and system-wide discrimination. Hunt (2016) indicates that women STEM graduates more often leave the profession due to unconscious bias in the workplace, restricted opportunities for promotion, and common social expectations, which collectively undermine their participation in STEM fields.

Gender-Based Wage Inequality in the Care Services Sector

In Türkiye, the care services sector has traditionally been characterized by the concentration of female workers, low wages, and widespread forms of precarious employment. A comparison of the average hourly earnings of men and women employed in this sector during the 2015–2019 period clearly reveals that women consistently earned significantly less than their male counterparts (Table 3).

In 2015, the average hourly wage of women working in the care services sector was recorded at 7.94 TL, while it reached 11.36 TL for men. This difference, amounting to 3.43 TL, is significantly large and indicates that women earned only 69.8% of what their male counterparts received. A similar trend continued in 2016; although women's wages increased to 8.68 TL, men earned 12.01 TL, maintaining a gender pay ratio of 72.3%.

In the following years, although women's hourly wages continued to increase, the wage gap between the sexes not only persisted but also widened in absolute terms. In 2017, women earned 8.85 TL per hour, while men earned 12.03 TL, resulting in a gender pay ratio of 73.6%. In 2018, the ratio fell to 70%, demonstrating a decline in women's relative earnings position. By 2019, women's earnings had risen to 10.28 TL, but the average wage for men increased to 14.24 TL, widening the absolute gap to 3.96 TL.

The consistent underpayment of women in the care services sector cannot be attributed only to individual skill differences; rather, it stems from structural wage inequalities that arise from the societal classification of care work as “women's work”—a form of labor viewed as inherently less valuable due to its association with femininity (England et al., 2002; ILO, 2018). Historically, care work has been closely associated with domestic roles assigned to women, and social expectations generally define such labor as requiring emotional commitment. As a result, care work is often rendered invisible and low-wage. The concept of “invisible labor” refers to the fact that household and caregiving tasks are not perceived as productive activities and are often excluded from economic valuation (Duffy, 2005; Folbre, 2006; ILO, 2018).

The high concentration of women in caregiving occupations results in their economic undervaluation and their symbolic invisibility in society. This hampers their access to economic

Table 3. Gender-based earnings gap—care services sector (2015–2023)

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023
Female	7.94	8.68	8.85	8.91	10.28	15.76	15.69	19.35	38.62
Male	11.36	12.01	12.03	12.73	14.24	20.81	20.69	27.47	56.16
Gender pay ratio (F/M)	0.70	0.72	0.74	0.70	0.72	0.76	0.76	0.70	0.69

Source: ILO Statistical Database, 2024

resources and structurally undermines their standing in society (Budig et al., 2012; Razavi, 2007). Women's low wages in the caregiving profession might not be an indication of gendered pay discrimination alone; it may also indicate a wider structural devaluation phenomenon. This is a phenomenon that is defined as institutionally undervaluing labor socially assigned to women, especially labor in “natural responsibilities” fields, such as caregiving. This structural devaluation manifests in the persistent underpayment and marginalization of such works (Duffy, 2005; England et al., 2002; ILO, 2022).

The persistence of wage gaps over time suggests that gender inequality may be shaped not only discursively but also through structural economic patterns observed across the period. These inequalities have direct and lasting effects on the material well-being and financial security of women (Cha & Weeden, 2014; Seguíno, 2010).

Gender Differences in Informal Employment

Informal employment remains one of the most critical structural challenges in the Turkish labor market, undermining both the sustainability of the social security system and the economic security of workers. To understand the extent to which women are exposed to precarious and unprotected working conditions, evaluating this issue from a gender perspective is key. During the 2015–2019 period, informal employment rates consistently showed that women were more likely than men to work in informal jobs (Table 4).

In 2015, the informal employment rate for women was recorded at 23.90%, while for men, it stood at 19.95%. This means that, in the same year, women were employed informally at a rate approximately 3.95 percentage points higher than men. In 2016, the gap widened slightly to 4.08 points, as the rate for women rose to 24.28%. The year 2017 marked the peak of this disparity, with the informal employment rate for women exceeding that of men by 5.59 percentage points, the largest difference observed during the period. In the same year, the informal employment rate for women reached 26.21%, compared to 20.63% for men.

Although the gender gap in informal employment narrowed slightly over the next two years, it remained consistently higher for women. In 2018, the difference stood at 4.54 percentage points, while it was 2.27 points in 2019. Despite the reduction, the absolute figures indicate that women experienced higher

exposure to informal employment than men throughout the period. When assessed in terms of gender ratio, the informal employment rate of women was 119.7% of that of men in 2015, and this figure peaked at 127.1% in 2017. Although the ratio declined to 110.1% in 2019, the inequality persisted.

Women in the labor market are disproportionately represented not only in low-wage positions but also in forms of employment that lack social protection systems. This situation is directly associated with gender-based discrimination, the growth of insecure and flexible work arrangements, and the systematic assignment of domestic roles to women (ILO, 2022; Tiryaki-Yenilmez, 2023). Informal employment hinders women's access to essential social protection rights, such as pensions, health insurance, and job security. Over time, this worsens their economic vulnerability and significantly raises the risk of poverty in old age (OECD, 2012; Varışlı, 2021). Women's disproportionate responsibility for domestic care work, their greater propensity to seek flexible or part-time work, and their concentration in temporary forms of employment all contribute to their higher rates of informal employment compared to men. This pattern may reflect underlying structural inequalities in the labor market and the influence of gender norms on employment choices (Ghosh & Vinod, 2017; Tansever, 2022).

Gender-Based Wage Disparities by Educational Attainment

According to the 2021 data, although women's hourly earnings increased with higher levels of education, the gender pay gap persisted across all levels. Women with a high school education earned an average of 10.13 TL per hour, while men with the same qualification earned 12.13 TL, resulting in a difference of more than 2 TL. At this level, women's earnings amounted to only 83.5% of men's. A similar pattern was observed among university graduates: Women earned 12.70 TL per hour compared to 14.68 TL for men. Although the gender pay ratio at this level reached 86.6%, it still fell short of equality. At the master's level, the gap widened further to 3.28 TL, with women earning 18.43 TL per hour and men earning 21.72 TL. At the doctoral level, despite narrowing differences, women's earnings still lagged behind those of men. Female doctoral holders earned 30.58 TL per hour, while their male counterparts earned 31.79 TL, resulting in a gender pay ratio of 96.1% (Table 5).

Table 4. Informal employment rates by gender (2015–2023)

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023
Female	23.90	24.28	26.21	25.47	24.71	22.00	21.56	21.59	20.56
Male	19.95	20.20	20.63	20.93	22.43	19.58	17.71	17.15	17.46
F/M difference (percentage point)	3.95	4.08	5.59	4.54	2.27	2.43	3.85	4.44	3.10

Source: ILO Statistical Database, 2024

Table 5. Hourly earnings by gender and education level (2021)

Year	Education level	F	M	Gender pay ratio (F/M)
2021	Upper secondary education	10.14	12.13	0.84
2021	Bachelor's or equivalent level	12.71	14.68	0.87
2021	Master's or equivalent level	18.44	21.72	0.85
2021	Doctoral or equivalent level	30.58	31.79	0.96

Source: ILO Statistical Database, 2024

The 2022 findings reflect a persistence of the trends observed in the previous year. Among individuals with a high school education, women earned 12.84 TL per hour, while men earned 15.32 TL, increasing the wage gap to 2.48 TL. Although the hourly earnings of women university graduates increased from 14.52 TL in 2021 to 15.43 TL in 2022, the absolute wage gap widened, with the difference increasing from 2.03 TL to 5.11 TL. This indicates a deterioration rather than an improvement in gender pay parity, as reflected in the decline of the gender pay ratio from 87.7% to 75%. Women with a master's degree earned 20.57 TL per hour, while men with the same qualification earned 24.25 TL, with the gap widening to 3.68 TL. At the doctoral level, the gender wage gap decreased again, with women earning 35.00 TL and men earning 35.54 TL per hour. This corresponds to a gender pay ratio of 98.5%, representing the lowest level of inequality across all educational categories (Table 6).

The 2023 data reveal that while the absolute wage gap between the two sexes has narrowed at certain levels, structural disparities persist. Among high school graduates, women earned 16.50 TL per hour, whereas men earned 18.48 TL, resulting in a gap of 1.98 TL. At the bachelor's level, women earned 19.44 TL

compared to men who earned 21.95 TL, with a difference of 2.51 TL. Among individuals with a master's degree, the gender wage gap widened further: Women earned 25.29 TL per hour, while men earned 29.08 TL, resulting in a difference of 3.79 TL. At the doctoral level, the gap once again remained relatively narrow, with women earning 42.66 TL and men earning 43.32 TL per hour (Table 7).

Although women's absolute earnings increased with higher levels of education, the persistence of wage gaps between women and men despite similarities in qualifications suggests that women continue to face structural disadvantages in the labor market (Blau & Kahn, 2017; OECD, 2012). The situation of women earning lower wages and facing disadvantages in promotion processes, despite possessing similar skills and credentials as men in high-skilled occupations, stems from institutional biases in the workplace, lack of flexibility, and the enduring impact of the glass ceiling (Ceci et al., 2014; Hunt, 2016; Sassler & Meyerhofer, 2023). While higher education increases women's absolute earnings, it appears insufficient, on its own, to fully address gender-based wage disparities, based on observed trends. This pattern suggests that structural disadvantages may persist in more subtle and implicit forms,

Table 6. Hourly earnings by gender and education level (2022)

Year	Education level	F	M	Gender pay ratio (F/M)
2022	Upper secondary education	12.84	15.32	0.84
2022	Bachelor's or equivalent level	15.43	20.54	0.75
2022	Master's or equivalent level	26.17	27.93	0.94
2022	Doctoral or equivalent level	36.05	41.54	0.87

Source: ILO Statistical Database, 2024

Table 7. Hourly earnings by gender and education level (2023)

Year	Education Level	F	M	Gender pay ratio (F/M)
2023	Upper secondary education	25.41	30.64	0.83
2023	Bachelor's or equivalent level	33.13	38.99	0.85
2023	Master's or equivalent level	49.27	53.54	0.92
2023	Doctoral or equivalent level	74.96	82.06	0.91

Source: ILO Statistical Database, 2024

particularly within higher levels of employment (Blau & Kahn, 2017; Cha & Weeden, 2014; England, 2010).

The descriptive findings indicate that gendered labor market disadvantages, manifested in lower wages and higher informality among women, lead to increased financial vulnerability. Specifically, women's greater concentration in informal and low-paying sectors implies weaker access to savings, credit, and contributory social security schemes, which directly undermines their household-level financial resilience. Thus, the observed disparities in earnings and job quality are not only labor market outcomes but also core drivers of financial fragility.

Conclusion and Discussion

This study investigates gender-based disparities in hourly wages and informal employment in Türkiye during the 2015–2023 period. It adopts a gender-sensitive approach to examine disparities across educational levels, sectors, and occupational categories. While women's labor force participation grew quantitatively over this period, the study findings show ongoing qualitative gaps, especially in terms of earnings and access to social insurance provisions. Women's over-representation in low-paying industries and under-representation in high-paying sectors, such as STEM, as well as their persistent higher rates of informal employment, reveal that employment quality is influenced by sectoral structure and by institutional constraints and flaws in social protection provisions (Blau & Kahn, 2017; England, 2010; ILO, 2018).

The figures further reveal that women with similar or even higher educational qualifications than men have lower earnings and higher exposure to informal working conditions across all layers of employment. The normalization of low wages in feminized care occupations reveals how wages are determined based on gender-based factors. Such trends highlight that labor markets are organized as much by economic as by deeply rooted cultural and societal norms.

To properly understand these inequalities, engagement with feminist theoretical concepts, including “invisible labor” (Federici, 2012) and “social reproduction” (Fraser, 2016), is crucial. The undervaluing of care labor is reflective of both Fraser's contention about reproductive labor marginalization and Federici's critique of unpaid and underappreciated labor that supports economic structures. Women's exclusion from high-prestige areas, including STEM, illustrates that the “glass ceiling” still operates at the sectoral level (Cotter et al., 2001). In addition, the systematic channeling of women into precarious and low-wage sectors illustrates how patriarchal structures exist within labor and economic policy and supports the perception that inequality in employment is driven by both labor market conditions and institutionalized gender norms, rather than

by labor market conditions alone. In all this, when statistical evidence found in this study is viewed with feminist theoretical insight, it is evident that women's equality is more than an end result; instead, it is a structurally and socially produced procedure within labor structures and society as a whole.

The findings of this study reveal not only employment-related inequalities but also individual-level financial vulnerabilities. Women's lower hourly wages, exclusion from social security systems, and persistent wage disparities with men, even with the increase in their educational attainment, directly impact their savings behavior, retirement accumulation, borrowing capacity, and financial autonomy. One particularly noteworthy finding is that although women's labor force participation increases with higher levels of education, this upward trend does not translate into wage equality. While the literature often assumes that higher education improves employment opportunities and narrows gender-based wage gaps, this study finds that even women with higher levels of education earn lower average wages than their male counterparts. The persistence of income disparities, despite higher educational attainment among women, suggests that education alone is insufficient to overcome gender-based wage disparity. It also indicates that wage-setting and promotion mechanisms within the labor market continue to be strongly influenced by patriarchal norms (Blau & Kahn, 2017; Cha & Weeden, 2014; England, 2010). Therefore, policy frameworks that focus solely on educational equality appear inadequate for attaining economic parity. For this reason, the study approaches gender inequality not only as a social policy issue but also from the perspective of financial inclusion, income-based financial injustice, and the sustainability of individual economic well-being, positioning its conclusions in direct conversation with the field of finance.

These findings suggest that policies targeting gender equality in the labor market should be supplemented with broader financial inclusion strategies. Expanding women's access to affordable credit, formal savings instruments, and social insurance mechanisms is essential to reducing household-level financial vulnerability. Strengthening financial literacy and promoting tailored financial products for female workers, particularly those employed in informal or low-wage sectors, could further enhance their economic resilience and long-term financial security.

The findings further indicate that gender-based inequalities have consequences not only at the individual and social levels but also at the macroeconomic level. The overrepresentation of women in low-wage and insecure jobs limits household income and savings capacity, which in turn can suppress aggregate demand and hinder the deepening of the financial system. This vulnerability is exacerbated by making women more susceptible to financial exclusion and could have broader macroeconomic implications (Demirgüç-Kunt et al., 2018;

Seguino, 2010). Low-income women who encounter structural barriers when accessing formal financial services are further excluded (Demirgüç-Kunt et al., 2018).

In total, this research presents an evidence-based examination of the economic face of gender inequality and asserts that women's place in the labor force is more than just work and employment; it is also economic security and financial agency. Therefore, policymakers must strive for an integrated framework of gender equality beyond employment figures that entails income equality, social entitlement, and financial inclusion.

The increasing power of digital communication tools has raised public awareness about gender disadvantage, women's working conditions, and gender wage gaps. In Türkiye, women across all sectors have adopted hashtags such as #eşitücret and #kadıngücü and shared lived testimonies on how these gaps became a part of everyday life. Although female STEM role models have become more visible through digital media, women who work in care services remain invisible online (Fotopoulou, 2017). This research posits that in today's digital era, economic disadvantage is fueled not merely statistically but also algorithmically through bias, representational erasure, and digital invisibility (Duffy & Hund, 2019; Fotopoulou, 2017). These arguments substantiate and enhance the study's contribution toward both academic endeavors and general societal awareness about gender-based gaps.

Ethical Statement

It is hereby declared that all rules specified in the *Higher Education Institutions Scientific Research and Publication Ethics Directive* were followed in this study.

Ethics Committee Approval

Since this study did not require ethics committee approval, no ethics approval was obtained.

Conflict of Interest

The author(s) declare that they have no competing interests.

Funding

No financial support was received for this research.

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