

Can occupational skills explain the gender wage gap in a developing economy? Evidence from an unconditional quantile regression approach

Zubaria Andlib

Federal Urdu University of Arts, Sciences and Technology, Pakistan; Lancaster University, UK

e-mail: zubaria.andlib@fuuast.edu.pk, z.andlib@lancaster.ac.uk

ORCID: [0000-0002-4042-6861](https://orcid.org/0000-0002-4042-6861)

© 2025 Zubaria Andlib

This work is licensed under the Creative Commons Attribution-ShareAlike 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-sa/4.0/>

Quote as: Andlib, Z. (2025). Can occupational skills explain the gender wage gap in a developing economy? Evidence from an unconditional quantile regression approach. *Argumenta Oeconomica*, 2(55), 161-180.

DOI: [10.15611/aoe.2025.2.11](https://doi.org/10.15611/aoe.2025.2.11)

JEL: J08, J24, J31

Abstract

Aim: This study investigated the gender wage gap across occupational groups in Pakistan differentiated by their skill level. The author intended to explore how wage disparities between men and women vary across low, average, high, and very high-skilled occupations and examines the presence of structural barriers such as the glass ceiling.

Methodology: The study utilised nationally representative microdata from the Pakistan Labour Force Survey (2020-2021) and applied Oaxaca-Blinder decomposition techniques along with unconditional quantile regression models.

Results: The empirical findings indicate that women earn significantly lower wages in low and average-skilled occupations compared to their male counterparts. Conversely, women attain wage parity or enjoy a relative advantage in high and very high-skilled occupations. Nonetheless, evidence of glass ceiling effects persists in low, average, and very high-skilled groups, suggesting that human capital differences alone do not fully explain gender-based wage disparities.

Implications and recommendations: A multi-pronged approach is necessary to reduce the gender wage gap. Policymakers should strengthen labour market regulations, raise minimum wages, enforce equal pay legislation, and promote gender-inclusive work environments. Encouraging women's participation in high-skilled occupations through targeted training, mentorship, and flexible work arrangements is essential for sustained wage equality.

Originality/Value: This study makes a novel contribution by examining gender wage disparities across occupational skill levels in a developing country using recent data. It also offers disaggregated insights

beyond aggregate wage gap estimates, providing actionable evidence for policymakers addressing gender inequality in labour markets across the Global South.

Keywords: gender wage gap, skill levels, occupations, glass ceiling

1. Introduction

Globally, women earn 20 per cent less than men, and there are wide variations across economies (ILO Global Wage Report, 2019). The gender wage gap (GWG) in the developing world is a significant concern due to its influence on social equity, gender equality, and economic development. Therefore addressing the GWG is crucial to achieving sustainable economic growth, alleviating poverty, and attaining greater social justice (Gharehgozli, & Atal, 2020), whilst eliminating the GWG can have a substantial positive influence on economic prosperity. Female workers constitute a significant proportion of the labour force, and guaranteeing equitable remuneration enhances their productivity, agency, and empowerment. Hence, closing the wage gap would enable more households to escape poverty, as women's earnings play a substantial role in the overall well-being of households (Iwasaki, & Satogami, 2023; Andlib, & Zafar, 2023).

In developing countries a sizeable proportion of female workers are engaged in low-paid occupations and industries, such as retail, hospitality, and agriculture. These sectors are typically hit the hardest during economic contraction, leading to more job losses. In developing economies the majority of the employed women work as part-time workers or hold temporary positions, and these jobs are often the first to be cut, impacting women's wages and employment status (Bennedsen et al., 2023; Andlib, 2025). Moreover, in developing economies the informal sector has a dominant share in employment, where the wages are significantly lower, thus exacerbating the GWG. The presence of strong social safety nets can lower the GWG. However, weak social support systems in developing economies can exacerbate female workers' financial standing, yet effective policy measures such as childcare support, paid maternity leave, and equal pay legislation can be used as practical policy tools to encourage women workers to participate in labour market activities and compete with their male counterparts (Wihardja, & Pradana, 2024), but developing economies need more resources to implement these measures. Various shocks, e.g. the global financial crisis and COVID-19, also increased the GWG in developing economies. The economic impact of the recent pandemic revealed the vulnerability of women's employment with significant job losses in female-dominated sectors (Lim, & Zabek, 2024).

The GWG in low and middle-income economies in general, and Pakistan, is a multifaceted issue determined by many economic, social, and cultural factors (Yasmin et al., 2021). Women in Pakistan earn less than their male counterparts, and this gap varies across various sectors, particularly in the informal sector. Pakistan has the lowest female labour force participation (FLFP) rate in the South Asian region, and most of the women are either working in vulnerable employment or the informal sector, where the GWG is more pervasive compared to the formal sector. There are many determinants of the GWG, including occupation segregation, differences in education attainment among males and females, gender discrimination, and employment in specific types of occupations that are not well-paid (Akram, 2022). Women have limited access to technical and vocational training. In addition, only 1% of women are employers, and this figure has stagnated for over a (Government of Pakistan, Pakistan Bureau of Statistics, 2023).

The study's theoretical foundation is based on a broader perspective of feminist economics, which challenges the assumption of mainstream economics models grounded in gender norms, discrimination in the labour market, and the undervaluation of unpaid and care work. Gender equality is the central theme at the heart of feminist economics. Ferber and Nelson (2009) postulated that it is essential to integrate gender-specific perspectives in mainstream economic analysis. In his pioneer work, Sen's capabilities approach stated that equal access to opportunities and resources enhances women's agency and increases FLFP (Manji, 2000). Moran (2017) asserted that to decrease gender inequalities

in the labour market, it is mandatory to integrate the feminist perspective into mainstream economic analysis, whilst Goldin (2021) provided compelling historical evidence on the evolution of FLFP and wage inequalities in developed economies. This study's theoretical foundation is grounded in these eminent economists' pioneering contributions, and offers a comprehensive approach towards the GWG within a theoretically rich discourse, highlighting the need for inclusive labour policies and structural reforms to reduce GWGs.

Generally, skill is the ability to perform various job duties, whilst *skill level* is usually defined as a function of the complexity and range of tasks and duties to be performed in an occupation. Skill level is typically assessed by considering the nature of work performed in a specific occupation relative to the defined tasks and responsibilities associated with each ISCO-08 skill level, as well as the formal education level specified by the International Standard Classification of Education (ISCED-97) (UNESCO, 1997) required for the proficient execution of these tasks and duties, along with the requisite informal on-the-job training and/or prior experience in a related occupation necessary for competent task performance. The International Labour Organization (ILO) and the Pakistan Bureau of Statistics (PBS) classified eight occupations into four skill levels, namely low-skilled, average-skilled, high-skilled, and very high-skilled occupations (as discussed in detail in the methodology section). Each skill level provides comprehensive information about the nature of jobs and associated tasks and the required levels of formal education. The author of this study intended to offer detailed insights into the GWG in the case of a developing economy, analyse four skill levels and examine which occupational group has the highest GWG.

Specific research questions based on the previously mentioned scenario were addressed. Does the GWG differ across occupational groups based on skill level? Does working in a high-skilled occupation reduce or exacerbate the GWG? Does the GWG change along the distribution in different occupations based on skill levels?

For empirical analysis, the author applied the unconditional quantile regression method in an Oaxaca-Blinder type decomposition. The research goal was to evaluate the influence of different household and individual-level variables on the GWG at both the mean and along the entire wage distribution, using Pakistan as a case study to examine this policy issue for various reasons. First and foremost, the vast majority of women (70 per cent) work in vulnerable employment, and even those who are well-educated and in high-skilled jobs are still paid lower wages compared to their male counterparts. Furthermore, the GWG phenomenon holds significant importance in Pakistan, as evidenced by research conducted by Yasmin et al. (2021). However, to the best of the author's knowledge, this research is the first attempt to evaluate the GWG in Pakistan using advanced econometrics techniques and considering four skill levels.

After a comprehensive introduction, Section 2 presents an overview of the earlier literature on the GWG and establishes the research interests. Section 3 provides an analysis of the utilised data source and offers descriptive analysis. Section 4 includes a detailed description of the econometric approach. Section 5 illustrates the results of the regression analysis, whilst final Section 6, elaborates on policy discussions grounded on the study's findings.

2. Literature review

This section presents the existing literature on GWGs in various economies, however emphasising the relevant literature for developing economies.

Goldin (2014) explained the causes of persistent GWG in the USA. The study argued that differences in pay structure diminish over time due to the narrowing differences in human capital, suggesting that to reduce wage inequality, there is a need to restructure the job and compensation, promote temporal flexibility, and reduce overwork. Goldin et al. (2017) further explained the GWG for college graduates in another study. According to the empirical findings, the GWG increased to 34 log points for ages 26 to 39, moreover it is more pronounced for married individuals and varies between employment sectors and occupations.

Duraisamy and Duraisamy (2016) discussed the GWG in the Indian economy and highlighted that the GWG decreased in the selected period of 1983-2012. Their research found evidence of sticky floors compared to glass ceilings for all labour market segments. In another interesting study, Deshpande et al. (2018) supported the previously mentioned findings and showed that the GWG is higher at lower quantiles, and elaborated on the existence of sticky floors rather than glass ceilings in the Indian labour market. Poddar and Mukhopadhyay (2019) explored the GWG in the Indian economy, using the Oaxaca-Blinder decomposition and Heckman's two-step technique. According to the findings, women are discriminated against in different jobs at the time of recruitment, especially in those occupations and industries where most employers are men. In addition, the lack of relevant experience and low skills among women workers are two of the most prominent reasons for the low pay structure for women. Agrawal (2021) demonstrated that gender segregation in India is more pervasive in rural areas. The reasons behind the gender segregation in rural labour markets stem from educational attainment, while in urban markets it is caused by an individual's vocational profile. The empirical outcomes of the wage decomposition analysis stressed that a significant portion of the GWG may also be explained by education in rural areas, yet a significant portion of the pay disparity in rural and urban areas remains unexplained. Seneviratne (2020) explored the GWG in Sri Lanka and concluded that it has declined since the 1990s liberal reforms, yet the unexplained issues still prevail. High-skilled female workers in the public sector earn more than their male counterparts.

Ahmed and McGillivray (2015) analysed the GWG in Bangladesh and emphasised that the GWG declined from 1999 to 2009, which is attributed to human capital endowment. Bjerger et al. (2021) assessed the influence of on-the-job training on the GWG in Vietnam and concluded that it is a pertinent factor in decreasing the GWG. The difference in the GWG was more pervasive between trained and untrained workers, irrespective of gender. Cheng et al. (2020) explained the existence of the GWG among rural and urban migrants in the case of China. The empirical outcomes revealed that urban migrant workers are paid more than rural migrant workers. Overall, the GWG is higher in public sector enterprises and among highly educated workers in Guangdong province. Yamamoto et al. (2019) demonstrated that educated rural female workers face higher GWGs than educated urban female workers in Nepal. Rahman and Al-Hasan (2022) examined the GWG in Bangladesh and concluded that male workers earn significantly more than their female counterparts, and confirmed both the glass ceiling and sectoral segmentation in Bangladesh. Siddiquee and Hossain (2018) found that the GWG increased in Bangladesh in 2010, being more persuasive at the lower end of the distribution than at the higher end. Rahman and Al-Hasan (2019) used the Labour Force Survey data for the year 2016 and examined the GWG in Bangladesh. The mean wage decomposition revealed that female employees earn 12 per cent less than men, due to the fact that a sizeable proportion of employed workers are engaged in informal employment. Nonetheless, females working in formal sectors earn higher wages than males in the first few deciles.

Some interesting studies on the Pakistani economy were found in the earlier literature. For instance, Aslam (2009) revealed that the education-earning profile is convex for women compared to men, finding that the labour market outcomes were higher for men, even though returns to education were higher for women. Yasmin et al. (2021) concluded that schooling, region of residence, and type of occupation were the most pertinent factors behind the GWG in Pakistan, and based on the empirical outcomes concluded that the GWG increased in 2018. Cheema et al. (2022) utilised data from the PSLM survey and highlighted that labour market discrimination is prevailing in the Pakistani labour market, thus exaggerating the GWG. Malik and Akram (2024) explored the factors behind the GWG in the case of Pakistan, applying the ordered logit model and showing that many household and individual factors are behind the GWG, including marital status, education level, age, and type of employment.

The author could not find any earlier research for Pakistan that examined the GWG for different occupations based on skill levels, therefore this study will add value to the existing knowledge in various aspects by the assessment of the GWG for employees working in low, average, high, and very high-skilled occupations, and provide an in-depth analysis in the case of a developing economy, also elaborating on the existence of a glass ceiling in various occupations. In addition, the study also highlights which household characteristics are more pervasive in explaining the GWG in a developing economy.

3. Data and variable construction

To examine the GWG, the authors used data from the Labour Force Survey (LFS) of Pakistan for 2020-2021 by the Pakistan Bureau of Statistics (PBS), a nationally representative survey conducted at the provincial and district levels. It provides the largest sample size and vast coverage of labour market indicators compared to any other household survey in Pakistan and even any other round of LFS conducted in recent years. The survey contains information on employment status, industry, occupations, wages, unemployment, and underemployment, as well as information on individual characteristics from a large, nationally representative population, including age, education, household size, migration, number of children, region, and province of residence. Furthermore, the LFS survey provides comprehensive, detailed information regarding competencies, duties, and job responsibilities according to International Labour Organisation (ILO) guidelines. Overall, the LFS examines the attributes of various occupations using a comprehensive and detailed questionnaire.

Following the ILO guidelines, PBS has published an extensive document that provides information on skill levels, with nine occupations divided into four groups concerning skills: skill level 1, skill level 2, skill level 3, and skill level 4. Skill level 1 (low-skilled) occupations involve routine, straightforward physical and manual tasks which mostly require knowledge of handheld tools, such as vacuum cleaners, electrical equipment, and shovels. Similarly, most of the functions included in this group required physical strength, i.e. cleaning, digging, picking fruit and vegetables, lifting and carrying materials by hand, and operating non-motorised vehicles. Basic education and short on-the-job training are required for some jobs in this category.

The occupations included in skill level 2 (average-skilled occupations) involved performing various tasks such as operating electric equipment and machinery, repairing electrical and mechanical equipment, driving vehicles, and ordering and storing information. The nature of the occupations shows that workers need the ability to read information, instruction manuals, and to perform simple calculations, however a few occupations in this category require relatively higher literacy levels and numeracy skills; good interpersonal skills may be another advantage to performing better. In addition, most jobs require completing the first stage of secondary education (International Standard Classification of Education (ISCED) level 2). Nonetheless, some jobs also require the completion of the second stage of secondary education (ISCED level 3) for which on-the-job training is necessary.

Table 1. Detailed description of the variables used in the empirical analysis

Variable	Description
Dependent variable	
Wages	Log of monthly wages
Explanatory variables	
Age	Age in completed years (15 to 60 years)
Urban	If the individual resides in an urban area, the rural area is the reference category.
Punjab	If the individual resides in Punjab province.
Sind	If the individual resides in Sind province.
KP	If the individual resides in Khyber Pakhtunkhwa (KP) province, Balochistan is the reference category.
Never married	If the individual has never married, ever married is the reference category.
Migrants	If the individual has migrated from rural to urban areas, native is the reference category.
T&V training	If the individual has obtained technical and vocational training, no training is the reference category.
Below the secondary level	If the individual has less than a secondary level of education.
Secondary or above-level	If the individual has a secondary or above level of education, no education is the reference category.
Average-skilled occupations	If the individual works as a clerical support worker, a service and sales worker, a skilled agricultural worker, a craft and related trades worker, a plant and machine operator, or an assembler.
High-skilled occupations	If the individual works as a technician or an associate professional.
Very high-skilled occupations	If the individual works as a manager or professional, Elementary occupations (low skill level) are the reference category.
Formal sector	If the individual works in the formal sector.
Informal sector	If the individual works in the informal sector, the agriculture sector is the reference category.
Household size	Household size
Under five children	Number of children under 5 years of age at home

Source: Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

Occupations included in skill level 3 (high-skilled) mainly require performing complex and technical tasks, and they also involve procedural knowledge in a specialised field. These occupations require higher education and interpersonal skills (ISCED-97 level 5b), moreover they also need a high level of professional training. Skill 4 (very high-skilled) is the most competent category among all occupations; it mainly involves tasks requiring creativity and complex problem-solving techniques based on extensive theoretical and factual knowledge in a specialised discipline. These occupations require a higher level of education (ISCED-97 level 5a or higher); they include sales and marketing managers, civil engineers, secondary school teachers, medical practitioners, musicians, operating theatre nurses, and computer system analysts.

The study analysed the GWG for 15-60-year-old workers in Pakistan, and excluded those individuals from the LFS dataset who do not work/ earn from any occupation. The total sample size for those receiving a monthly wage was 66,140, out of which 58,257 were male and 7,883 female. Table 1 provides a detailed explanation of the variables under consideration.

3.1. Descriptive statistics

Pakistan has the lowest FLFP in the South Asian region, as presented in Table 2, showing a sizeable proportion of the employed workforce in the selected period comprised men. However, Table 2 shows that a significant proportion of women were engaged in low-skilled occupations or very high-skilled occupations, and that the mean wage was higher for men than for women workers in all skills. The difference was largest in the case of average-skilled occupations and smallest in the case of high-skilled occupations. The mean wages for both genders are presented in Figure 1.

Table 2. Sample composition and mean wage by gender for the period 2020-2021

Gender	Sample composition		Log monthly wages	
	N	%	Mean	SD
Overall				
Male	58,257	88.08	9.85	0.55
Female	7,883	11.92	9.44	0.80
Total	66,140	100	9.80	0.60
Low-skilled occupations				
Male	23,202	88.63	9.64	0.40
Female	2,977	11.37	9.08	0.51
Total	26,179	100	9.58	0.45
Average-skilled occupations				
Male	26,535	92.93	9.89	0.51
Female	2,018	7.07	9.14	0.69
Total	28,553	100	9.83	0.55
High-skilled occupations				
Male	3,251	86.26	10.23	0.57
Female	518	13.74	10.10	0.48
Total	3,769	100	10.21	0.56
Very high-skilled occupations				
Male	5,269	68.97	10.39	0.74
Female	2,370	31.03	10.00	0.83
Total	7,639	100	10.27	0.79

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

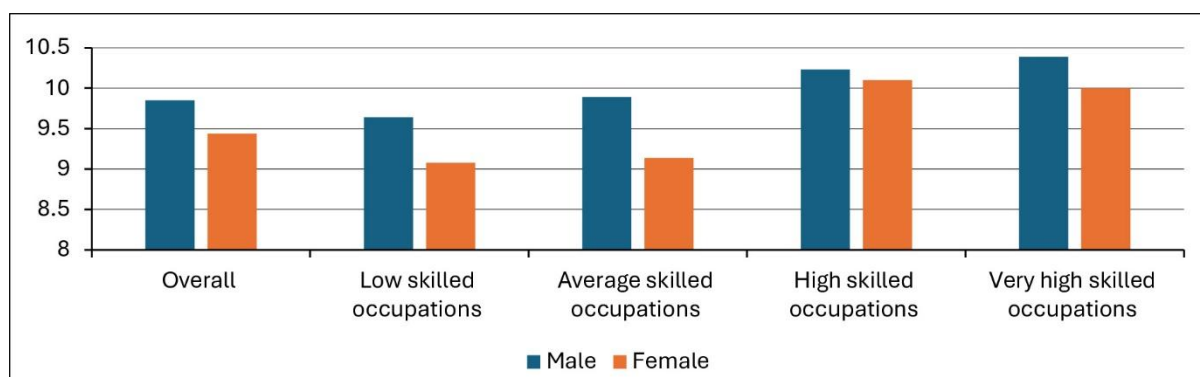


Fig. 1. Mean monthly wages for overall and various skill levels

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

Figure 2 elaborates on the kernel estimates of the wage density for both genders for 2020-2021, whereas Figures 3 to 6 show the wage distributions for four groups of occupations divided by skill sets. The figures reveal that male employees' wage distribution is higher than female employees.

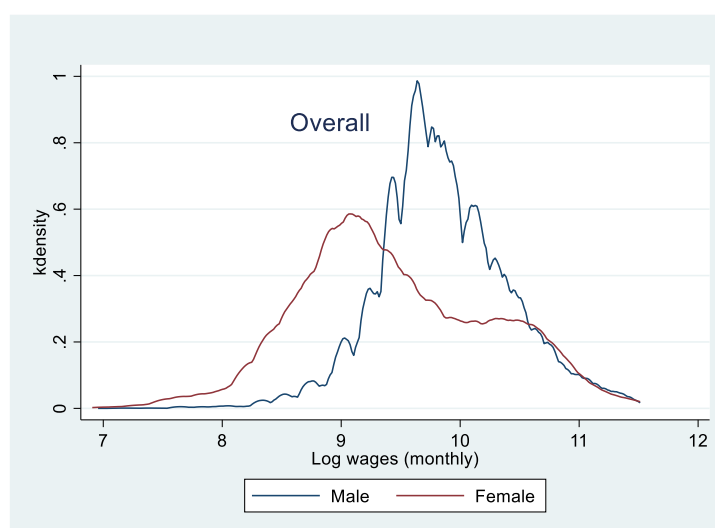


Fig. 2. Wage distribution by gender – overall

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

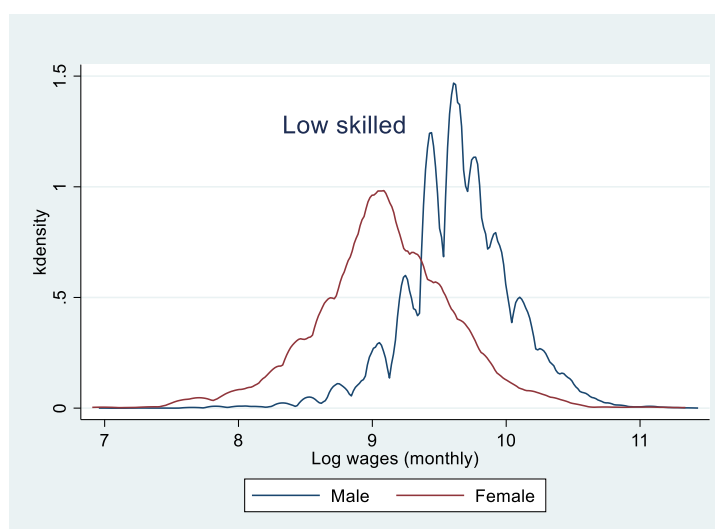


Fig. 3. Wage distribution by gender – low-skilled occupations

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

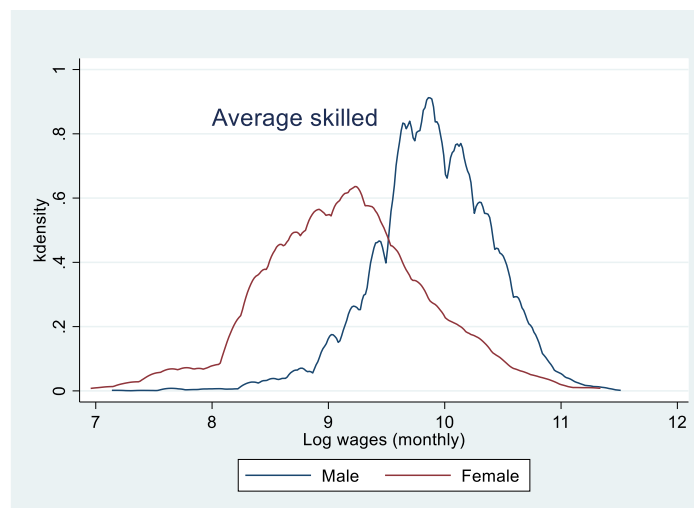


Fig. 4. Wage distribution by gender – average-skilled occupations

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

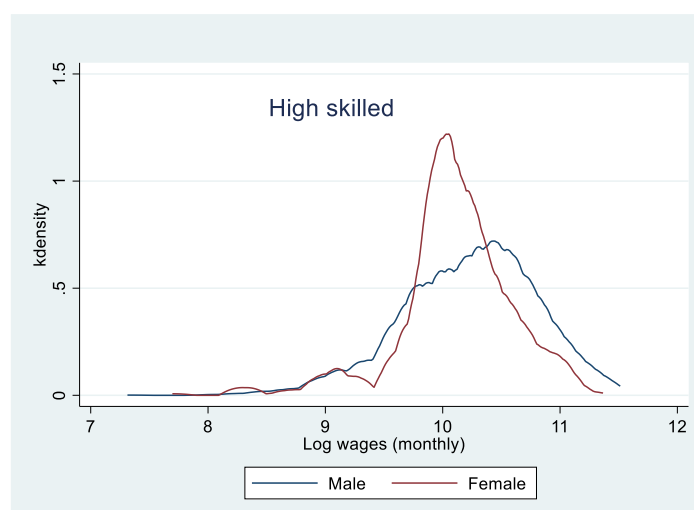


Fig. 5. Wage distribution by gender – high-skilled occupations

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

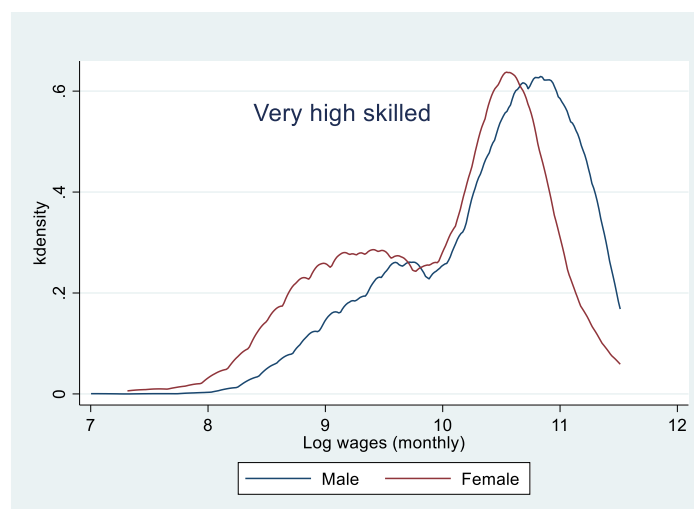


Fig. 6. Wage distribution by gender – very high-skilled occupations

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

Table 3. The Kolmogorov-Smirnov test

	Combined	Male	Female
Overall			
KS2	0.369 (0.000)	-	-
KS1	-	0.006 (0.521)	-0.369 (0.000)
Low-skilled occupations			
KS2	0.539 (0.000)	-	-
KS1	-	0.005 (0.999)	-0.539 (0.000)
Average-skilled occupations			
KS2	0.537 (0.000)	-	-
KS1	-	0.001 (0.999)	-0.537 (0.000)
High-skilled occupations			
KS2	0.189 (0.000)	-	-
KS1	-	0.065 (0.023)	-0.189 (0.000)
Very high-skilled occupations			
KS2	0.209 (0.000)	-	-
KS1	-	0.000 (1.00)	-0.209 (0.000)

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

In addition to Figures 2 to 6, the non-parametric Kolmogorov-Smirnov (K-S) test was employed to evaluate accurately the distributions' uniformity. The notion of applying this test was derived by measuring the most significant discrepancy in the empirical distribution functions for different skill levels.

The author utilised the one-sided and two-sided Kolmogorov-Smirnov tests (KS1 and KS2). The KS2 allowed to assess whether the two distributions were uniform, whereas the KS1 established if one distribution was superior. The findings in Table 3 demonstrate that the wage distribution for both genders was not the same for overall and various skill levels. Regarding the outcomes of the KS1, Table 3 showed that the monthly wage distribution of male employees significantly and stochastically dominated the distribution reported by female employees for various skill levels.

The descriptive statistics can be seen in Table 4.

Table 4. Descriptive statistics

Variables	Overall	Low-skilled occupations	Average-skilled occupations	High-skilled occupations	Very-high-skilled occupations
	Mean	Mean	Mean	Mean	Mean
Age	32.941	31.927	32.840	35.392	35.585
Urban	0.314	0.200	0.372	0.450	0.422
Rural	0.686	0.800	0.628	0.550	0.578
Punjab	0.441	0.437	0.446	0.424	0.445
Sind	0.269	0.286	0.263	0.282	0.224
KP	0.176	0.172	0.170	0.171	0.215

Variables	Overall	Low-skilled occupations	Average-skilled occupations	High-skilled occupations	Very-high-skilled occupations
	Mean	Mean	Mean	Mean	Mean
Balouchistan	0.114	0.105	0.121	0.124	0.116
Never married	0.274	0.283	0.283	0.224	0.234
Ever married	0.726	0.717	0.717	0.776	0.766
Migrants	0.083	0.074	0.081	0.089	0.113
Natives	0.917	0.926	0.919	0.911	0.887
No T&V training	0.828	0.957	0.699	0.788	0.890
T&V training	0.172	0.043	0.301	0.212	0.110
No education	0.335	0.539	0.274	0.042	0.010
Below secondary level	0.462	0.427	0.583	0.415	0.151
Secondary or above-level	0.203	0.035	0.143	0.543	0.840
Low-skilled occupations	0.396	-	-	-	-
Average-skilled occupations	0.432	-	-	-	-
High-skilled occupations	0.057	-	-	-	-
Very high-skilled occupations	0.115	-	-	-	-
Agriculture sector	0.099	0.234	0.013	0.016	0.001
Formal sector	0.355	0.187	0.346	0.743	0.773
Informal sector	0.546	0.580	0.641	0.241	0.226
Household size	6.650	6.580	6.702	6.648	6.694
Under five children	0.884	0.909	0.878	0.825	0.851
N	66,140	26,179	28,553	3,769	7,639

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

4. Methods

The decomposition technique suggested by Oaxaca (1973) and Blinder (1973) is widely recognised in examining discriminatory attitudes in the labour market. It enables the study of the difference in the average earnings of two groups (males and females) into a segment that is influenced by explanatory factors or endowments (explained effect) and one elucidated by the differences in the group coefficients (unexplained effect). Nevertheless, the technique depends on the assumption of linearity (Firpo et al., 2018) and exclusively permits an average estimate. This study utilised unconditional quantile regressions (UQRs) of recentred influence functions (RIFs) to achieve a comprehensive decomposition beyond the mean, similar to the Oaxaca-Blinder method (Firpo et al., 2018).

Compared to the traditional quantile regression approach devised by Koenker and Bassett (1978), this approach can determine the impact on the distribution of an outcome variable that is not influenced by the variables included in the model (Fortin et al., 2011). Therefore, one can directly compare income disparities between both genders at various quantiles on the distribution without enforcing a path dependence in the wage gap estimation (Gaeta et al., 2022).

Furthermore, by employing the approach suggested by Firpo et al. (2009), the study incorporated pertinent covariates into the model without modifying the explication of the estimated coefficients on the distributional statistic, i.e. the average or a quantile.

The previously mentioned UQR approach was taken into account in the calculation of the RIF, which is explained as follows:

$$rif(x; u, G) = u(G) + if(x, u, G) = u(G) + \lim_{t \downarrow 0} \frac{u((1-t)G + tA_x) - u(G)}{t} \quad (1)$$

where G is the distribution function for the dependent or outcome variable, here represented by x , i.e. the logarithm of monthly wages, whereas $u(G)$ denotes a distributional statistic. In addition, $if(x, u, G)$ is called the influence function. Firpo et al. (2009) demonstrated that firstly, one could calculate the values of $f(x, u, \text{ and } G)$ for all observations. The influence of additional or marginal change in the distribution of the variable (gender) of interest on the distributional statistic $u(G)$ can be evaluated through the ordinary least squares method. The main advantage of using the UQR technique is that it considers the economic and demographic characteristics of individuals, which are different for male and female employees, and this difference can bring a potential bias in marginal effects. In this study, the author regressed RIFs on the variable of interest and other included variables (age, education, marital status, migrated or native, household size, children, occupations with respect to various skill levels, sector of employment, region, and provinces).

In the earlier literature, the resultant influence on wage distribution statistics was identified as a counterfactual effect, unconditional partial effect, or policy effect (Rothe, 2010; Gallo, & Pagliacci, 2020). Finally, similarly to the conventional Oaxaca-Blinder decomposition, the GWG was divided into an endowment component and a coefficient component. As explained previously, the same approach was applied to various skill levels.

5. Results and discussions

In Table 5, the author estimated the average GWG for 2021 and also for various occupational groups based on skill levels. The GWG was decomposed into the explained and unexplained components, and it was negative and significant (in favour of women) for that year (2021); the explained component represented -21 per cent of the total GWG. In contrast, most of the GWG was reflected by the unexplained component, indicating the presence of discrimination in the Pakistani labour market. It was observed that the GWG was the highest for workers in high-skilled occupations, but interestingly this was in favour of women workers, yet the empirical analysis revealed the incidence of the highest discrimination in these occupations.

Table 5. Estimates and decomposition of the average GWG

Overall/skill levels	Difference	Explained	%	Unexplained	%
Overall	0.404***	-0.088***	-21.782	0.492***	121.782
Low skilled	0.576***	0.058***	10.069	0.518***	89.931
Average-skilled	0.716***	0.083***	11.592	0.633***	88.408
High-skilled	0.144***	-0.051***	-35.417	0.194***	134.722
Very high-skilled	0.452***	0.057***	12.611	0.395***	87.389

Note: ***, ** and * denote the significance at 1%, 5% and 10%.

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

Table A1 (see Appendix) presents the average GWG decomposed into explained and unexplained components for 2021. The author inferred from the empirical outcomes that the estimated GWG was significantly negative at the mean and 0.80 and 0.90 quantiles, whereas the negative explained component showed that the GWG was in favour of women in Pakistan. However, this was not significant for all quantiles, and most of the GWG related to unexplained components, i.e. labour market discrimination. In developing nations, women are not given equal preferences in the hiring process, and men are always preferred for highly paid jobs. In addition, women are not given equal preferences to get promotions in various occupations compared to their male counterparts. This situation is called the glass ceiling effect in the labour economics literature. Moreover, women are disproportionately represented in specific jobs and occupations, such as teaching and nursing (occupation segregation). The empirical results also provide evidence of the glass ceiling effect, i.e. the GWG at 0.90 quantile was greater than the GWG at the median quantile (0.50).

In order to examine the GWG for various groups of occupations, the authors divided the overall sample by skill levels and estimated the GWG for four groups of occupations. As already mentioned, the ISCO's nine occupations were divided into four skill levels: low-skilled, average-skilled, high-skilled, and very high-skilled.

First, the GWG for workers who work in low-skilled occupations (see Table A2 in Appendix) was examined observing an interesting pattern: at mean, the GWG was positive and in favour of men, however at all the quantiles, the GWG was negative and in favour of women, but significant only at higher quantiles. In addition, a large part of the GWG came from the unexplained part, which means that discrimination is prevalent in low-skilled occupations, with the GWG higher at the higher quantiles reflecting the glass ceiling effect – women were excluded from top positions.

Table A3 (see Appendix) presents the estimated GWG for average-skilled workers. The results differed from those of a previously mentioned category, i.e. low-skilled workers. It was observed from the empirical estimations that the explained component was positive and highly significant not only at the mean but also at all quantiles – which means men earn more than women working in average-skilled occupations. However, most of the gender gap reflected discrimination in the labour market.

As presented in Table A4 (see Appendix), the author also estimated the GWG for high-skilled workers. The analysis showed that the GWG favours women up to the 0.70 quantile, but at the 0.80 and 0.90 quantiles the GWG was positive – that is males earned more than female workers. However, the results also showed the presence of discrimination here. Next, the GWG for very highly skilled occupations was estimated (see Table A5 in Appendix). The mean GWG estimates showed that males earned more than female employees, yet the quantile regression provided evidence of the opposite scenario, where females earned better wages than their male counterparts in very high-skilled jobs. Thus the authors inferred from the empirical analysis that women earned higher wages in high and very high-skilled occupations than in lower and average-skilled occupations.

The study's empirical estimates for various occupations based on skill levels also provided evidence for a sticky floor (the GWG at 0.10 quantile was higher than the GWG at the median 0.50 quantile) and a glass ceiling effect (the GWG at 0.90 quantile was higher than the GWG at the median 0.50 quantile). Accordingly, individuals working in low, average, and very high-skilled occupations faced the glass ceiling effect. The earlier literature supports the empirical outcomes of the study; see e.g. Biagetti and Scicchitano (2011), Scicchitano (2012), Christofides et al. (2013) Said et al. (2022), Bonacini et al. (2024).

To assess the robustness of the findings, the author applied the methodologies of Acemoglu and Autor (2011) by categorising jobs into two dimensions: cognitive vs manual and non-routine versus routine. These descriptions are derived from the diverse duties executed within the professions. The differentiation between cognitive and manual occupations can be defined by the variance in the degree of mental vs physical activities involved. Occupations that include several activities necessitating creativity, adaptability, and problem-solving abilities are classified within the non-routine cognitive category. Conversely, work that entails a limited range of specialisations is a routine task. According to this classification, the authors developed dependent variables based on the following skill sets: cognitive non-routine (managers, professionals, and associate professionals), cognitive routine (clerks and sales personnel), manual routine (craft and plant workers), and manual non-routine (service workers). Cognitive non-routine jobs were classified as high-skilled, whereas manual non-routine jobs as low-skilled.

The empirical estimations in Table 6 indicate that the average GWG is significant and positive in cognitive non-routine, manual routine, and manual non-routine occupations, which shows that men earn more than women in these occupations. In addition, the unexplained part is significant for cognitive non-routine, manual routine, and manual non-routine occupations. However, in the case of cognitive routine occupations, the GWG is negative, which demonstrates that women earn better than men. The unexplained part is not significant here.

Table 6. Estimates and decomposition of average (at mean) GWG

	Cognitive non-routine	Cognitive routine	Manual routine	Manual non-routine
Male	10.392***	9.898***	9.862***	9.955***
Female	10.040***	10.155***	9.057***	9.524***
Difference	0.352***	-0.257***	0.804***	0.431***
Explained	0.053***	-0.208***	0.051***	0.139***
%	15.057	80.934	6.343	32.251
Unexplained	0.299***	-0.050*	0.753***	0.293***
%	84.943	19.455	93.657	67.981
N	11,408	5,582	17,091	5,578

Note: ***, ** and * denote the significance at 1%, 5% and 10%.

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

6. Conclusions and policy implications

The study examined the GWG in Pakistan as an example of a developing economy, estimating the overall GWG for 2020-2021 and four different groups of occupations divided into skill levels. The empirical estimations highlighted that the GWG favours women in high-skilled occupations, but men earn more than women workers in low and average-skilled occupations. The study provides some valuable policy insights aimed to decrease wage discrimination in developing economies.

Addressing the GWG in low and average-skilled jobs is essential to advancing socioeconomic equality and enhancing the well-being of women, particularly in developing economies where a large share of employed women are working in low and average-skilled occupations. In the same regard, increasing minimum wage levels is crucial to compensate workers, especially women adequately. This contributes to reducing wage disparity as many women are engaged in sectors that pay the minimum wage or slightly over it. Furthermore, it is imperative to enforce industry-specific minimum wage regulations, which can be especially advantageous in industries with a significant number of female employees with low or average skills, such as housekeeping, retail, and hospitality.

The empirical results revealed that technical and vocational training are negatively associated with the GWG, therefore advancing vocational training initiatives designed for women will provide them with the necessary expertise to meet the job market requirements of high-skilled occupations. It is necessary to offer customised training programmes specifically designed for women employed in low and average-skilled jobs, emphasising skills development that can improve their efficiency and create a pathway to well-paid positions. It is also necessary to promote the recruitment and hiring of women in traditionally male-dominated roles, which provide high remuneration. There is a need to advocate flexible working hours, remote work alternatives, and job-sharing possibilities to help women effectively manage their work and family obligations. This adaptability can assist in retaining women in the job market and enable them to pursue professional advancement without compromising personal obligations.

To reduce the GWG for low and average-skilled occupations and all other occupations, the first and most important step is to provide women with easy access to higher education in developing economies. A higher education level provides access to professional and managerial positions that usually come with higher pay. In addition, education enables women to access traditionally male-dominated sectors such as science, technology, engineering, and mathematics (STEM), hence it mitigates occupational segregation and diminishes the wage disparity. Higher levels of education

provide individuals with essential skills, such as critical thinking, problem-solving, and technical abilities, which are highly sought after in the job market. Moreover, education and professional development enable men and women to remain abreast of current industry trends and acquire new skills, enhancing their competitiveness and increasing their chances of being considered for promotions and pay rises.

References

- Acemoglu, D., & Autor, D. (2011). Skills, tasks and technologies: Implications for employment and earnings. In O. Ashenfelter, & D. Card (Eds.). *Handbook of labor economics* (Vol. 4, pp. 1043-1171). Elsevier.
- Agrawal, T. (2021). Gender segregation and wage differentials in India: The role of educational attainment and occupational choices. *International Journal of Manpower*, 42(1), 1-20.
- Ahmed, S., & McGillivray, M. (2015). Human capital, discrimination, and the gender wage gap in Bangladesh. *World Development*, 67, 506-524.
- Akram, N. (2022). Public-Private Wage Differentials: Evidence from Pakistan. *The Lahore Journal of Economics*, 27(2), 39-64.
- Andlib, Z. (2025). *Breaking Barriers or Reinforcing Gaps? Gender Wage Disparities Across Skill Levels in a Developing Economy* [Unpublished manuscript]. EconStor. Available at: <https://www.econstor.eu/handle/10419/309299.2>
- Andlib, Z., & Khan, A. H. (2018). Low female labour force participation in Pakistan: Causes and factors. *Global Social Sciences Review*, 3(3), 237-264.
- Andlib, Z., & Khan, A. H. (2019). The paradox of out-of-labor-force educated women in Pakistan: Evidence from PSLM 2013-14 Household Survey. *The Journal of Humanities and Social Sciences*, 27(2), 201.
- Andlib, Z., & Zafar, S. (2023). Women and vulnerable employment in the developing world: Evidence from Pakistan. *Journal of International Women's Studies*, 25(7), 17.
- Aslam, M. (2009). Education gender gaps in Pakistan: Is the labour market to blame? *Economic Development and Cultural Change*, 57(4), 747-784.
- Bennedsen, M., Larsen, B., & Wei, J. (2023). Gender wage transparency and the gender pay gap: A survey. *Journal of Economic Surveys*, 37(5), 1743-1777.
- Biagetti, M., & Scicchitano, S. (2011). A note on the gender wage gap among managerial positions using a counterfactual decomposition approach: sticky floor or glass ceiling? *Applied Economics Letters*, 18(10), 939-943.
- Bjerger, B., Torm, N., & Trifkovic, N. (2021). Can training close the gender wage gap? Evidence from Vietnamese SMEs. *Oxford Development Studies*, 49(2), 119-132.
- Blinder, A. S. (1973). Wage discrimination: Reduced form and structural estimates. *Journal of Human Resources*, 436-455.
- Bonacini, L., Gallo, G., & Scicchitano, S. (2024). Does working from home increase the gender wage gap? Insights from an Italian survey of occupations. *Feminist Economics*, 1-36.
- Cheema, A. R., Saleem, A., Haq, J. U., & Shehzadi, B. (2022). Estimating gender wage gap and its decomposition in Pakistan. *Journal of Quantitative Methods*, 6(2), 26-50.
- Cheng, H., Hu, D., & Li, H. (2020). Wage differential between rural migrant and urban workers in the People's Republic of China. *Asian Development Review*, 37(1), 43-60.
- Christofides, L. N., Polycarpou, A., & Vrachimis, K. (2013). Gender wage gaps, 'sticky floors' and 'glass ceilings' in Europe. *Labour Economics*, 21, 86-102.
- Deshpande, A., Goel, D., & Khanna, S. (2018). Bad karma or discrimination? Male-female wage gaps among salaried workers in India. *World Development*, 102, 331-344.
- Duraisamy, M., & Duraisamy, P. (2016). Gender wage gap across the wage distribution in different segments of the Indian labour market, 1983-2012: Exploring the glass ceiling or sticky floor phenomenon. *Applied Economics*, 48(43), 4098-4111.
- Faizan, M., & Khan, M. N. (2022). Gender discrimination & wage gap in the perspective of the banking sector of Pakistan. *International Journal of Social Science & Entrepreneurship*, 2(1), 40-51.
- Ferber, M. A., & Nelson, J. A. (Eds.). (2009). *Beyond economic man: Feminist theory and economics*. University of Chicago Press.
- Firpo, S. P., Fortin, N. M., & Lemieux, T. (2009). Unconditional quantileregressions. *Econometrica*, 77(3), 953-973.
- Firpo, S. P., Fortin, N. M., & Lemieux, T. (2018). Decomposing wage distributions using recentered influence function regressions. *Econometrics*, 6(2), 28.
- Fortin, N., Lemieux, T., & Firpo, S. P. (2011). Decomposition methods in economics. In Ashenfelter, O., & Card, D. (Eds.). *Handbook of labor economics* (Vol. 4, pp. 1-102). Elsevier.

- Gaeta, G. L., Lavadera, G. L., & Pastore, F. (2022). Overeducation wage penalty among Ph. D. holders: an unconditional quantile regression analysis on Italian data. *International Journal of Manpower*, 44(6), 1096-1117.
- Gallo, G., & Pagliacci, F. (2020). Widening the gap: the influence of 'inner areas' on income inequality in Italy. *Economia Politica*, 37(1), 197-221.
- Gharehgozli, O., & Atal, V. (2020). Revisiting the gender wage gap in the United States. *Economic Analysis and Policy*, 66, 207-216.
- Goldin, C. (2014). A grand gender convergence: Its last chapter. *American Economic Review*, 104(4), 1091-1119.
- Goldin, C. (2021). Career and family: Women's century-long journey toward equity. Princeton University Press.
- Goldin, C., Kerr, S. P., Olivetti, C., & Barth, E. (2017). The expanding gender earnings gap: Evidence from the LEHD-2000 Census. *American Economic Review*, 107(5), 110-114.
- Government of Pakistan, Pakistan Bureau of Statistics. (2023). *Labour force survey of Pakistan 2020–21*. Pakistan Bureau of Statistics.
- Hakro, A. N., Ghulam, Y., Jaffry, S., & Shah, V. (2021). Returns to Education and Wage Inequality in Pakistan. *The Journal of Developing Areas*, 55(3), 1-22.
- Iwasaki, I., & Satogami, M. (2023). The gender wage gap in European emerging markets: A meta-analytic perspective. *Journal for Labour Market Research*, 57(1), 9.
- Koenker, R., & Bassett Jr, G. (1978). Regression quantiles. *Econometrica: Journal of the Econometric Society*, 33-50.
- Lim, K., & Zabek, M. (2024). Women's labour force exits during Covid-19: Differences by motherhood, race, and ethnicity. *Journal of Family and Economic Issues*, 45(3), 504-527.
- Malik, A. I., & Akram, N. (2024). Determinants of the gender wage gap in Pakistan. *SN Business & Economics*, 4(2), 26.
- Manji, F. (2000). Review of the book *Development as freedom*, by A. Sen. *Development in Practice*, 10(2), 258-259.
- Moran, C. (2017). *Why feminist economics is necessary*. Exploring Economics. <https://www.exploring-economics.org/en/discover/Why-feministeconomics-is-necessary/>
- Oaxaca, R. (1973). Male-female wage differentials in urban labour markets. *International Economic Review*, 14(3), 693-709.
- Poddar, S., & Mukhopadhyay, I. (2019). Gender wage gap: Some recent evidence from India. *Journal of Quantitative Economics*, 17, 121-151.
- Rahman, M., & Al-Hasan, M. (2019). Male-female wage gap and informal employment in Bangladesh: A quantile regression approach. *South Asia Economic Journal*, 20(1), 106-123.
- Rahman, M., & Al-Hasan, M. (2022). The reverse gender wage gap in Bangladesh: Demystifying the counterintuitive. *The Indian Journal of Labour Economics*, 65(4), 929-950.
- Rothe, C. (2010). Nonparametric estimation of distributional policy effects. *Journal of Econometrics*, 155(1), 56-70.
- Said, M., Majbouri, M., & Barsoum, G. (2022). Sticky floors and glass ceilings: gender wage gap in Egypt. *Feminist Economics*, 28(4), 137-165.
- Scicchitano, S. (2012). The male-female pay gap across the managerial workforce in the United Kingdom: A semi-parametric decomposition approach. *Applied Economics Letters*, 19(13), 1293-1297.
- Seneviratne, P. (2020). Gender wage inequality during Sri Lanka's post-reform growth: A distributional analysis. *World Development*, 129, 104878.
- Siddiquee, M. S. H., & Hossain, M. A. (2018). Exploring the gender wage gap in the urban labor market of Bangladesh. *Research in Applied Economics*, 10(1), 36-58.
- UNESCO. (1997). *International Standard Classification of Education: ISCED 1997*. United Nations Educational, Scientific and Cultural Organization. <https://uis.unesco.org/en/topic/international-standard-classification-education-isced>
- Wihardja, M. M., & Pradana, A. T. (2024). Examining the drivers of changes in mean earnings and earnings inequality in Indonesia. *Asian Economic Journal*, 38(2), 232-255.
- Yamamoto, Y., Matsumoto, K. I., Kawata, K., & Kaneko, S. (2019). Gender-based differences in employment opportunities and wage distribution in Nepal. *Journal of Asian Economics*, 64, 101131.
- Yasmin, S., Jamil, M., & Iqbal, M. (2021). The gender wage gap in Pakistan: Extent, trends, and explanations. *Forman Journal of Economic Studies*, 17(2).

Acknowledgments: An earlier unpublished version of this manuscript is available at:

<https://www.econstor.eu/handle/10419/309299.2>

Received: January 2025, revised: April 2025

Appendix

Table A1. Full estimates of the GWG at the mean and along the distribution (overall sample)

Variables	Mean	q10	q20	q30	q40	q50	q60	q70	q80	q90
Overall										
Male	9.888***	7.745***	8.005***	8.107***	8.258***	8.350***	8.389***	8.427***	8.445***	8.532***
Female	9.485***	7.037***	7.231***	7.385***	7.474***	7.527***	7.605***	7.624***	7.642***	7.654***
Difference	0.404***	0.708***	0.774***	0.722***	0.784***	0.823***	0.783	0.804***	0.803***	0.878***
Explained	-0.088***	0.011	-0.041	-0.024	-0.033	-0.003	-0.003	-0.003	-0.026**	-0.020**
Unexplained	0.492***	0.697***	0.814***	0.745***	0.817***	0.826***	0.787***	0.807***	0.829***	0.899***
Explained										
Age	0.002*	0.001	0.002	0.003	0.002	0.001	0.001	0.001	0.002	0.001
Urban	0.002***	0.003*	0.004*	0.005	0.004	0.002	0.002	0.002	0.000	0.000
Punjab	0.019***	0.016***	0.001	0.017	0.023	0.003	0.003	0.003	-0.001	-0.002
Sind	-0.011***	-0.007**	-0.007	-0.015	-0.017*	-0.008**	-0.008**	-0.008**	-0.008	-0.005
KP	-0.005***	0.000	0.003	0.000	-0.001	-0.002	-0.002	-0.002	0.001	0.000
Never married	-0.004***	-0.005**	-0.012***	-0.026***	-0.026***	-0.010***	-0.010***	-0.010***	-0.018***	-0.010***
Migrants	-0.004***	-0.005***	-0.007*	-0.012*	-0.008	-0.003	-0.003	-0.003	-0.006	-0.003
T & V training	-0.002***	0.001	0.003	0.004	0.005*	0.002	0.002	0.002	0.007**	0.003**
Below secondary level	0.023***	0.017	0.028	0.025	0.021	0.007	0.007	0.007	0.005	0.002
Secondary or above-level	-0.063***	-0.013	-0.018	-0.024	-0.037*	-0.021**	-0.021**	-0.021**	-0.046***	-0.027***
Average-skilled occupations	0.019***	-0.034**	-0.043**	-0.054**	-0.027	-0.019**	-0.019**	-0.019**	-0.039***	-0.023***
High-skilled occupations	0.000***	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Very high-skilled occupations	-0.066***	0.043**	0.032	0.063**	0.045	0.048***	0.048***	0.048***	0.089***	0.051***
Formal sector	-0.010***	-0.002	-0.003***	-0.015***	-0.011**	-0.006**	-0.006**	-0.006***	-0.010***	-0.005***
Informal sector	0.011***	-0.005	-0.027	0.007	-0.003	0.004	0.004	0.004	0.000	-0.002
Household size	0.000***	0.000	-0.001	-0.001	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001
Under five children	0.000	0.001	0.003	0.001	0.001	0.000	0.000	0.000	0.001	0.001
Unexplained										
Age	-0.039	-0.648	-0.387	-0.354	-0.232	-0.375**	-0.112	-0.112	0.050	-0.112
Urban	-0.018***	0.185	0.151	0.083	0.050	0.029	0.019	0.019	-0.001	-0.004
Punjab	0.111***	0.070	0.119	0.133	0.085	0.170***	0.115***	0.115***	0.135**	0.153***
Sind	0.013*	-0.026	-0.025	-0.014	-0.019	0.001	-0.006	-0.006	-0.006	0.007
KP	0.012**	0.001	0.006	0.020	0.015	0.013*	0.013*	0.013*	0.017*	0.016**
Never married	-0.004	-0.013	-0.069	-0.172***	-0.168***	-0.068***	-0.055***	-0.055***	-0.104***	-0.049***
Migrants	0.005	-0.029	-0.001	0.019	0.010	-0.001	0.003	0.003	0.009	0.007
T & V training	0.017***	0.088	0.026	0.024	-0.007	0.020	0.008	0.008	-0.037	-0.021
Below secondary level	-0.011*	-0.189	-0.050	-0.077	-0.049	-0.060	-0.033	-0.033	-0.035	-0.030
Secondary or above-level	-0.055***	-0.327	-0.117	-0.140	-0.124	-0.161*	-0.097**	-0.097**	-0.042	-0.074*
Average-skilled occupations	-0.005	0.010	-0.084	-0.015	0.000	0.009	0.031	0.031	0.011	-0.015
High-skilled occupations	-0.007**	0.012	-0.011	-0.008	0.004	0.006	0.006	0.006	0.002	-0.002
Very high-skilled occupations	0.048***	0.047	-0.086	-0.049	0.042	0.038	0.030	0.030	-0.029	-0.005
Formal sector	-0.022	0.144	0.169***	0.341***	0.242	0.168***	0.104***	0.104***	0.164***	0.139***
Informal sector	0.127***	0.135	0.122	0.210**	0.147***	0.171***	0.073***	0.073**	0.059	0.118***
Household size	0.028	0.462*	0.378*	0.161	0.025***	0.108	0.057	0.057	0.047	0.055
Under five children	-0.017***	-0.107	-0.091	-0.076	-0.045	-0.050	-0.032*	-0.032**	-0.030	-0.029**
Constant	0.309***	0.881**	0.767***	0.659***	0.841***	0.808***	0.663***	0.683***	0.618***	0.745***

Note: ***, ** and * denote the significance at 1%, 5% and 10%.

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

Table A2. Full estimates of the GWG at the mean and along the distribution (low-skilled occupations)

Variables	Mean	q10	q20	q30	q40	q50	q60	q70	q80	q90
Overall										
Male	9.664***	7.874***	8.038***	8.122***	8.171***	8.355***	8.406***	8.443***	8.533***	8.532***
Female	9.089***	7.067***	7.366***	7.604***	7.619***	7.634***	7.649***	7.664***	7.631***	7.662***
Difference	0.576***	0.807***	0.672***	0.518***	0.553***	0.721***	0.757***	0.779***	0.902***	0.871***
Explained	0.058***	-0.016	-0.268	-0.023	-0.023	-0.023	-0.023	-0.023	-0.053**	-0.056**
Unexplained	0.518***	0.823***	0.940***	0.541***	0.576***	0.744***	0.780***	0.802***	0.955***	0.926***
Explained										
Age	-0.003	-0.041	-0.087*	-0.007*	-0.007*	-0.007*	-0.007*	-0.007*	-0.014**	-0.011*
Urban	-0.002	-0.004	-0.006	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001
Punjab	0.119***	0.056	0.184*	0.015*	0.015*	0.015*	0.015*	0.015*	0.033*	0.035**
Sind	-0.023**	-0.007	-0.022	-0.001	-0.001	-0.001	-0.001	-0.001	-0.005	-0.005
KP	-0.048**	0.027	0.016	-0.009	-0.009	-0.009	-0.009	-0.009	-0.013	-0.015
Never married	-0.004	0.061	0.090	0.010	0.010	0.010	0.010	0.010	0.013	0.011
Migrants	-0.004	-0.020	-0.001	-0.002	-0.002	-0.002	-0.002	-0.002	-0.001	0.004
T & V training	0.000	-0.003	-0.012*	0.000	0.000	0.000	0.000	0.000	-0.001	-0.002
Below secondary level	0.019**	0.050	-0.196	-0.014	-0.014	-0.014	-0.014	-0.014	-0.003	-0.019
Secondary or above-level	-0.007	0.003	0.000	0.001	0.001	0.001	0.001	0.001	0.003	0.002
Formal sector	0.033***	-0.026	-0.016*	0.001*	0.001	0.001	0.001	0.001	-0.005*	-0.002
Informal sector	-0.024***	-0.102	-0.219	-0.017	-0.017*	-0.017*	-0.017*	-0.017*	-0.056***	-0.055***
Household size	-0.001	-0.015	-0.036	-0.002	-0.002	-0.002	-0.002	-0.002	-0.003	-0.003
Under five children	0.001	0.007	0.036	0.004***	0.004**	0.004**	0.004**	0.004**	0.003	0.003
Unexplained										
Age	0.089**	-0.600	-1.236*	-0.170	-0.292	-0.118	-0.118	-0.013	-0.179**	-0.110
Urban	-0.007	-0.085	-0.092	-0.001	-0.031	-0.013	-0.013	0.001	-0.022	-0.013
Punjab	0.233***	0.156	0.498*	0.083	0.037	0.091	0.091	0.086	0.097**	0.115**
Sind	0.097*	0.045	0.150	0.006	0.030	0.036	0.036	0.024	0.040	0.039
KP	0.054	-0.032	0.009	0.036	0.072	0.050**	0.050**	0.046	0.029	0.039**
Never married	-0.010	-0.168*	-0.244	-0.136***	-0.235***	-0.097***	-0.097***	-0.099***	-0.058***	-0.070***
Migrants	0.001	-0.006	0.009	0.013**	0.010	0.002	0.002	-0.001	0.000	0.004
T & V training	0.001	-0.004	-0.028	-0.005	-0.011	-0.004	-0.004	-0.018	-0.010	-0.012
Below secondary level	0.011	-0.014	0.411	0.105**	0.164**	0.077**	0.077**	0.085*	0.023	0.070
Secondary or above-level	0.015*	-0.016	-0.014	-0.010	-0.010	-0.003	-0.003	0.000	-0.003	0.000
Formal sector	-0.005	0.067	0.037	0.058**	0.100**	0.056***	0.056***	0.067**	0.035***	0.029***
Informal sector	0.136***	0.309***	0.586	0.111	0.118	0.137**	0.137**	0.159**	0.208***	0.223***
Household size	0.000	0.335	0.839	0.002	-0.222	-0.013	-0.013	0.005	0.054	0.033
Under five children	-0.010	-0.029	-0.219*	-0.038	-0.048	-0.039	-0.039	-0.048	-0.029	-0.036
Constant	-0.087	0.864	0.234	0.488**	0.892**	0.580***	0.617***	0.509**	0.769***	0.618***

Note: ***, ** and * denote the significance at 1%, 5% and 10%.

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

Table A3. Full estimates of the GWG at the mean and along the distribution (average-skilled occupations)

Variables	Mean	q10	q20	q30	q40	q50	q60	q70	q80	q90
Overall										
Male	9.887***	7.679***	7.799***	8.035***	8.175***	8.305***	8.358***	8.389***	8.419***	8.450***
Female	9.171***	7.010***	7.063***	7.146***	7.187***	7.228***	7.269***	7.315***	7.434***	7.451***
Difference	0.716***	0.669***	0.735***	0.889***	0.988***	1.077***	1.089***	1.074***	0.985***	0.999***
Explained	0.083***	0.062***	0.208***	0.149***	0.227***	0.062***	0.044***	0.044***	0.044***	0.044***
Unexplained	0.633***	0.607***	0.528***	0.740***	0.760***	1.015***	1.045***	1.030***	0.941***	0.954***
Explained										
Age	0.009***	0.007**	0.026***	0.018***	0.027***	0.007***	0.006***	0.006***	0.006***	0.006***
Urban	0.001**	0.008*	0.016	0.013	0.019	0.007***	0.006**	0.006**	0.006**	0.006**
Punjab	0.014***	0.009**	0.019	0.011	0.027**	0.007**	0.005**	0.005**	0.005**	0.005**
Sind	-0.004**	-0.002	-0.011	-0.005	-0.010*	-0.004*	-0.004*	-0.004*	-0.004*	-0.004*
KP	-0.006***	0.001	-0.002	-0.001	-0.009	-0.005	-0.009***	-0.009***	-0.009***	-0.009***
Never married	-0.006***	-0.006**	-0.037***	-0.023***	-0.050***	-0.015***	-0.014***	-0.014***	-0.014***	-0.014***
Migrants	-0.002***	-0.003**	-0.020***	-0.004	-0.006	-0.001	0.000	0.000	0.000	0.000
T & V training	-0.014***	0.011	0.053	0.043	0.080	0.027	0.018	0.018	0.018	0.018
Below secondary level	0.017***	0.010	0.018	0.004	-0.010	-0.004	-0.004	-0.004	-0.004	-0.004
Secondary or above-level	0.020***	0.005	0.026**	0.010	0.009	0.004	0.004	0.004	0.004	0.004
Formal sector	0.083***	-0.012*	0.195	0.090	0.118	0.019	0.013	0.013	0.013	0.013
Informal sector	-0.029***	0.034***	-0.078	-0.010	0.029	0.020	0.023	0.023	0.023	0.023
Household size	0.001	0.000	0.002	0.001	0.002	0.000	0.000	0.000	0.000	0.000
Under five children	0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000
Unexplained										
Age	0.100	0.248***	0.959***	0.238	0.597*	-0.146	-0.172	-1.132*	-0.160	-0.160
Urban	-0.015	0.039*	0.074	0.228*	0.256*	0.197*	0.194*	0.208	0.073	0.073
Punjab	-0.047**	-0.070***	-0.152	-0.046	-0.171*	-0.017	-0.002	0.260***	0.053	0.053
Sind	-0.020**	-0.019*	-0.124**	-0.069**	-0.122**	-0.054**	-0.056***	-0.046	-0.032**	-0.032**
KP	-0.006	0.001	-0.002	-0.015	-0.024**	-0.019**	-0.025**	-0.038	-0.019***	-0.019***
Never married	-0.050***	-0.031**	-0.206***	-0.057	-0.209***	-0.017	-0.010	0.035	-0.047	-0.047
Migrants	0.022***	0.008**	0.052***	-0.008	0.000	-0.013	-0.016	-0.013	0.001	0.001
T & V training	0.127***	-0.024	-0.123	0.041	-0.043	0.078	0.099	0.315*	0.055	0.055
Below secondary level	-0.025	0.023	0.042	-0.164	-0.196	-0.182	-0.183	-0.421**	-0.136**	-0.136**
Secondary or above-level	-0.027***	0.007	0.041**	-0.022	-0.023	-0.031	-0.031	-0.092**	-0.024*	-0.024*
Formal sector	-0.039***	-0.010	0.158	0.021	0.043	-0.037	-0.042	-0.022	0.009	0.009
Informal sector	-0.007	-0.132***	0.299	-0.162	-0.311	-0.277	-0.289*	-0.262	-0.091	-0.091
Household size	0.064	-0.010	-0.082	0.195	0.167	0.250	0.246	0.280	0.073	0.073
Under five children	-0.013	0.022	0.091*	-0.022	-0.014	-0.069	-0.066	-0.099	-0.022	-0.022
Constant	0.569***	0.554***	-0.500	0.582	0.810	1.352***	1.398***	2.056***	1.210***	1.223***

Note: ***, ** and * denote the significance at 1%, 5% and 10%.

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

Table A4. Full estimates of the GWG at the mean and along the distribution (high-skilled occupations)

Variables	Mean	q10	q20	q30	q40	q50	q60	q70	q80	q90
Overall										
Male	10.261***	8.141***	8.328***	8.431***	8.521***	8.591***	8.609***	8.696***	8.419***	8.450***
Female	10.117***	8.320***	8.356***	8.392***	8.428***	8.464***	8.500***	8.536***	7.434***	7.451***
Difference	0.144***	-0.178***	-0.027***	0.039***	0.093***	0.127***	0.109***	0.159***	0.985***	0.999***
Explained	-0.051***	0.039	-0.146	-0.164	-0.221*	-0.221*	-0.236**	-0.215**	0.044***	0.044***
Unexplained	0.194***	-0.217***	0.118***	0.203***	0.314***	0.348***	0.345***	0.375***	0.941***	0.954***
Explained										
Age	0.020***	0.006	-0.016	-0.009	-0.007	-0.007	0.002	-0.002	0.006***	0.006***
Urban	0.020***	0.031	-0.020	-0.028	-0.053	-0.053	-0.029	-0.027	0.006*	0.006*
Punjab	0.005	0.000	0.007	0.008	-0.010	-0.010	-0.010	-0.010	0.005**	0.005**
Sind	-0.011***	-0.001	-0.020	-0.017	0.011	0.011	-0.005	-0.004	-0.004*	-0.004*
KP	0.011***	0.061	0.042	0.039	-0.002	-0.002	0.016	0.009	-0.009***	-0.009***
Never married	-0.003	-0.005	-0.012	-0.013	-0.015	-0.015	-0.008	-0.009	-0.014***	-0.014***
Migrants	-0.004	-0.004	-0.015	-0.015	-0.001	-0.001	-0.004	-0.006	0.000	0.000
T & V training	-0.009***	-0.034	-0.008	-0.015	-0.023	-0.023	-0.032*	-0.017	0.018**	0.018**
Below secondary level	-0.002	0.004	-0.024	-0.022	-0.008	-0.008	-0.003	0.000	-0.004	-0.004
Secondary or above-level	-0.005	0.003	-0.018	-0.017	-0.010	-0.010	-0.007	-0.004	0.004	0.004
Formal sector	-0.093***	0.011	0.006	0.007	0.035	0.035	0.048*	0.042**	0.013	0.013
Informal sector	0.022***	-0.028	-0.052*	-0.066**	-0.125***	-0.125***	-0.192***	-0.174***	0.023	0.023
Household size	-0.001	0.007	0.001	0.000	0.002	0.002	-0.002	-0.001	0.000	0.000
Under five children	-0.001	-0.012	-0.018	-0.015	-0.013	-0.013	-0.010	-0.011	0.000	0.000
Unexplained										
Age	0.284***	0.061	-0.481	-0.310	-0.275	-0.275	-0.043	-0.141	-0.160	-0.160
Urban	-0.006	0.057	-0.032	-0.047	-0.090	-0.090	-0.049	-0.044	0.073	0.073
Punjab	-0.012	0.001	-0.141	-0.148	0.208	0.208	0.221	0.211	0.053	0.053
Sind	-0.042***	-0.003	-0.051	-0.044	0.030	0.030	-0.013	-0.010	-0.032***	-0.032***
KP	-0.008	-0.179	-0.121	-0.112	0.018	0.018	-0.039	-0.018	-0.019***	-0.019***
Never married	0.000	-0.038	-0.074	-0.081	-0.091*	-0.091*	-0.054	-0.057	-0.047	-0.047
Migrants	0.001	0.008	0.031	0.031	0.001	0.001	0.007	0.012	0.001	0.001
T & V training	-0.056***	0.087*	0.026	0.044	0.062	0.062	0.082**	0.049	0.055	0.055
Below secondary level	0.010	-0.093	0.601	0.547	0.199	0.199	0.068	0.011	-0.136**	-0.136**
Secondary or above-level	0.073	-0.154	0.898	0.852	0.496	0.496	0.330	0.207	-0.024*	-0.024*
Formal sector	-0.204*	-0.040	-0.013	-0.016	-0.177	-0.177	-0.256*	-0.220*	0.009	0.009
Informal sector	-0.013*	-0.018**	-0.036***	-0.046***	-0.089***	-0.089***	-0.136***	-0.124***	-0.091	-0.091
Household size	0.030	0.422*	0.157	0.079	0.184	0.184	0.006	0.042	0.073	0.073
Under five children	-0.001	-0.101	-0.148	-0.124	-0.107*	-0.107*	-0.089	-0.096*	-0.022	-0.022
Constant	0.138	-0.227	-0.500	-0.423	-0.056	-0.022	0.308	0.553	1.210***	1.223***

Note: ***, ** and * denote the significance at 1%, 5% and 10%.

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.

Table A5. Full estimates of the GWG at the mean and along the distribution (very high-skilled occupations)

Variables	Mean	q10	q20	q30	q40	q50	q60	q70	q80	q90
Overall										
Male	10.476***	8.165***	8.312***	8.383***	8.389***	8.523***	8.553***	8.584***	8.614***	8.644***
Female	10.024***	7.456***	7.567***	7.677***	7.756***	7.827***	7.902***	8.019***	8.054***	8.088***
Difference	0.452***	0.709***	0.745***	0.706***	0.634***	0.696***	0.651***	0.565***	0.560***	0.555***
Explained	0.057***	0.027	-0.041	-0.041	-0.065*	-0.056**	-0.056**	-0.056**	-0.056**	-0.056**
Unexplained	0.395***	0.682***	0.786***	0.747***	0.699***	0.752***	0.706***	0.620***	0.615***	0.611***
Explained										
Age	0.089***	0.002	-0.027	-0.027	0.014	-0.004	-0.004	-0.004	-0.004	-0.004
Urban	0.015***	0.022***	0.008	0.008	0.012*	0.010**	0.010**	0.010**	0.010**	0.010**
Punjab	0.006	0.029	0.018	0.018	0.005	-0.036	-0.036	-0.036	-0.036	-0.036
Sind	0.000	-0.004	-0.035	-0.035	-0.065***	-0.007	-0.007	-0.007	-0.007	-0.007
KP	-0.001	0.002	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001
Never married	0.008**	-0.009	-0.003	-0.003	-0.002	0.006	0.006	0.006	0.006	0.006
Migrants	-0.002**	-0.003	-0.003*	-0.003*	-0.004*	-0.001	-0.001	-0.001	-0.001	-0.001
T & V training	0.001	0.001	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001
Below secondary level	-0.006	-0.053*	-0.038**	-0.038**	-0.075***	-0.062***	-0.062***	-0.062***	-0.062***	-0.062***
Secondary or above-level	-0.033***	0.055***	0.056***	0.056***	0.067***	0.052***	0.052***	0.052***	0.052***	0.052***
Formal sector	0.003	-0.004	-0.004	-0.004	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Informal sector	-0.021*	-0.010	-0.013	-0.013	-0.020*	-0.015*	-0.015*	-0.015*	-0.015*	-0.015*
Household size	0.000	0.000	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001
Under five children	0.001	0.000	-0.001	-0.001	0.002	-0.002	-0.002	-0.002	-0.002	-0.002
Unexplained										
Age	-0.383***	-0.053	-0.417	-0.571*	-0.314	-1.291***	-1.291***	-0.899***	-0.899***	-0.899***
Urban	0.047***	0.105*	-0.015	0.097	0.127	0.105	0.105	0.087	0.087	0.087
Punjab	0.245***	-0.058	0.021	-0.011	0.030	0.383***	0.383***	0.268***	0.268***	0.268***
Sind	0.037***	0.002	-0.018	-0.039	-0.058***	-0.014	-0.014	-0.010	-0.010	-0.010
KP	0.035***	0.062*	0.033	0.025	0.009	0.061**	0.061**	0.048**	0.048**	0.048**
Never married	0.016	0.002	-0.017	0.008	0.005	0.030	0.030	0.006	0.006	0.006
Migrants	0.004	0.010	0.002	-0.008	-0.004	-0.049**	-0.049**	-0.003	-0.003	-0.003
T & V training	0.002	0.001	-0.012	-0.017*	-0.016	-0.044***	-0.044***	-0.016	-0.016	-0.016
Below secondary level	-0.057*	-0.034	0.048	0.105	0.077*	0.095***	0.095***	0.043***	0.043***	0.043***
Secondary or above-level	-0.836	-0.272	-0.285	-0.278	-0.381	-0.728	-0.728	-0.696	-0.696	-0.696
Formal sector	-0.089	0.124	0.121	0.121	0.040	0.026	0.026	0.026	0.026	0.026
Informal sector	-0.017	-0.017	-0.023	0.005	-0.042	-0.041	-0.041	-0.068	-0.068	-0.068
Household size	0.019	0.106	0.026	0.064	0.048	0.218	0.218	0.100	0.100	0.100
Under five children	-0.031**	-0.015	0.008	-0.019	0.010	-0.120**	-0.120**	-0.084***	-0.084***	-0.084***
Constant	1.404***	0.718*	1.312***	1.264***	1.169***	2.121***	2.076***	1.819***	1.814***	1.809***

Note: ***, ** and * denote the significance at 1%, 5% and 10%.

Source: own calculations based on Labour Force Survey 2020-2021, Pakistan Bureau of Statistics, the Government of Pakistan.