WAGE INEQUALITY WITHIN AND BETWEEN OCCUPATIONS: A CASE STUDY OF PAKISTAN

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Abstract

This study investigates wage inequality within and between occupations in Pakistan, using data from the Labor Force Survey (LFS) for 2010-11 and 2020-21. It is among the first studies to decompose overall wage inequality in Pakistan into between-occupation and within-occupation components. The variance of log wages framework, combined with growth curve regression, is employed for this decomposition. Key findings reveal that the gender wage gap increased from 0.84% in 2009 to 1.04% in 2020, while between-occupation inequality declined over the period. Conversely, within-occupation inequality increased significantly, rising from 1.04% to 1.104%. Education was found to play a critical role in moderating wage inequality, particularly between occupations. The study recommends targeted policy interventions including investment in education and training, enforcement of equal pay legislation, and strengthening of collective bargaining mechanisms.

Keywords: Wage Inequality, Occupational Wage Inequality, Decomposition Analysis, Pakistan, Labor Force Survey, Gender Wage Gap

INTRODUCTION

Wage inequality — the unequal distribution of wages among workers — is a pressing concern in both developed and developing economies. It is linked not only to economic inefficiency but also to broader social outcomes including poverty, reduced mobility, and weakened social cohesion. In Pakistan, these disparities are especially pronounced across occupational lines, yet the subject has received insufficient empirical attention at the occupational level. The International Labour Organization (ILO, 2020) estimates that approximately 62% of the global working-age population is employed, with 54% receiving wages or salaries. Wages constitute between 40% and 80% of total household income, particularly in developing economies, making wage inequality a direct driver of household-level deprivation. Pakistan, with a labour force of over 68 million (Labour Force Survey, 2020-21), represents a critical case where occupational wage structures have undergone significant transformation.

Occupational wage inequality (OWI) can manifest in two distinct forms: (i) between-occupation inequality, which captures wage differentials across different job categories; and (ii) within-occupation inequality, which reflects wage dispersion among workers performing similar roles. Despite a growing literature on income inequality in Pakistan using tools such as the Gini coefficient, Theil index, and Oaxaca-Blinder decomposition, the occupational decomposition of wage inequality has been largely overlooked.

This paper fills that gap by decomposing overall wage inequality in Pakistan into between- and within-occupation components using data from the 2010-11 and 2020-21 Labour Force Surveys. By tracking these components over a decade, the study identifies whether reforms in education, labour market structure, and gender participation have narrowed or widened wage gaps. This has direct implications for Pakistan's obligations under SDG 8.5, which calls for equal pay for equal work.

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Research Objectives

This study pursues three main objectives:

- To quantify and decompose overall wage inequality in Pakistan into between-occupation and within-occupation components.
- To examine changes in these components over the period 2010-11 to 2020-21.
- To identify the individual-level determinants — gender, age, and education — that explain occupational wage differentials.

Significance of the Study

This study makes a methodological contribution by applying the variance decomposition framework of Western and Bloome (2009) and Mouw and Kalleberg (2010) to Pakistani data — a first in the country's economic literature. Existing studies have predominantly focused on aggregate income inequality without distinguishing between occupational sources. By doing so, this study provides policy-relevant insights into where targeted interventions would be most effective.

LITERATURE REVIEW

Determinants of Occupational Wage Inequality

The determinants of OWI have been extensively studied across multiple theoretical traditions. Human capital theory (Becker, 1964; Krueger & Summers, 1988) posits that wage differentials reflect differences in education, skills, and experience. Empirically, Autor, Levy, and Murnane (2001) demonstrated that education is a primary driver of wage inequality in the United States, a relationship referred to as the 'education premium.'Discrimination theory (Gibbons & Katz, 1992; Blau & Kahn, 2017) attributes part of the wage gap to differential treatment based on gender, race, or age. Evidence from field experiments, notably Bertrand and Mullainathan (2003), confirms that labour market discrimination persists in both developed and developing economies, contributing to observed wage differentials that cannot be explained by productivity-related characteristics alone. Technological change has also been identified as a key driver of OWI. Autor, Katz, and Kearney (2006) documented that skill-biased technological change in the United States has increased demand for high-skilled workers while depressing wages for low-skilled workers, contributing to wage polarization. Similar patterns have been observed in European labour markets (Machin & Van Reenen, 1998).Globalization further compounds these pressures. Katz and Autor (1999) found that increased global trade integration intensifies demand for skilled labour while reducing demand for unskilled workers, widening the wage gap. In the Pakistani context, Qureshi and Akhtar (2011) found that greater global integration increased pay for highly skilled workers while lowering earnings for low-skilled counterparts.

Within-Occupation versus Between-Occupation Inequality

Kim and Sakamoto (2008) pioneered the analysis of intra-occupational wage inequality in the United States, finding a significant rise in within-occupation wage dispersion between 1983 and 2002. Mouw and Kalleberg (2010) extended this work, demonstrating that occupational structure accounts for a substantial share of overall wage inequality. Williams (2013) applied similar methods to British data, confirming the importance of occupational boundaries in shaping wage distributions.Western and Bloome (2009) developed the variance function regression framework used in this study, which enables decomposition of overall wage variance into between- and within-group components. This approach is particularly well-

suited for tracking how changes in occupational composition and within-occupation wage dispersion contribute to overall inequality trends.

Wage Inequality in Pakistan

Research on wage inequality in Pakistan has grown considerably, though the within-/between-occupation distinction remains underexplored. Ahmad and Afzal (2010) found education and experience — rather than gender or location — to be the primary drivers of wage disparities using Pakistan Integrated Household Survey data. Hussain and Ahmad (2013) similarly concluded that occupation, education, and experience were the main determinants of earnings differences. Chaudhary and Kausar (2018) found that minimum wage laws and unionization helped narrow skill-related wage gaps, while Hakro et al. (2021) documented significant returns to education in the Pakistani context. The informal sector presents an additional layer of complexity. Pakistan's large informal economy creates wage disparities not captured in formal surveys, with informal workers earning substantially less than their formal sector counterparts and lacking access to social protections (Bargain & Kwenda, 2014). Gender-based wage discrimination is particularly acute in the informal sector.

Role of Institutions and Policy

Institutions play a central mediating role in wage-setting. Countries with higher rates of unionization and stronger labour protections tend to exhibit lower wage inequality (Mishel & Bivens, 2021). Progressive taxation and social welfare programs have been shown to reduce post-tax income inequality (Atkinson, 2015). Dube, Lester, and Reich (2010) demonstrated that minimum wage increases reduce wage dispersion for low-wage workers without significant employment losses in adjacent U.S. counties.

DATA AND METHODOLOGY

Data

This study uses micro data from the Labour Force Survey (LFS) of Pakistan, collected by the Pakistan Bureau of Statistics, for two cross-sectional years: 2008–09 and 2018–19. The LFS is a nationally representative household survey covering formal and informal sector workers across all provinces. The primary variable of interest is the natural logarithm of monthly wages. Occupations are classified according to the Pakistan Standard Classification of Occupations (PSCO), yielding nine major occupational groups consistent with the International Standard Classification of Occupations (ISCO-88).

A key limitation of the LFS is its repeated cross-sectional design, which precludes individual-level panel tracking. To address potential unobserved individual heterogeneity, the study follows Deaton's (2006) pseudo-panel approach, estimating relationships using occupational group averages and applying a multivariate fixed-effects framework.

Decomposition Framework

Following Western and Bloome (2009) and Mouw and Kalleberg (2010), overall wage inequality is measured using the variance of log wages (Voc), decomposed as:

$$\mathbf{VOC = BOC + WOC}$$

Where BOC denotes between-occupation inequality (the weighted variance of mean wages across occupations) and WOC denotes within-occupation inequality (the employment-share-weighted average of within-occupation wage variance). Formally:

$$\mathbf{BOC = \Sigma sj \cdot rj^2 \quad and \quad WOC = \Sigma sj \cdot \sigma j^2}$$

Where sj is the employment share of occupation j, rj^2 is the squared deviation of occupation j's mean wage from the overall mean wage, and σj^2 is the variance of wages within occupation j.

Changes in overall inequality between periods p (2008–09) and c (2018–19) are further decomposed into three components:

$$\Delta VOC = \Delta BOC + \Delta WOC + \Delta COC$$

ΔBOC captures the mean wage effect (changes in average wages between occupations), ΔWOC captures the within-occupation effect (changes in wage variance within occupations), and ΔCOC captures the composition effect (changes in the occupational employment shares).

Regression Models

To identify the individual-level determinants of wage inequality, two regression models are estimated. The first models mean log wages (between-occupation inequality):

$$ln(wageij) = \beta 1 \cdot GENij + \beta 2 \cdot AGEij + \beta 3 \cdot YRSEDUij + \beta 4 \cdot GENij \times AGEij + \beta 5 \cdot GENij \times YRSEDUij + \alpha j \cdot OCCij + \varepsilon ij$$

The second models the squared residuals from the first regression (within-occupation inequality):

$$log(\varepsilon^2 ij) = \beta 1 \cdot GENij + \beta 2 \cdot AGEij + \beta 3 \cdot YRSEDUij + \beta 4 \cdot GENij \times AGEij + \beta 5 \cdot GENij \times YRSEDUij + \gamma j \cdot OCCij + \omega ij$$

In both models, GEN is a binary gender variable, AGE proxies for experience, YRSEDUC represents years of formal education, and αj/γj are occupational fixed effects. Interaction terms capture gender-age and gender-education heterogeneity.

Finally, growth-curve models are estimated using occupation-year averages from the first-stage regressions to trace the trend in between- and within-occupation inequality across the study period, following Kim and Sakamoto (2008):

$$\alpha jt = B0 + B1 \cdot Yearjt + \varepsilon jt \quad and \quad \gamma jt = B0 + B1 \cdot Yearjt + ¥jt$$

DESCRIPTIVE ANALYSIS

Occupational Employment and Wage Trends (2010-11 to 2020-21)

Table 1 presents changes in employment shares and average monthly wages across major occupational groups over the study period.

Table 1

Distribution of Employees and Average Monthly Wages by Occupation, 2010-11 and 2020-21

Occupation	Emp. Share 2009 (%)	Avg. Wage 2009 (PKR)	Emp. Share 2019 (%)	Avg. Wage 2019 (PKR)	Wage Growth (%)
Managers	4.25	18,612	2.74	64,606	+247%
Professionals	3.98	15,368	11.35	36,514	+138%
Technicians	12.44	9,878	6.56	30,010	+204%
Clerical Workers	3.74	10,903	3.42	29,878	+174%
Service & Sales Workers	10.67	6,888	14.01	18,103	+163%
Skilled Agricultural	1.29	6,187	0.60	17,342	+180%

Workers					
Craft & Trades Workers	23.76	6,412	17.49	17,466	+172%
Machine Operators	7.73	7,149	9.41	19,260	+169%
Elementary Occupations	32.12	5,305	34.41	14,274	+169%

Source: Pakistan Bureau of Statistics, Labour Force Survey 2010-11 and 2020-21.

Several notable patterns emerge. Managers recorded the highest absolute wage growth (from PKR 18,612 to PKR 64,606), though their share of total employment declined from 4.25% to 2.74%, suggesting an upgrading dynamic in this segment. Professionals registered the most dramatic employment expansion — from 3.98% to 11.35% of the workforce — accompanied by substantial wage growth. By contrast, Elementary Occupations remain the largest occupational category (34.41% in 2018-19) and recorded the lowest average wages, indicating persistent structural concentration of workers in low-wage employment.

Gender Wage Patterns

Average wages increased for both male and female workers over the decade. Male workers experienced a wage increase of approximately 152%, while female workers saw a slightly higher increase of approximately 155%. Despite this convergence, significant occupational segregation persists: female workers are heavily concentrated in Elementary Occupations (38.02% in 2018-19) and Professionals (31.39%), while male workers show a broader distribution across higher-wage categories.

Female managers and professionals receive substantially lower average wages than their male counterparts — a pattern consistent with within-occupation wage discrimination. For example, female managers earned an average of PKR 52,953 in 2018-19 compared to PKR 65,592 for male managers.

Regional and Age Dimensions

Urban areas across all provinces recorded higher wage growth than rural areas. Urban KPK exhibited the highest growth rate (308%), followed by urban Sindh (279%) and urban Punjab (228%). Rural Sindh recorded the lowest growth rate (87.8%), indicating persistent urban-rural wage divides. Wage growth was broadly distributed across age categories, with 'Old Age Youth' recording the highest increase (157.6%) and 'Seniors' the lowest (128.7%).

EMPIRICAL RESULTS

Between-Occupation Wage Inequality

Table 2 presents the results of the between-occupation regression for 2008–09 and 2018–19.

Table 2

Key Coefficients from Between-Occupation Wage Regression

Variable	Coeff. 2009	Std. Err. 2009	Coeff. 2019	Std. Err. 2019
Gender (Female = 1)	0.839***	0.037	1.043***	0.033

Age	0.018***	0.001	0.021***	0.001
Years of Education	0.057***	0.002	0.051***	0.002
Age × Gender	-0.005***	0.001	-0.010***	0.001
Education × Gender	-0.023***	0.002	-0.023***	0.002
Constant	10.510***	0.045	11.592***	0.059

*Note: *** p<0.01. All coefficients are statistically significant. Occupation fixed effects included but not reported.*

The gender coefficient indicates a significant between-occupation wage gap, with female workers earning systematically different wages than male workers, net of age and education. The gap widened from 0.84% in 2008–09 to 1.04% in 2018–19. Notably, the negative and significant interaction between gender and age (age×gender) indicates that the gender wage gap narrows as workers grow older, in both periods.

Education exerts a positive and statistically significant effect on between-occupation wages. A one-year increase in education raises mean occupational wages by 5.7% in 2009 and 5.1% in 2019. The slight decline in the education coefficient over time may reflect the increased supply of educated workers entering the labour market. The significant negative coefficient on the education×gender interaction term implies that education reduces the gender wage gap at the between-occupation level in both years.In terms of occupational ranking, Legislators and Senior Officials serve as the base category. Engineering Professionals and Health Professionals are the only two groups to exceed the wage benchmark of Legislators in both periods. While; all other occupations record lower mean wages, with Service and Sales Workers, Craft Workers, and Elementary Occupations recording the largest negative deviations.

Growth Curve Model: Between-Occupation Inequality Trend

Table 3

Growth-Curve Model for Between-Occupation Inequality

Variable	Coefficient	Std. Error	Z-Statistic	P-Value
Year (trend)	-0.136	0.045	-3.00	0.003
Constant (baseline 2009)	0.652	0.070	-9.37	0.000

The growth curve results indicate that between-occupation wage inequality declined significantly over the study period. Starting from an average level of 0.652 in 2009, between-occupation inequality decreased by 0.136 per year on average, indicating a convergence in mean wages across occupations over the decade.

Within-Occupation Wage Inequality

Table 4 presents selected results from the within-occupation regression, which models the log of squared residuals from the first-stage regression.

Table 4

Key Coefficients from Within-Occupation Wage Regression

Variable	Coeff. 2009	Std. Err. 2009	Coeff. 2019	Std. Err. 2019
Gender (Female = 1)	0.506***	0.142	-1.255***	0.140

Age	0.008**	0.004	-0.006	0.004
Years of Education	0.009	0.008	-0.022***	0.007
Age × Gender	-0.006	0.004	0.014***	0.004
Education × Gender	-0.038***	0.008	0.004	0.007
Constant	1.058***	0.172	1.783***	0.248

*Note: *** p<0.01, ** p<0.05. Occupation fixed effects included but not reported.*

Within-occupation inequality among female workers was 0.51% in 2008–09 but reversed to -1.25% in 2018–19, indicating a change in the direction of gender-based dispersion within occupations. This reversal likely reflects compositional shifts: as more women entered professional occupations, within-occupation wage variance among women changed in character.Education's effect on within-occupation inequality also changed direction: it had no statistically significant effect in 2009 but significantly reduced within-occupation variance in 2019 (-0.022), suggesting that education increasingly equalizes wages within occupational categories. The education×gender interaction, however, shows that in 2009, additional education reduced the gender-based within-occupation gap by 3.8%, whereas in 2019, this effect is negligible.

Growth Curve Model: Within-Occupation Inequality Trend

Table 5

Growth-Curve Model for Within-Occupation Inequality

Variable	Coefficient	Std. Error	Z-Statistic	P-Value
Year (trend)	1.104	0.085	12.95	0.000
Constant (baseline 2009)	1.044	0.094	-11.05	0.000

In sharp contrast to between-occupation trends, within-occupation wage inequality increased significantly over the study period. Starting from a baseline of 1.044 in 2009, within-occupation inequality grew by 1.104 over the period, reaching an estimated level of 1.104 by 2018–19. This finding suggests that while occupational boundaries have converged in terms of average wages, the dispersion of wages within occupations has widened substantially — a pattern consistent with rising intra-occupational heterogeneity in worker characteristics, productivity, and bargaining power.

Occupation-Level Decomposition

The occupation-level decomposition reveals heterogeneous patterns across groups. Table 6 summarizes the decomposition results.

Table 6

Decomposition of Changes in Overall Wage Inequality by Occupation

Occupation	ΔVoc	ΔBoc	ΔWoc	ΔCoc
Legislators/Managers	-0.183	+0.080	-0.043	-0.220
Professionals	+0.023	-0.004	-0.002	+0.030
Technicians	-0.020	+0.007	-0.012	-0.016

Clerical Workers	-0.001	+0.001	-0.001	-0.001
Service & Sales Workers	+0.026	-0.001	-0.007	+0.033
Skilled Agricultural Workers	-0.075	-0.007	-0.069	+0.001
Craft & Trades Workers	-0.008	-0.003	+0.003	-0.008
Machine Operators	+0.001	+0.001	-0.004	+0.005
Elementary Occupations	-0.024	-0.006	-0.017	-0.001

Source: Author's calculations from LFS 2008-09 and 2018-19.

For Managers and Senior Officials, the overall decline in inequality (-0.183) was primarily driven by compositional effects (-0.220, 60%), reflecting the sharp decline in this group's employment share. For Skilled Agricultural Workers, the dominant factor was a decline in within-occupation wage variance (-0.069, 92%), suggesting wage convergence among agricultural workers. Service and Sales Workers saw increasing inequality driven almost entirely by compositional effects (+0.033), as the expansion of this heterogeneous sector brought in workers with widely varying wages.

DISCUSSION

The findings present a nuanced picture of wage inequality dynamics in Pakistan over a decade of economic change. The simultaneous decline in between-occupation inequality and rise in within-occupation inequality reflects a structural transformation in the labour market: occupational boundaries have become less predictive of wages, while factors operating within occupational categories — individual productivity, employer bargaining power, and worker characteristics — have become increasingly important. The persistence and growth of the gender wage gap (from 0.84% to 1.04%) despite a decade of economic growth and increased female labour force participation is particularly concerning. That this gap narrows with age and education suggests that older, more educated women close the gap relative to their male counterparts, but younger women entering the labour market continue to face structural disadvantages. The reversal in within-occupation gender inequality by 2019 may reflect the growing entry of women into higher-paying professional occupations, introducing new within-group heterogeneity. Education emerges as the most consistently important moderating factor. Its role in reducing between-occupation inequality is well-established; the finding that it increasingly also reduces within-occupation inequality (by 2019) suggests that educational attainment is becoming a differentiating factor even within jobs, perhaps through performance-linked pay systems and increased employer recognition of credentials. The composition effect as the dominant driver of inequality changes in several occupations (Managers, Professionals, and Service Workers) underscores the importance of occupational mobility and structural transformation. Pakistan's labour market is shifting away from Craft and Agricultural occupations toward Services and Professional categories — a pattern consistent with early-stage structural transformation, but one that creates new forms of within-occupation heterogeneity.

CONCLUSIONS AND POLICY RECOMMENDATIONS

Conclusions

This study provides the first occupational decomposition of wage inequality in Pakistan, drawing on Labour Force Survey data for 2010-11 and 2020-21. The principal findings are:

- Between-occupation wage inequality declined significantly over the decade, with occupational mean wages converging.
- Within-occupation wage inequality increased substantially, from approximately 1.04% in 2009 to 1.104% in 2020 — a trend that has received no prior attention in Pakistani wage research.
- The gender wage gap at the between-occupation level widened from 0.84% to 1.04%, though it narrows with age and educational attainment.
- Education is the most powerful policy lever, significantly reducing both between- and within-occupation wage inequalities.
- Compositional effects — changes in occupational employment shares — are the dominant driver of inequality changes in several major occupational groups, including Managers, Professionals, and Service Workers.

Policy Recommendations

Based on these findings, the following policy interventions are recommended:

- Expand and improve access to education and vocational training, particularly for women and rural populations, to reduce both between- and within-occupation wage gaps.
- Enforce and strengthen equal pay legislation, paired with mandatory pay transparency requirements, to address the persistent gender wage gap.
- Establish and rigorously enforce a statutory minimum wage that is regularly updated to reflect inflation and productivity growth, particularly for Elementary Occupations.
- Support collective bargaining and unionization, especially in service and informal sector occupations where within-occupation wage dispersion is rising fastest.
- Introduce targeted anti-discrimination policies for women in professional and managerial occupations to address structural barriers to wage advancement.
- Regularly monitor and report occupational wage inequality using decomposition methods, enabling evidence-based policy adjustment.
- Invest in formal sector job creation in higher-wage occupational categories to reduce the structural concentration of workers in low-wage elementary occupations.

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