

UNDERSTANDING THE GENDER WAGE GAP IN THE FORMAL AND INFORMAL SECTORS OF THE GHANAIAN ECONOMY

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ABSTRACT

This paper investigated how gender wage inequality varies across formal and informal enterprises in Ghana. Applying a multinomial logit model on the data set of the seventh round of the Ghana Living Standard Survey (GLSS 7), we found that individual and household characteristics have gendered differential effects on the probability of working in the formal and informal wage sectors. We observed that while the likelihood of working in the formal sector increases for both men and women with higher levels of education, the opposite is the case for higher levels of education in the informal wage sector. Using the Dubin-McFadden (DMF) and Lee control function approaches to control for both observable characteristics and endogenous selection bias in formal and informal jobs, it was observed that while the raw gender wage gap in formal employment is overestimated as a result of the observable characteristics and selection process, that of the informal sector tends to be underestimated for the same reasons. In both formal and informal employment, we observed gender wage discrimination against women. This therefore indicates the importance of enforcing regulations against gender discrimination and expanding regulated formal employment to accommodate more women in the effort to reduce gender wage gaps in Ghana.

Keywords: Gender wage-gap, Formal wage sector, Informal wage sector

JEL classification: J31, J45 and J46, J81

1. Introduction

The gender wage gap has received much attention in literature, especially from the developed world. This is mainly because men and women are traditionally tied to some specific occupations – with women-affiliated occupations paying less. In the last few decades, the gender wage gap has assumed a nose-diving trend partly because women have gradually been entering into occupations traditionally dominated by men (Blau & Kahn, 2000). According to Ward (2018), the United Kingdom's wage gap differential score has declined consistently from 47.6% in 1970 to 16.8% in 2016. Despite the gains made, more policy actions are still needed to address the persistent problem!

Appleton, Hoddinott and Krishnan (1999) explained how gender discrimination in the labour market adversely affects labour efficiency and growth. An estimated US\$160 trillion in human capital wealth is said to be lost annually due to gender wage differentials (Mosom, 2019). As a result, several studies across the various regions of the world have focused on various strategies to ensure parity in wages between men- and women-dominated occupations (Becker, 1975; Psacharopoulos & Tzannatos, 1992; Horton, 1996; Grun, 2009; Yahmed, 2018).

Apart from the socioeconomic challenges associated with the gender wage gap, some studies have also complained about estimation problems. Spiggle (2021) explained using data from 'pay-scale reports' that the gender wage gap is mostly overestimated. Comparing the median salary between men and women in the US, he indicated that for every dollar earned by a man, his counterpart woman earns 82 cents – indicating a gender wage gap of 18%. However, after controlling for other factors besides gender, including education, experience, location, and industry, the gender wage gap shrinks to only a 2% difference.

Due to the danger of overestimation, the current discourse on the gender wage gap has shifted closely to the use of advanced econometric models to account for the observable characteristics and sometimes selection bias of the labour participants to establish the exact or near-reasonable gender wage differentials (Glick & Sahn, 1997; Appleton et al., 1999; Grun, 2009; Yahmed, 2018; Mosom, 2019).

Even though discussions on the gender wage gap have not received the needed research attention in Africa as has been the case in other parts of the world (Appleton et al., 1999), a few have found that differences in observable characteristics and selection bias significantly account for higher gender wage gaps in Africa (Glick & Sahn, 1997; Appleton et al., 1999). For instance, Appleton et al. (1999) extended the Neumark method for decomposing wage gaps and concluded that the differences between actual and pooled returns are the reason for much of the gender wage gap in Ethiopia and Uganda.

Considering the absence of employment protection legislation for most workers in the informal sector, Yahmed (2018) focused attention on how gender inequality differs across formal and informal wage earners in urban Brazil. Using a multi-level analysis, she identified observable characteristics and selection bias as having a significant impact on the gender wage gap between formal sector workers and informal sector workers.

Just like in Brazil, the Ghanaian economy is hugely informal. This is largely because the formal sector has not been growing fast enough to create jobs to meet the needs of the growing labour force. Moreover, the sector does not usually require any minimum level of academic qualification, employable skills and relevant working experience and therefore its borders are wide open for any participant in the labour market – especially women (Osmani, 2003; Domfe et al., 2013).

Even though not much work has gone into the comparison of gender wage gaps between workers in the formal and informal sectors of the Ghanaian economy, it is useful for such comparison to account for the observable characteristics and selection bias to avoid the usual problem of overestimation. This study therefore closely follows Yahmed's (2018) estimation techniques by employing three approaches that discriminate against the effects of observable characteristics and the selection process into formal and informal jobs to explain the gender wage gap among workers across these sectors in Ghana.

2. Gender Issues in the Ghanaian Labour Market

Differences exist in the characteristics between men and women participants in the Ghanaian labour market. For instance, the economic activity rate, which indicates the proportion of economically-active persons in the reference population, has always been higher for men (Ghana Statistical Service [GSS], 2008). The net economic activity rate for men (54.9%) was slightly higher compared to that of women (53.4%) in 2006. Similarly, the standardized economic activity rate for men (66.9%) was higher than that of women (63.3%) in 2017. Apart from the economic activity rate, the likelihood of being engaged in informality – which GSS (2019) described as being engaged by the informal sector or employed in informal jobs – is higher for men (78.7%) than it is for women (73.3%).

The cultural complexion of the Ghanaian labour market appears to favour men in terms of job acquisition (Domfe et al., 2017). Mainly as a result, unemployment among women has been higher than it has been for men. While the unemployment rate for men was 3.5% compared to 3.6% for women in 2006, the trend did not change so much when the men recorded a lower unemployment rate of 5.5% against 6.3% for women in 2017 (GSS, 2008; GSS, 2019). Additionally, the overall time-related underemployment rate, where some of the employed work for 40 hours a week or less, is also higher for women (43.2% in 2006 and 24.5% in 2017) compared to those of men (36.3% in 2006 18.0% in 2017).

Another characteristic of labour outcome that is influenced by gender in the Ghanaian labour market is employment status. GSS (2019) described employment status as the position of workers in the establishment where they work. Available data suggest marked differences in the employment status of men and women working in Ghana. For instance, higher proportions of women (56.9% in 2006 and 55.7% in 2017) engaged in vulnerable employment (own-account worker) than men (53.1% in 2006 and 42.3% in 2017). Interestingly, while the proportion of men in vulnerable employment has declined significantly, that of women experienced only marginal decline from the 2005/2006 survey period to the 2016/2017 survey period. Additionally, a greater proportion of men compared to women, are paid employees. This is probably because Ghanaian employers prefer to work with men – for various social and health reasons.

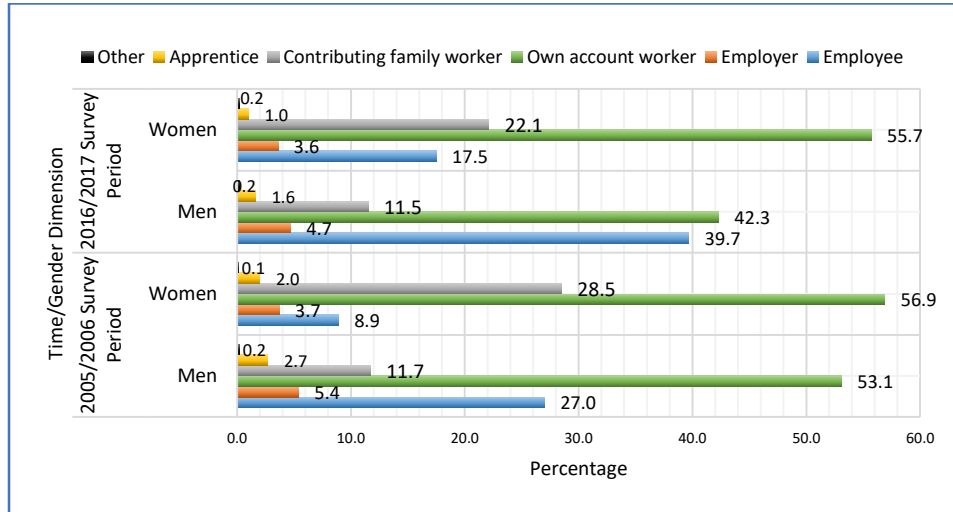


Figure 1: Employment Status of the Currently Employed Population Aged 15 Years and Older, by Sex and Survey Period (%)
 Source: GLSS 5 & 70.2.

In line with structural changes in economies as they develop, the proportion of employment in the agricultural sector of the Ghanaian economy has been declining over the years. Yet, a larger proportion of men (58.5% in 2006 and 40.0% in 2017) compared to women (51.9% in 2006 and 34.4% in 2017) are engaged in the agricultural sector. This is probably because women consider farming as a last resort due to its laborious nature (Domfe, Osei, and Ackah, 2013). On the other hand, there are more women involved in trading (19.5% in 2006 and 33.0% in 2017) compared to men (6.3% in 2006 and 12.2% in 2017).

According to the GSS (2019), on average, a Ghanaian worker earns GHC972 in a month (see Figure 2) – with men earning a higher monthly income of GHC1,106 compared to GHC679 for women. Men earn higher monthly income (estimated for both cash and in-kind) in all the major occupations listed in Figure 2. Indeed, women earn less than half (GHC335) of the amount men earn in a month (GHC 766) in elementary occupations.

The higher income the men earn is probably because they usually occupy top positions in their various places of work.

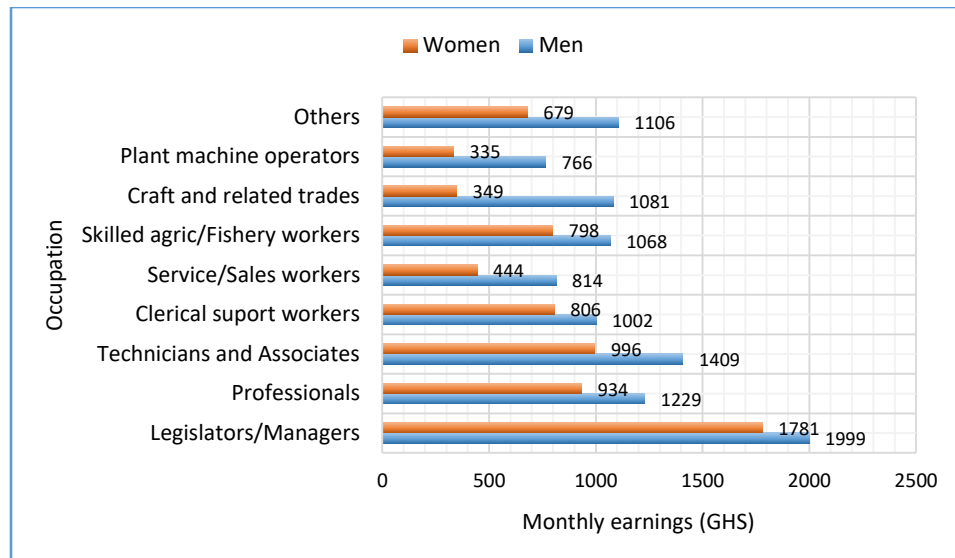


Figure 2: Main Occupation of Paid Employees 15 Years and Older by Average Monthly Earnings and Sex

Source: GLSS 7.

3. Econometric Framework

Our study assesses the wage gaps between men and women in formal and informal wage employment in Ghana. We then discuss how selection affects the gender wage gap in these two different sectors within the Ghanaian economy. First, we estimate the wage gap that does not control for observables. The next step is to estimate the wage gaps that adjust for observables. Finally, we estimate the wage gaps by controlling for the observable characteristics and the selection into wage employment. By comparing the raw wage gap with the wage gaps that correct for observables and selection into formal wage employment and informal wage employment, it becomes clearer how gender differences in observable characteristics and selection into formal-informal wage employment shape the gender wage gaps in these two sectors.

3.1 Gender wage gap without sample selection correction

We begin the econometric analysis by stating the raw wage gap for individual i in sector j as:

$$\ln w_{ij} = \alpha + \delta_j F_{ij} + \varepsilon_{ij} \quad (1)$$

where: F_{ij} is a dummy indicating that employee i in sector j is a woman and $\ln w_{ij}$ is the log monthly wage of individual i in sector j . In this case, δ_j is the gender wage gap for working in sector j .

The wage decomposition developed by Oaxaca (1973) and Blinder (1973) is used to estimate the wage gap. Subsequently, an approach by Fortin (2008) is used to make sure the decomposition is not sensitive to the choice of the reference group. Fortin (2008) developed the reference wage structure from a pooled regression for both men and women to ensure that the advantage of men would correspond to the disadvantage of women for the reference wage structure. First, the Mincerian wage equation is computed before the Oaxaca decomposition is estimated. The Mincerian wage equation for men and women is given as:

$$\ln w_{imj} = \alpha_{mj} + \beta_{mj} X_{imj} + \varepsilon_{imj} \quad (2)$$

$$\ln w_{ifj} = \alpha_{fj} + \beta_{fj} X_{ifj} + \varepsilon_{ifj} \quad (3)$$

where: the subscripts m and f represent men and women respectively. X_{imj} is a set of observable characteristics of individuals i who are men and are working in sector j . X_{ifj} is similarly defined for women. The set of observable characteristics in the Mincerian equation includes age, the square of age, years of education, a dummy for urban, hours worked in a week, and a dummy for permanent regular employment and literacy.

By assuming that ε_{ifj} and ε_{imj} have a zero conditional mean, the ordinary least squares estimates become unbiased – which means that the total wage gap can be expressed into terms based on observables and their returns. The sufficient condition needed to estimate the mean wage gap for Equations (2)

and (3) is that the distribution of ε , given observable characteristics, must be the same in both equations (Yahmed, 2018). Under this condition, the mean wage gap between men and women can be described by Equation 4 as:

$$\overline{\ln w}_{mj} - \overline{\ln w}_{fj} = (\bar{X}_m - \bar{X}_f)\widehat{\beta}_{pj} + \bar{X}_m(\widehat{\beta}_{mj} - \widehat{\beta}_{pj}) + \bar{X}_f(\widehat{\beta}_{pj} - \widehat{\beta}_{fj}) \quad (4)$$

The parameters from the pooled wage regression are denoted by the subscript p . The dependable variable represents gender differences in sector j based on observable characteristics and the other two terms on the left side of the equation capture the sum of the advantages of men and the disadvantages of women in the treatment of the characteristics in sector j . The total summation of the advantages of men and the disadvantages of women in the treatment of the characteristics is represented by the adjusted wage gap as:

$$\overline{WG}_j = \bar{X}_m(\widehat{\beta}_{mj} - \widehat{\beta}_{pj}) + \bar{X}_f(\widehat{\beta}_{pj} - \widehat{\beta}_{fj}) \quad (5)$$

3.2 The wage gap controlling for both observables and selection

It is most likely that different processes are used in selecting men and women into employment. If that is the case, then computing the gender wage gap with no regard to the selection processes into employment may lead to inconsistent estimates. First, cultural norms and religious beliefs in many societies cause women's labour market participation to be lower. Second, among individuals participating in the labour market, the same norms and beliefs overburden women with household chores which often cause women to opt for a more flexible type of employment. Women are therefore more likely to participate in the informal sector as the sector provides more employment flexibility than the formal sector. If the ignorability assumption does not hold, then estimating Equations (2) and (3) without taking care of the selection into employment may result in inconsistent estimates. To address the problem that may result because of not controlling for selection biases, we follow the estimation procedure suggested in Yahmen (2018), which is briefly discussed in the following section.

To estimate the control function, we model individual choices (constrained or unconstrained) into employment. The employment choices available to individuals are classified into three mutually exclusive groups:

(1) not into wage employment, (2) formal wage employment, and (3) informal wage employment. We use a multinomial model to estimate the probabilities of being in a given work status depending on an individual's characteristics and preferences, as well as on demand constraints imposed by employers that are likely to cause job rationing and segregation. In addressing the selection biases in Equations (2) and (3), the two equations can be restated as:

$$\ln w_{imj} = \alpha_{mj} + \beta_{mj} X_{imj} + \theta_{mj} h_{mj}(P_1 + \dots + P_3) + \varepsilon_{imj} \tag{6}$$

$$\ln w_{ifj} = \alpha_{fj} + \beta_{fj} X_{ifj} + \theta_{fj} h_{fj}(P_1 + \dots + P_3) + \varepsilon_{ifj} \tag{7}$$

where: $\theta_j h_j(P_1 + \dots + P_3) = E(\varepsilon_j | X, Y = j)$ depends on the model assumptions. The estimation of Equations (6) and (7) allow us to recover ρ_j – the correlation between the error terms in the multinomial regression model used as the control function and the error terms in the wage equation for the different sectors. For the sample correction in Equations (6) and (7), we adopt the Lee and the Dubin-McFadden (DMF) control function approach. Under a minimal condition, the distribution of the error terms in Equations (6) and (7) are the same, thus the gender wage gap in the formal or informal sectors of the economy can be decomposed as:

$$\overline{\ln w}_{mj} - \overline{\ln w}_{fj} = (\bar{X}_m - \bar{X}_f) \widehat{\beta}_{pj} + \bar{X}_m (\widehat{\beta}_{mj} - \widehat{\beta}_{pj}) + \bar{X}_f (\widehat{\beta}_{pj} - \widehat{\beta}_{fj}) + \theta_{mj} h_{mj}(P_1 + \dots + P_3) - \theta_{fj} h_{fj}(P_1 + \dots + P_3) \tag{8}$$

where the selection term represents the difference between the observed wage gap and the gap in the actual wage offered. The wage gap that is due to differences in returns to similar observable characteristics in a specific sector is given as:

$$\overline{WG}_j = \bar{X}'_m (\widehat{\beta}_{mj} - \widehat{\beta}_{pj}) + \bar{X}'_f (\widehat{\beta}_{pj} - \widehat{\beta}_{fj}) \dots \tag{9}$$

The adjusted wage gap in Equation (9) differs from the one in Equation (5) because the adjusted wage gap in Equation (9) is consistently estimated.

4. Data and Descriptive Statistics

4.1 Data

The paper used the data set of the last round of the Ghana Living Standard Survey [Ghana Living Standards Survey Seven (GLSS 7)]. This survey was conducted between November 2016 and October 2017. The survey employed a two-stage stratified sampling strategy to gather information on household members. At first, 1,500 enumeration areas (EAs) were selected to constitute the primary sampling units (PSUs). Subsequently, 15 households were selected systematically from each of the PSUs. At the end of the survey, 31,305 of the adult population (15-60 years) were successfully interviewed. Out of the number interviewed, 47.3% were men, and the remaining were women. We excluded 269 observations in our analysis because there was some missing information on those observations. The sample we used in our analysis also excluded people who were still schooling and the disabled, as in many other studies.

Our classification of workers into formal and informal sector wage-earners was based purely on a definition by the Ghana Statistical Service (2008) that a formal sector is any business, a firm, or an economic entity that has registered with a state agency recognized for that purpose. In the GLSS 7 survey, businesses were asked to indicate whether they were registered with state institutions and the outcome of this was a binary: 'Yes' if registered and 'No' if not registered. We depended on this binary variable to classify businesses into the formal or informal sector.

Paid employees (whether formal or informal) who did not receive their earnings in cash but in kind were excluded from the sample. The formal and informal workers, when compared, were similar because they all had employers and received their earnings in cash. According to the data, 69.7% of the wage earners indicated that they received monthly payments, 19.7% collected daily payments, 9.2% collected weekly payments, with the rest (1.4%) indicating other time units. The paper defines marriage as individuals who are either customary/legally married or two individuals of the opposite sex cohabiting. Literacy describes individuals who can read and write simple sentences in English and solve some elementary mathematical problems.

4.2 Descriptive statistics

Table 1 shows the demographic characteristics of the sample used in the analysis. These include education, location, parental education, and employment-related characteristics of men and women in the formal and informal sectors. Columns (1) and (2) present information about those in formal wage employment, columns (3) & (4) are for those in informal wage employment, and columns (5) and (6) represent characteristics of those individuals in non-wage employment. Columns (1), (3), and (5) provide characteristics of men in the various groups of the employment category and the even columns are for women.

There was a higher likelihood for formal wage workers to marry compared to their counterparts in informal wage employment. Among the three employment positions in Table 1, those in non-wage employment were more likely to be older and have the greatest proportion of those who were married. Women in formal wage employment were mostly the heads of households and hardly lived with children or a person above 60 years old. The women were relatively younger and more likely to live with a person above 60 years old.

Table 1 also indicates that a higher proportion of the Akan tribe was more likely to be in paid employment than non-wage employment. For example, men of the Akan tribe constituted as high as 50 and 48 percent of the total Ghanaian men respectively working in formal and informal paid employment. On the other hand, only 34 percent of men working as non-wage workers belonged to the Akan ethnic group.

Formal sector workers tend to have higher education than their counterparts in the other two sectors (Rocha & Ponczek, 2011). For instance, the average years of schooling for formal sector workers is about 14 years compared to around 5 years for non-wage employment. Generally, men in wage employment are more educated than women in the same type of employment. For example, while the years of education of men in formal paid employment and informal paid employment are 14.10 and 8.94, those for

women are 13.80 and 7.90 respectively. Interestingly, women in non-wage employment tend to be more educated than men.

Table 1: Descriptive Statistics

	Formal		Informal		Non-wage employment	
	(1)	(2)	(3)	(4)	(5)	(6)
	Men	Women	Men	Women	Men	Women
Demographics						
Age in years (Mean)	39.17	35.83	33.06	32.25	39.89	39.58
Married	0.68	0.59	0.40	0.32	0.69	0.60
Household size (Mean)	4.04	3.87	4.24	4.86	5.47	5.52
Household head	0.90	0.41	0.72	0.30	0.89	0.34
1 if Children below 5 in hh	0.41	0.45	0.43	0.48	0.57	0.55
1 if Aged (60+) in hh	0.07	0.14	0.12	0.19	0.13	0.19
1 if any other member in the hh is a wage employee	0.27	0.42	0.21	0.36	0.01	0.03
Akan tribe	0.50	0.53	0.48	0.44	0.34	0.42
Mole tribe	0.19	0.15	0.17	0.19	0.25	0.21
Ewe tribe	0.13	0.13	0.14	0.16	0.12	0.14
Other tribes	0.19	0.18	0.30	0.21	0.29	0.24
Education						
Literacy	0.79	0.82	0.58	0.46	0.37	0.26
Years of schooling (Mean)	14.10	13.80	8.94	7.90	5.09	6.19
Location						
1 if urban	0.72	0.70	0.58	0.62	0.29	0.42
Parental education						
1 if parents have a certificate	0.57	0.70	0.42	0.43	0.24	0.31
Employment related variable						
Share in employment	0.13	0.07	0.27	0.13	0.60	0.80
Hourly worked (mean)	36.06	32.67	35.4	33.11	2.18	0.83
Monthly wage	1217.36	1053.23	704.88	349.26	-	-
1 if permanent	0.96	0.96	0.69	0.66	0.86	0.821
N	516	1000	931	2129	5817	4,695

Note: hh = household. Children below 15 years and adults above 60 years are excluded and individuals who are still in school and the disabled are excluded.

Source: Author's calculations based on the GLSS7 dataset

Also, Table 1 indicates that a greater proportion of men and women in formal paid employment live in urban areas. Furthermore, the data indicate that urban women are more interested in non-wage employment. Again, the data reveal that individuals living with people who are in paid employment are more likely to work as wage employees.

The data further suggest that parents of women in formal wage employment are better educated than parents of women in the other categories of employment. Compared to men, women in employment (paid or unpaid) are more likely to have parents with better educational attainment. In Ghana, just like it is in many developing countries, there are limited spaces for paid employment and therefore getting an appointment in wage employment depends not only on personal characteristics but also includes having a social network (Afridi & Dhillon, 2022). In this case, individuals living with parents who have better educational qualifications or staying with household members engaged in wage employment are better placed to be engaged in wage employment as well.

In terms of job characteristics, as indicated in the literature on informality, formal sector jobs attract higher wages (Henley, Arabsheibani & Carneiro, 2006). The data (see Table 1) reveal that women earn lower monthly wages than men in both formal and informal wage employment. Among wage-earners, formal wage workers have more job security than those in informal wage employment. For example, 96% of formal wage workers are permanent employees while only 66% (69%) of women (men) in informal wage employment are permanent workers. There are no major differences across gender in the average hours of work between formal and informal employment. However, women in non-wage employment significantly work fewer hours in a week and this is not surprising due to the flexibility that non-wage employment provides to employees that work in that sector.

We include discussions on the share of wage employment by gender and occupation (see Table 2). The data suggest that while women in formal wage employment are mostly found in professional jobs (55.04%), their counterparts in informal wage employment are rather dominant in service and

sales occupations (36.20%). Men in formal wage employment are also highly concentrated in professional occupations (39.20%) while their counterparts in the informal wage sector dominate mostly in the craft, machine operating and assembling jobs (49.20%).

Table 2: Shares of Wage Employment by Gender and Occupation

Occupation	Employment share (percentages)			
	Formal		Informal	
	Men	Women	Men	Women
Managers	11.0	8.72	1.60	1.50
Professionals	39.20	55.04	8.98	12.35
Technicians and associate professionals	8.70	9.11	3.43	4.08
Clerical support workers	5.30	6.59	3.43	4.94
Service and sales workers	15.00	12.40	15.04	36.20
Skilled agriculture and fishery workers	1.90	1.55	5.59	2.90
Craft and related trades workers	5.20	0.97	22.37	14.50
Plant machine operators and assemblers	4.0	0.19	26.83	2.36
Elementary occupation	0.5	5.43	12.74	21.16

Note: Children below 15 years and adults above 60 years are excluded. Individuals who are still in school and the disabled are excluded.

Source: Author's calculations based on the GLSS7 dataset.

The occupational distribution suggests that women in wage employment prefer to be engaged in certain occupations (Gabriel & Schmitz, 2007). For example, while 26.83% of men in informal wage employment were in plant, machine operating, and assembling, only 2.36% of the women in informal wage employment were in that occupation (see Table 2). On average, more than 66% of the women in formal wage employment were employed in only two occupations (i.e. professional workers and services and sales workers).

Table 3 provides further evidence of the negative selection of women into formal paid employment. There was a small difference in participation rates

between men and women. The difference in the participation rate was largest for those who had tertiary education certificates. For example, the participation rate of women with tertiary education was 89%, whereas that of men was 94%.

Column (4) indicates women's unemployment rates as being higher than men's unemployment rates at all levels of education. This appears to be consistent with a statement by ILO (2018) that despite years of significant improvement, a higher proportion of women compared to men remain unemployed. The gender gap in the unemployment rate was 8 percentage points among people who had a minimum of a basic education certificate. Columns (5) and (6) report the informality share among paid employees. While the informality rate decreased with education, the rate of decrease was faster among women. The informal sector is generally attractive to wage-earners (both men and women) with no certificate even though the proportion of women here was three percentage points higher. However, among wage-earners who had tertiary education, the informality rate for women was 3 percentage points lower than for men.

Table 3: Descriptive Statistics of the Labour Force by Education Group and Gender

	Participation rate		Unemployment rate		Informality rate among wage employees	
	(1) Men	(2) Women	(3) Men	(4) Women	(5) Men	(6) Women
Total	88	87	13	17	68	64
No certificate	87	88	14	16	93	96
Basic education certificate	88	84	10	18	81	82
Secondary certificate	97	84	17	25	60	51
Tertiary certificate	94	89	9	17	27	24

Note: Children below 15 years and adults above 60 years are excluded. Individuals who are still in school and the disabled are excluded.

Source: Author's calculations based on the GLSS7 dataset.

5. Results

5.1 Selection into potential employment statuses

We begin the analysis by computing the sample selection correction model used to correct for the sample selection in the wage equation. Tables 4a and 4b respectively present the marginal effects of the multinomial logit model for both sexes. The results from these two tables will shape our understanding of how both supply-side and demand-side factors affect the probability of being engaged in formal wage employment, informal wage employment, or non-wage employment.

The likelihood of working as a formal wage employee increased with age for both sexes. However, the effect on women was insignificant. The effect of age on the likelihood of working in the informal wage sector was negative for both sexes. This is not surprising as the earnings of informal wage workers were lower than formal wage workers and the entry requirement to formal wage employment was higher than that of informal wage employment. In this light, young people who are unable to get formal wage employment most, at times decide to work in the informal wage sector which would enable them to accumulate the necessary working experience needed to secure jobs in the formal sector.

Consistent with an analysis by NCES (2022) in the US labour market, the data (see Tables 4a & 4b) indicate that the likelihood of working as a formal employee increases for both men and women with educational certificate(s). However, while for both sexes the effect increases with attainment of higher levels of education, it was greater for men than it was for women. This is consistent with the results of a study by Assaad, Hendy, Lassassi and Yassin (2020) who indicated that women with equal academic qualifications in Middle East countries do not have equal opportunity as men to enter formal employment to earn higher wages. They found that the substantial slowdown in public sector hiring (a demand side factor) rather than the supply side factors such as conservative gender norms, fertility and heavy domestic work burdens, should be blamed for the inability of more women to enter formal employment.

In line with the position of Rocha and Ponczek (2011), the data indicate a negative relationship between literacy and non-wage employment for both men and women. Expectedly, while marriage increased the probability of women engaging in non-wage employment, it had no effect for men. There was also a positive relationship between marriage and formal employment. The effect was however stronger for men which suggests that formal wage employment may provide the needed resources for men to marry.

Having an older person in the household increased the probability of women being in wage employment but did not affect the probability of men being engaged in any of the employment statuses. This appears to suggest that older persons in a household may assist in taking care of the children to provide the needed time for women to take up jobs in less flexible wage employment. In many traditional household settings, childcare is a responsibility of women and therefore some women may decide to engage in self-employment and household businesses so they can take care of their children while working (Connelly, 1992).

Our results (see Tables 4a & 4b) suggest that having a parent with a minimum basic education certificate increases one's probability of getting employment in the formal sector. Having household members who were engaged in wage employment increased the likelihood of being in wage employment. This means that people whose parents have higher academic qualifications or who live with household members engaged in wage employment are more likely to provide the necessary contacts to enhance the possibility of getting employed in the formal sector. This tends to confirm the long-held opinion that social networks impact positively on entry into formal sector employment (IPA, 2021).

Table 4a: Labour Market Status, Marginal Effects of Women

Women	(1) Formal wage employment	(2) Informal wage employment	(3) Not in paid employment
1 if urban	-0.00604 (0.00577)	0.0269*** (0.00786)	-0.0208** (0.00867)
Literacy	0.00571 (0.00635)	0.0129 (0.00814)	-0.0186** (0.00932)
Age in years	-0.000523 (0.00172)	-0.0119*** (0.00233)	0.0124*** (0.00251)
Age*Age	1.37e-05 (2.12e-05)	9.70e-05*** (3.02e-05)	-0.000111*** (3.25e-05)
1 if basic education certificate	0.0631*** (0.0117)	-0.0277** (0.0114)	-0.0354*** (0.0116)
1 if secondary certificate	0.160*** (0.0122)	0.0130 (0.0112)	-0.173*** (0.0139)
1 if tertiary certificate	0.183*** (0.0121)	-0.0101 (0.0154)	-0.173*** (0.0166)
1 if a child below five years is in the household	0.00831 (0.00714)	-0.00692 (0.00836)	-0.00139 (0.00823)
Household size	-0.00609*** (0.00157)	-0.00358** (0.00161)	0.00966*** (0.00205)
1 if there is an aged in the household	0.0153* (0.00829)	0.0168* (0.00877)	-0.0322*** (0.0116)
1 if household head	0.0389*** (0.00557)	-0.0147 (0.0107)	-0.0242** (0.0102)
1 if married	0.0216*** (0.00544)	-0.0874*** (0.00813)	0.0658*** (0.00860)
1 if household member is in wage employment	0.0946*** (0.00476)	0.226*** (0.00968)	-0.321*** (0.0104)
1 if a parent has a minimum of basic education certificate	0.0129** (0.00543)	-0.0108 (0.00854)	-0.00213 (0.00931)
Regional dummies	Yes	yes	Yes

Notes: Individual with age 15 to 60 years. Standard errors clustered at the district level in parentheses below. p-values: * <0.05 ; ** <0.01 ; *** <0.001 . Other tribe is the reference group for ethnic group, No educational certificate is the reference group for education

Source: Ghana Living Standard Survey 2017 (GLSS7).

Table 4b: Labour Market Status, Marginal Effects of Men

	(1)	(2)	(3)
Women	Formal wage employment	Informal wage employment	Not in paid employment
1 if urban	0.0276*** (0.00833)	0.104*** (0.0147)	-0.132*** (0.0150)
Literacy	0.0109 (0.00796)	0.0379*** (0.0117)	-0.0488*** (0.0124)
Age in years	0.00601*** (0.00232)	-0.0113*** (0.00342)	0.00528 (0.00357)
Age*Age	-5.40e-05* (2.82e-05)	6.04e-05 (4.37e-05)	-6.45e-06 (4.45e-05)
1 if basic education certificate	0.0728*** (0.0160)	-0.0271* (0.0138)	-0.0457*** (0.0161)
1 if secondary certificate	0.204*** (0.0161)	-0.0645*** (0.0169)	-0.140*** (0.0184)
1 if tertiary certificate	0.271*** (0.0170)	-0.117*** (0.0203)	-0.154*** (0.0207)
1 if a child below five years is in the household	-0.0243*** (0.00807)	0.0405*** (0.0112)	-0.0162 (0.0112)
Household size	-0.00197 (0.00178)	-0.0174*** (0.00237)	0.0194*** (0.00225)
1 if there is an aged in the household	-0.0163 (0.0125)	-0.0139 (0.0163)	0.0302* (0.0170)
1 if household head	0.0374*** (0.0118)	-0.115*** (0.0175)	0.0773*** (0.0194)
1 if married	0.0389*** (0.00832)	-0.0560*** (0.0101)	0.0171 (0.0113)
1 if household member is in wage employment	0.138*** (0.0117)	0.360*** (0.0223)	-0.498*** (0.0270)
1 if a parent has a minimum of basic education certificate	0.0234*** (0.00652)	-0.00439 (0.0150)	-0.0191 (0.0149)
Regional dummies	Yes	yes	Yes

Notes: Individual with age 15 to 60 years. Standard errors clustered at the district level in parentheses below. p-values: * <0.05 ; ** <0.01 ; *** <0.001 . Other tribe is the reference group for ethnic group, No educational certificate is the reference group for education

Source: Ghana Living Standard Survey 2017 (GLSS7).

The differences in the marginal effects for the regression outcomes on men and women indicate that the selection processes for formal and informal wage employment are not the same for men and women. For example, the size of a household has a negative relationship with formal employment for women but there is no such relationship for men. Again, while men with a secondary or a tertiary educational certificate are less likely to engage in informal wage employment, the regression results show no such indication for women. The results in Tables 4a and 4b indicate that the selection of men into a particular employment status differs from women in the Ghanaian labour market.

5.2 Determinants of formal and informal wage employment across gender

As discussed in the empirical framework, we estimated the Mincerian wage equation for men and women separately. If there is no sample selection, then the parameters of a simple ordinary least square are consistent. However, failure to control for sample selection can lead to a biased estimate if sample selection is present (Yahmed, 2018). Some of the independent variables for the wage equation are urban, literacy, age, education, hours worked and a dummy of working as a permanent employee. We classified education into four mutually exclusive groups and used it in our Mincerian wage equation because the effect of education on wages is expected to be nonlinear. The groups are: (1) no educational certificate, (2) basic education certificate, (3) secondary certificate, and (4) tertiary education certificate. We controlled for regional dummies and the dummies of the time units for wage payment (i.e. daily, weekly, monthly, and others).

The dependent variable reported in Tables 5 & 6 is the logarithm of wages. Compared to the reference group, the return on having an educational certificate is significant for both men and women in formal wage employment (NCES, 2022). The data show that the return on higher education of workers in informal wage employment was stronger for women than for men and this pattern is also robust for all the specifications. Again, the data indicate that wages of both men and women increased with age, and they were robust to the introduction of a selection control function. The results of the analysis portray evidence of concave effect for men in both formal and informal wage employment but for women, the concave effect could only be seen in informal wage employment.

Table 5: Monthly Wages of Women in the Formal and Informal Sectors of Ghana

	OLS		Selection Lee		Selection DMF	
	(1) Informal	(2) Formal	(3) Informal	(4) Formal	(5) Informal	(6) Formal
1 if urban	0.0555 (0.0783)	-0.0154 (0.0444)	0.0944** (0.0417)	-0.0014 (0.0607)	0.0970** (0.0465)	0.011 (0.0905)
Literacy	0.0942* (0.0481)	0.0554 (0.0746)	0.0667 (0.0647)	0.0588 (0.081)	0.0607 (0.0536)	-0.0162 (0.0476)
Age in years	0.0526** (0.0178)	0.0509** (0.0206)	0.0566*** (0.0148)	0.038*** (0.0138)	0.0533** (0.0252)	0.0325** (0.0136)
Age*Age	-0.0006* (0.0003)	-0.0004 (0.0003)	-0.0006*** (0.002)	-0.0003 (0.0002)	-0.0006* (0.0003)	-0.0002 (0.0001)
1 if basic education certificate	0.1817* (0.0826)	-0.0124 (0.185)	0.2437*** (0.0813)	-0.1099 (0.1624)	0.2245** (0.1134)	-0.1769 (0.3546)
1 if secondary certificate	0.4106*** (0.0712)	0.540** (0.193)	0.4833*** (0.0872)	0.3037* (0.1884)	0.3939*** (0.0872)	0.1967 (0.4494)
1 if tertiary certificate	0.8337*** (0.1269)	0.893*** (0.173)	0.9386*** (0.0839)	0.6305*** (0.2055)	0.8057*** (0.1478)	0.5198 (0.4836)
Hours worked	0.0010 (0.0013)	0.0009 (0.0011)	0.002 (0.0015)	0.002** (0.001)	0.002 (0.0015)	0.002 (0.001)
1 if permanent employment	0.0976 (0.0820)	0.718*** (0.1280)	0.1504*** (0.046)	0.6772*** (0.0928)	0.1504*** (0.046)	0.6786*** (0.1593)
Constant	4.4249*** (0.2754)	4.043*** (0.3430)	4.4818*** (0.3465)	4.701*** (0.3108)	4.4818*** (0.3465)	4.9457*** (0.1593)
σ^2			0.5239*** (0.032)	0.3677*** (0.0522)	0.5391*** (0.0493)	0.3465*** (0.0728)
ρ_1				0.2096*** (0.0860)	-0.2582 (0.2182)	
ρ_2			0.0867* (0.0445)			0.3089 (0.3331)
ρ_3					0.2584 (0.1637)	-0.1133 (0.249)
R	0.2076	0.348				
N	931	516	931	516	931	516

Note: hh is household. Children below 15 years and adults above 60 years are excluded. Individuals who are still in school and the disabled are excluded.

Source: Author's calculations based on the GLSS7 dataset

Table 6: Monthly Wages of Men in the Formal and Informal Sectors of Ghana

	OLS		Selection Lee		Selection DMF	
	(1)	(2)	(3)	(4)	(5)	(6)
	Informal	Formal	Informal	Formal	Informal	Formal
1 if urban	0.0908** (0.0336)	0.116** (0.0504)	0.1645*** (0.0464)	0.0799* (0.0459)	0.1593*** (0.0464)	0.0967 (0.0599)
Literacy	0.0623 (0.0490)	0.0185 (0.0408)	0.0804 (0.0594)	-0.0162 (0.0476)	0.0712 (0.0596)	-0.0177 (0.0402)
Age in years	0.1076*** (0.0156)	0.0954*** (0.0278)	0.1017*** (0.0135)	0.0794*** (0.0146)	0.0979*** (0.0118)	0.0709*** (0.0272)
Age*Age	-0.0013 *** (0.0002)	-0.0010** (0.0003)	-0.0012*** (0.0002)	-0.0008*** (0.0002)	-0.0012*** (0.0002)	-0.0008*** (0.0003)
1 if basic education certificate	0.0572 (0.0358)	0.307*** (0.0811)	0.0463*** (0.0453)	0.1889** (0.0747)	0.0226 (0.0516)	0.1173 (0.1014)
1 if secondary certificate	0.1165** (0.0468)	0.633*** (0.0553)	0.1006** (0.0459)	0.2724** (0.1285)	-0.0496 (0.0831)	0.1552 (0.1646)
1 if tertiary certificate	0.4544*** (0.0731)	0.962*** (0.122)	0.4063*** (0.0682)	0.4529*** (0.1628)	0.1225 (0.1327)	0.3316 (0.2332)
Hours worked	0.0013 (0.0011)	-0.0005 (0.0014)	0.0014 (0.0006)**	-0.0006 (0.001)	0.0016 (0.001)**	-0.0006 (0.001)
1 if permanent employment	0.2314*** (0.0485)	0.220* (0.108)	0.2417*** (0.0562)	0.2032 (0.1263)	0.2384*** (0.0312)	0.2006 (0.084)**
Constant	4.4604*** (0.2335)	3.746*** (0.521)	4.7977*** (0.2344)	4.9488*** (0.5477)	4.9910*** (0.1977)	5.2485*** (0.8967)
σ^2			0.715*** (0.0278)	0.6095*** (0.1014)	0.7836*** (0.0789)	0.3944*** (0.0571)
ρ_1				0.4136*** (0.0903)	-0.5166*** (0.1588)	
ρ_2			-0.149*** (0.05)			0.3804 (0.3015)
ρ_3					0.2668** (0.1246)	0.0348 (0.1867)
R	0.2076	0.256				
N	2129	1000	2129	1000	2129	1000

Note: hh is household.. Children below 15 years and adults above 60 years are excluded. Individuals who are still in school and the disabled are excluded.

Source: Author's calculations based on the GLSS7 dataset.

Consistent with the findings of a study by Yankow (2006), men in urban areas received higher wages compared to their counterparts in rural communities for all the specifications apart from DMF's selection method which was not significant for informal wage employment. Permanent employment for women in both the formal and informal sectors provides higher monthly returns than temporary workers in the same sectors (Goldan, Jaksztat & Gross, 2023). However, in the case of the men, it is only the informal sector permanent employment that provides higher returns than what temporary employment offers.

The total hours worked had no significant effect on both men and women. This outcome is a reflection of the two-tier wage employment in which those employed in formal establishments and received remuneration for working extra hours aside from the normal working hours often did not get the opportunity to do so. However, while wage employees in the informal sector worked overtime, they were usually not rewarded with any compensation for the extra hours worked.

The regressions in columns (3) to (6) of Tables (5) & (6) include the control function as an additional covariate. Apart from the DMF selection bias for women in informal wage employment, the rest of the selection bias was significant in both formal and informal jobs for both sexes. The correlation coefficient presented in the table shows the direction of the average selection rules for both men and women. Note that by using Lee's control function approach, a positive implies there is a negative selection bias (Lee, 2007).

From Lee's control function approach, women were negatively selected in both informal and formal wage employment. The DMF control function approach also shows a negative selection of women into formal employment. While men were positively selected into informal employment, they were negatively selected into formal employment for both Lee's and DMF's methods. The results in Tables (5) & (6) are consistent with studies that indicate that some workers may have an individual relative advantage in

informal jobs but would not have that advantage in formal jobs (see, *inter alia*, Yahmed, 2018; Maloney, 2004).

Our results indicate that for any given values of observable characteristics, men in informal wage employment have unobserved characteristics that employers in this sector cherish. However, the result indicates that men are negatively selected into formal wage employment which suggests that those with higher wage potentials in formal jobs do not self-select into those jobs but may choose other work statuses. In the case of women, negative selection is done in both formal and informal wage employment (note that self-employment without employees and self-employment with employees are options that both men and women may consider). This suggests that non-wage employment may be providing some satisfaction to women. Such satisfaction may be the flexibility that they enjoy in those sectors but not the earnings (Connelly, 1992). The next section discusses the implications of the various selection biases across gender on the gender wage gaps in formal and informal employment.

5.3 The gender wage gap in formal and informal jobs

Table 7 provides estimates of the gender wage gaps in formal and informal wage employment for the whole population and the three education sub-groups. Figures that are bolded indicate that the wage gap between men and women in the formal or the informal is significant at 10%. Column (1) indicates the results of the average total wage gap, column (2) presents the wage gap of people with basic education certificates, column (3) is for those with secondary certificates, and column (4) is for those with tertiary education certificates.

Panel (1) provides results for the raw wage gap, Panel (2) presents results for the wage gap which is because of differences in returns when we control for observables. In Panels (3) and (4), we present results of the total wage gap and the part due to differences in returns when Lee's and DMF's control functions are adjusted for in the wage equation.

Panel (1) shows that the total average raw wage gaps are positive and significant for both informal and formal wage workers. For the case of the educational groupings, Panel (1) indicates that the average raw wage gap is

significant for people with basic and secondary education certificates but for the informal workers, it is only significant for those with basic education certificates. The total average raw wage gap is 82.7% among informal employees and Welch's statistics show that it is significantly different from the total raw wage gap of 14.92% among formal employees.

The gender wage gap may likely differ across different subgroups within the population and due to this, we tried the wage gap of different education sub-groups. In estimating the wage gap of different educational sub-groups, we are also indirectly accounting for some differences in productive characteristics. Our results show that the gender wage gap is smaller in formal than informal jobs and the gap decreases as education increases for both formal and informal jobs.

The outcome showing a smaller wage gap in formal jobs than in informal jobs is consistent with the findings of several studies (Deininger, Klaus, Jin, & Nagarajan, 2013; Tansel & Acar 2016; Yahmed, 2018; Malta, Kolovich, Leyva, & Tavares, 2019; ILO, 2020). The explanation has been that while employers in the informal sector can easily discriminate against women, those in the formal sector where labour regulations are strictly monitored and enforced do not have room to discriminate against women in payment of wages. Therefore, while the salaries of women in the formal sector are protected, the same cannot be said when it comes to informal wage employment. In determining the wages of workers, employers in the informal sector tend to discriminate against women on the grounds of maternity and childcare – which can affect their productivity.

It also came out that the gender wage gap reduced as the level of education increased. This outcome is consistent with the results of a study by Livanos and Nunex (2012) who found that an academic degree reduced discrimination in the labour market in Greece to address the gender wage-gap. In other words, as more women attain higher levels of education and get opportunities to work in the formal sector where wage discrimination is either low or non-existent, the gender wage gap tends to decline.

Table 7: Gender Wage Gap: Informal vs Formal Sectors Across Educational Levels

Level of Education	(1) All	(2) Basic	(3) Secondary	(4) Tertiary	
<i>1. Total Wage Gap:</i>					
$\overline{TWG}_j = \overline{\ln W}_{mj} - \overline{\ln W}_{fj}$					
Informal	0.6029*** (0.0388)	0.3533*** (0.0677)	0.275* (0.1629)	0.0727 (0.1914)	
Formal	0.1373*** (0.0284)	0.2632** (0.1112)	0.0878 (0.0617)	0.0205 (0.0375)	
Welch's t-statistics	9.68	0.69	0.97	0.27	
<i>2. Controlling for observables only</i>					
Part due to differences in returns:					
$WG_j = \bar{X}'_m(\hat{\beta}_{mj} - \hat{\beta}_{pj}) + \bar{X}'_f(\hat{\beta}_{pj} - \hat{\beta}_{fj})$					
Informal	0.5582*** (0.0338)	0.365*** (0.0732)	0.2938* (0.1692)	0.0818 (0.1727)	
Formal	0.1379*** (0.0273)	0.0706 (0.0927)	0.0875 (0.0654)	0.0278 (0.0518)	
Welch's t-statistics	9.66	2.49	0.98	0.30	
<i>3. Gap in wage offers: controlling for observables and self-selection</i>					
<i>3.1 Total gap in wage offers:</i>					
$\overline{TWG}_j = \overline{\ln W}_{mj} - \overline{\ln W}_{fj} - (\theta_{mj}h_{mj} - \theta_{fj}h_{fj})$					
Lee	Informal	0.3664 (0.0862)	0.4826*** (0.1629)	0.0685 (0.6665)	1.2539 (1.1750)
	Formal	0.4520*** (0.1062)	0.6988** (0.3374)	0.2071 (0.1357)	0.1770** (0.0807)
	Welch's t-statistics	0.57	0.26	0.19	0.75
DMF	Informal	0.3722*** (0.0803)	0.3483* (0.1932)	0.3738 (0.6137)	1.1993 (1.0864)
	Formal	0.4791*** (0.1348)	0.3196 (0.5964)	0.2774 (0.2003)	0.1840 (0.1260)
	Welch's t-statistics	0.68	0.05	0.15	0.83
<i>3.2 Part due to difference in returns:</i>					
$\overline{WG}_j = \bar{X}'_m(\hat{\beta}_{mj} - \hat{\beta}_{pj}) + \bar{X}'_f(\hat{\beta}_{pj} - \hat{\beta}_{fj})$					
Lee	Informal	0.3241*** (0.0852)	0.4128*** (0.1523)	0.0742 (0.6583)	1.1331 (1.2093)
	Formal	0.4015*** (0.1051)	0.508 (0.3329)	0.2031 (0.1377)	0.1908** (0.0942)
	Welch's t-statistics	0.63	0.58	0.20	0.91
DMF	Informal	0.3417*** (0.0801)	0.2983 (0.1853)	0.3773 (0.6072)	1.0864 (1.2169)
	Formal	0.4375*** (0.1335)	0.0744 (0.5988)	0.2800 (0.1961)	0.1972 (0.1246)
	Welch's t-statistics	0.62	0.35	0.15	0.73

Notes: Individual with age 15 to 60 years. Bootstrapped standard errors in parentheses below. p-values: *<0.05; **<0.01; ***<0.001. The results are expressed in logarithmic scale. To obtain the difference in percentage points: (exp(wg)-1)X100. Welch's t-statistics is 5% or 10% significant if |t|>1.96 or |t|>1.61 respectively. Source: (GLSS7).

Despite this, the effect of higher levels of education in addressing the gender wage gap is not automatic. As explained earlier, Assaad et al. (2020) indicated that even though women have improved in the acquisition of higher levels of education, the gender wage gap is still very high in Middle East countries because they do not have equal opportunities as men to enter formal employment. Kochhar (2020) concluded an analysis in the US labour market that the gender wage gap is declining because of a relatively higher rate of educational acquisition by women which has resulted in a more rapid increase in their earnings from 1980 to 2018. This appears to suggest that the gender wage gap would widen even in the US if men and women were to have the same levels of education and skills.

Based on the issues raised by the other studies (Livanos & Nunex, 2012; Assaad et al., 2020; Kochhar, 2020), our results support the argument that formalization of businesses and implementation of policies to improve women's participation in higher education is likely to reduce the gender wage gap.

Panel (2) of Table 7 presents the results of the gender wage gap that controls for observable characteristics such as education, hours worked, age, a dummy for urban, a dummy for working as a permanent employee, and literacy. The average wage gap in informal employment was approximately 0.56 log points and that of the formal was 0.14 log points and a Welch t-statistics for the two to be 9.66. For the case of different educational groups, the results for adjusting women's returns to the returns obtained by men were not different from the results obtained in Panel (1) for people with a secondary or a tertiary certificate. However, the adjusted wage gap for people with basic education certificates and having formal jobs was 7.3% which is significantly different from the 30% in Panel (1). The results in Panels (1) and (2) suggest that the wage rate in Ghana exhibits a sticky floor and the effect is stronger in informal wage employment.

The last two panels in Table 7 discuss how the selection bias affects the gender wage gap. If selection into formal and informal wage employment was different because of gender, the observed raw wage gap in the first panel

of Table 7 cannot explain the raw difference in wage offers. Therefore, controlling for selection into different work statuses will help in recovering the average wage offers within formal or informal wage jobs.

Panel (3) of Table 7 shows how selection shapes the gender wage gap in both formal and informal jobs. The regression results show that the observed wage gap in the informal jobs exaggerates the wage gap in wage offers whereas the observed wage gap in formal jobs understates the wage gap in wage offers. Among informal(formal) employees, the observed wage gap was 0.6029 (0.1373) log points in Panel (1) but in Panel 3.1 the gap in wage offers using Lee's control function was 0.3664(0.4520) and that of DMF's was 0.3722(0.4791). The Welch statistics indicate that the gender wage gap between formal-informal jobs was not significant for both Lee and DMF control function approaches. These results are consistent with the outcome of the study by Yahmed (2018) in Brazil.

The wage regressions result presented in Table 5 indicates that women are negatively selected into informal jobs, and this implies that the observed wages of women in informal jobs underestimate informal wage offers. On the contrary, Table 6 shows that men are positively selected into informal jobs, and this implies that the observed informal wages overestimate wage offers for men. Therefore, controlling for selection reduces informal wage offers for men and increases informal wage offers for women, and hence a lower gender wage gap—as presented in Panel 3.1. The gender wage gap in the informal sector still exists even after controlling for selection, although, the gap is smaller than the case when selection is not accounted for. In the case of the education sub-groupings, Panels 3.1 and 3.2 show that there is no gender wage gap—both in observable and in returns for individuals with a secondary education certificate or higher.

In the case of the formal sector, both men and women are negatively selected into the formal sector. This shows that the observed formal wages underestimate formal wages for both men and women, but more so for men. This can be seen from a smaller selection term ($\sigma_j \rho_j$) for women in Table 5 than for men in Table 6. Thus, controlling for selection into formal jobs increases the wage gap. For example, while the raw wage gap in formal jobs is only 0.2632 log points, it increases to 0.4520(0.4791) log points for Lee's (DMF's) control function.

6. Conclusion

This paper examines gender wage inequality in formal and informal jobs in Ghana. The average gender wage gap based on raw data indicates that the wages of men are significantly higher than those of women in both the formal and informal sectors. Moreover, the gender wage gap in the formal sector is higher than what obtains in the informal sector. These higher observed gender differences in wages in the two sectors result from differences in the characteristics of men and women as well as employment selection processes.

To account for differences in selection processes into the formal and informal sectors and observable characteristics, the study employed three approaches – DMF and Lee control function approaches, and OLS – to arrive at our results on the gender wage gap. We find that selection bias is significant for both sexes in formal and informal jobs (except the DMF control function approach for women in informal wage employment). From Lee's control function approach, women are negatively selected into both informal and formal wage employment. The DMF control function approach also shows a negative selection of women into formal employment. However, men are positively selected into informal employment but negatively selected into formal employment for both Lee's and DMF's methods.

We find that the selection process and characteristics reinforce gender wage gaps in formal employment: the gender wage gap in the formal sector is higher than the raw gender wage gap. However, the gender wage gap in the informal sector is reduced when selection processes are considered. These results suggest that the observed gender wage gaps in formal wage employment underestimate the actual gender wage gap because of selection bias in formal employment opportunities. However, in informal wage jobs, the observed gender gap in wage is lower than the gender gap in wage offers.

In both formal and informal employment, the findings suggest the existence of gender wage discrimination against women. These outcomes therefore suggest the importance of enforcing regulations against gender discrimination and expanding the regulated formal employment to

accommodate more women in the effort to reduce gender wage gaps in Ghana.

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