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Gender wage gaps in Ghana: A comparison across different selection models

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WIDER Working Paper 2021/10

Gender wage gaps in Ghana

A comparison across different selection models

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Abstract: The wage of an individual is observed only when he/she is employed. However, getting employment requires two decisions. First, an individual has to decide to participate in the labour market, and second, an employer must decide to hire that individual. Since female labour market participation often differs from that of men, and employers' decisions to hire may also be influenced by gender, it is appropriate to account for this double selection process. This study uses the latest household survey in Ghana to estimate gender wage gaps by correcting for this double selection process. We find that the average total gender wage gap is positive and significant irrespective of the sample selection correction method used. Our results indicate that women on average receive lower wages than men. Irrespective of the type of selection method used, our findings suggest that almost all the wage gap is a result of differences in returns, with only a small part coming from differences in observables. We find that the gender wage gap is smaller among formal wage employees and the gap decreases as education level increases. Although our findings indicate a similar trend in the wage gap across all specifications, the magnitude of the gap is sensitive to the choice of the model. This points to the need to be cautious about the choice of sample selection correction used to analyse gender wage gaps.

Key words: gender, Ghana, labour market, sample selection, wage gap

JEL classification: J16

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1 Introduction

The existence of gender wage inequality is a persistent reality across many countries. This reality has necessitated gender equality policies as part of global development goals over the century.[1] Over the years countries have therefore implemented policies that specifically target reducing or eliminating gender wage inequalities, and some of these nations have succeeded in gradually reducing these (Blau and Kahn 2008). Studies across countries have shown that men on average earn more than women (AfDB 2019; ILO 2015b). These gender wage inequalities can be attributed to social norms and cultural practices that impose household chores as women's exclusive responsibility, or to labour market discrimination against women[2] by employers because of imperfect information about labour characteristics. Although the gender wage imbalance has improved over the years, the margin is still a concern.

Most researchers interested in this area of study are confronted with a choice of sample selection correction procedure needed for the wage equation. Much of the literature in this area employs the canonical Blinder-Oaxaca decomposition (Oaxaca 1973) with either no selection or at best controlling for only one selection. However, a major limitation to these existing studies is that they ignore the important fact that selection into the labour market by gender may differ according to employers' hiring decisions (Bairagya 2020; Krishnan 1990; Mohanty 2001; Tunali 1986). Although correcting for a single selection may be an improvement on no selection, the gender wage gap reported in those estimates may still be inconsistent if the selection procedure in the labour market is generated in two ways.

Against these considerations, our paper provides new evidence on the gender wage gap by demonstrating the sensitivity of estimating gender wage gaps when a different selection model is used. To achieve this objective, we employ a recent household survey in Ghana and adopt Oaxaca decomposition to estimate the gender wage gap by first considering a model that does not correct for sample selection. The underpinning assumption in such a regression estimate is that selection of women into the labour market is not systematically different from that of men. However, because of maternity leave and heavy household responsibilities that are imposed on women, which often affect their output in the workplace, employers tend to discriminate against them during hiring, and this discrimination in hiring causes the selection of women into wage employment to differ from men. With this in mind, we estimate the next model by controlling for selection into wage employment only. Finally, the double selection correction model is employed, whereby selection into the labour force and then selection into paid employment are both considered. The former selection process is also very important because religious beliefs and societal norms may cause women's participation in the labour market to systematically differ from men's.

Despite the importance of eliminating gender inequalities in global development goals, empirical evidence on gender wage gaps in Sub-Saharan Africa (SSA) is scarce. The majority of the empirical works on gender wage gaps have been based on data from developed countries. The largest share of the gender wage gap literature in developing economies comes from Asia, the smallest from Africa (Khalid 2017). A meta-analysis of the gender wage gap from the 1960s to the 1990s indicates that only 3 per cent of gender wage gap studies used data from African countries (Weichselbaumer

[1] See the Millennium Development Goals (MDGs) and the Sustainable Development Goals (SDGs).

[2] Discrimination involves treating equally productive individuals differently because they belong to different groups—in this case by gender.

and Winter-Ebmer 2005). Of the few studies on the gender wage gap across the African continent, most have demonstrated that wages of men are higher than those of their female counterparts (Appleton and Hoddinott 1999; Bhorat and Goga 2013; Fafchamps et al. 2009; Nordman and Wolff 2009; Ntuli and Kwenda 2020). For example, a review of gender wage gaps in SSA by Ntuli and Kwenda (2020) shows that a substantial proportion of the gender wage gap in many countries within the sub-region can be attributed to discrimination against women.

In recent times, several studies have provided explanations for the observed wage gap between men and women. Some studies have highlighted gender differences in attitudes towards risk, competition, and negotiation, which are important elements in the choice of potentially lucrative ventures, as these are usually characterized by volatile earnings (Azmat and Petrongolo 2014; Bertrand 2011; Blau and Kahn 2017; Croson and Gnezy 2009). Another explanation for the gender wage gap is the normative role of women as the principal agent in child-rearing and household management, which usually affects their participation in the labour market. These responsibilities affect women's work life by making them opt for shorter and more irregular working hours than their male counterparts (Bertrand 2018; Blau and Kahn 2017; Wiswall and Zafar 2017). The final explanation is that traditionaly female-dominated occupations usually give lower returns than male-dominated occupations with similar measured labour demand characteristics (Blau and Khan 2017; Levanon et al. 2009). We make major a contribution to the literature by, first, controlling for double selection to provide consistent estimates and, second, demonstrating the sensitivity of the wage gap estimation to the choice of sample selection specification.

Our findings indicate that the average total gender wage gap is positive and significant irrespective of the sample selection correction method. The results without sample selection correction are high but conceal differences in sample selection of men and women in terms of labour force participation and paid employment. When we ignore double selection correction and concentrate on univariate simple correction, the gender wage gap is lowest (41.91 percentage points) but this also conceals the fact that self-selection in labour force participation of men and women may differ. We find the univariate double selection correction to be the specification that provides the best estimated result for the average total gender wage gap, which is 44.91 percentage points. Irrespective of the type of selection method used, our findings suggest that almost all the wage gap is a result of differences in returns, with only a small part coming from differences in observables. We find that the gender wage gap is smaller among formal wage employees and the gap also decreases with an increase in the level of education.

The remainder of the paper is organized as follows: Section 2 presents a brief outline of the Ghanaian labour market. In Section 3, the empirical design used for the study is discussed. Section 4 provides a brief discussion of the data used for the analysis. Section 5 presents results and discusses a variety of important interpretation issues. Finally, Section 6 presents conclusions about the results.

2 The Ghanaian labour market

Ghana is a youthful country with more than half of its population below the age of 24 years. The nation has experienced a significant sectoral transformation of employment in the last two decades. Employment in the agricultural sector has decreased from 55 per cent in the early 2000s to 33 per cent in 2020 (DTDA 2020). Over the same period, the service sector and the industrial sector have increased by 17 and 4 percentage points, respectively. Sectors like construction, mining and quarrying, transport, storage and communication, real estate, and business services are heavily dominated by men, whereas women dominate the manufacturing sector. The 2015 Ghana

Statistical Service labour force report indicates that the private informal sector accounts for 53 per cent of total employment in the country. The public sector employs more men, whereas employment in the private sector and the civil service is dominated by women (Ghana Statistical Service 2015).

The labour force participation rate in the country has continued to experience a downward trend since the early 2000s, especially among the youth (15–24 years). Since 2005, the labour force participation rate among the youth has been hovering around 40 per cent compared with 70 per cent for the entire adult population. Youth unemployment is considered to be one of the country's major problems, and the problem is more severe in urban communities. The overall unemployment rate in 2019 was 7 per cent compared with 14 per cent among the youth.[3] However, time-related underemployment[4] and seasonal unemployment is a major feature of employment opportunities for people living in rural Ghana. As many as 17 per cent of the labour force are either unemployed or are in time-related underemployment (DTDA 2020). Own account workers form the largest share of the people in employment (roughly 60 per cent), followed by employees (26 per cent). Contributing family workers are the third largest group, with employers forming the smallest (DTDA 2020).

The national daily minimum wage at the beginning of 2020 stood at GH¢11.82 (US$2.98), which is slightly lower than that of neighbouring countries in West Africa. A study conducted in 2016 suggests that only 24 per cent of urban employees received incomes that were higher than or equivalent to the minimum wage (Anuwa-Amarh 2016). This may be largely attributable to the size of the informal sector, which covers roughly 90 per cent of all the economic activities in the country and makes it difficult to enforce the minimum wage laws. Worse, the Labour Act does not prescribe overtime rates or prohibit excessive compulsory overtime. Some employers take advantage of lapses in the labour law and make their employees work extra hours without properly compensating them for these. On average, workers in the informal economy are found to work for 54 hours a week and six days a week (DTDA 2020). Furthermore, on average, women employed to do a similar work schedule receive 70 per cent of the wages of their male counterparts (DTDA 2020).

Gender inequalities in the labour market are prevalent in Ghana and this is mostly connected to cultural norms that determine the distribution of social roles. These societal norms often make Ghanaian women enter self-employment, which diminishes their opportunities to access productive employment. The inequalities can be seen in the higher male labour force participation and the higher proportion of men in paid employment (twice that of women), while women dominate vulnerable employment. For example, 88.4 per cent of women are own account workers or contributing family workers but the figure for men is 58.3 per cent (Ghana Statistical Service 2015). These stark differences stem from the fact that many women withdraw from the labour market when they start giving birth and enter self-employment due to the flexibility that this provides. Apart from the above disadvantages, customary laws restrict women's access to land, which greatly affects the number of women working on their own farms and the size of farmlands they may have. Even in non-agricultural self-employment with no employees, women form a greater proportion than men but the situation reverses for non-agricultural self-employment with

[3] These figures are based on the ILO definition of (strict) unemployment, which is not working more than one hour per week.

[4] Time-related underemployment is those individuals who, during the reference period, worked fewer hours than they were willing and able to work.

employees (Ghana Statistical Service 2015). The most recent Enterprise Survey indicates that only 31 per cent of all indigenous firms are owned by women (DTDA 2020).

3 Econometric framework

The study analyses the wage gaps between men and women in paid employment and then discusses how selection affects the gender wage gap. First, we estimate the gender wage gap without correcting for sample selection. Next, we compute the wage gap, controlling for both observable characteristics and selection into wage employment. We finally estimate the gender wage gap by controlling for observables and selection into both participation and wage employment. In this instance, we assume that the selection occurs in labour force participation decisions and employers' hiring decisions. By comparing the wage gap not corrected for selection with estimations that correct for sample selection, we can see how selection shapes the gender wage gap.

3.1 Gender wage gap without sample selection correction

We begin our econometric framework by stating the Mincerian wage equation:

$$lnw_i = \alpha + \delta F_i + \beta X_i + \varepsilon_i \tag{1}$$

where lnw_i is the monthly log wage of individual *i*, F_i is a dummy indicating that employee *i* is a female, X_i is a vector of other control variables that includes age, the square of age, education (grouped into four categories: none, basic, secondary, and tertiary)[5], and dummies for urban, hours worked in a week, and permanent regular employment. ε_i is the idiosyncratic error term.

To compute the wage gap, we employ the wage decomposition developed by Blinder (1973) and Oaxaca (1973). To ensure that our decomposition is not sensitive to the choice of the reference group, we follow the approach presented in Fortin (2008). In his approach, the reference wage structure is obtained from a pooled regression for both females and males so that the male advantage would be equivalent to the female disadvantage with respect to the reference wage structure obtained from the pooled regression. Before we estimate the Oaxaca decomposition, we first estimate the Mincerian wage equation for men and women given as:

$$lnw_{if} = \alpha_f + \beta_f X_{if} + \varepsilon_{if} \tag{2a}$$

$$lnw_{im} = \alpha_m + \beta_m X_{im} + \varepsilon_{im} \tag{2b}$$

where the subscript *f* and *m* represent females and males, respectively.

We assume that ε_{if} and ε_{im} has a zero conditional mean and therefore the ordinary least squares (OLS) estimates are unbiased. This assumption suggests that the total wage gap can be decomposed into terms based on observables and their returns (Yahmed 2018). With the assumption that the distributions of ε_{if} and ε_{im} are the same, we can perform the decomposition, since the same distribution of the error terms suggests an identical selection bias for both females

[5] We grouped education because we believe that the effect of education on wage is not linear. Wage usually depends on the level of education that has been completed.

and males. Under this assumption, the mean wage gap between males and females can be represented as:

$$\overline{lnw}_m - \overline{lnw}_f = (\overline{X'}_m - \overline{X'}_f)\hat{\beta}_p + \overline{X'}_m(\hat{\beta}_m - \hat{\beta}_p) + \overline{X'}_f(\hat{\beta}_p - \hat{\beta}_f) \quad (3)$$

The subscript *p* shows that the parameters are from the pooled wage regression. The first term on the right-hand side of the equation captures gender differences based on observable characteristics and the last two terms represent the sum of male advantage and female disadvantage in the treatment of the characteristics.

3.2 The wage gap controlling for both observables and selection

Single selection

Estimating the gender wage gap without considering selection into wage employment may lead to inconsistent estimates. Cultural norms in most countries overburden women with household chores and this affects their decision to enter wage employment, since the demands of self-employment are much more flexible than those of paid employment. Also, the need for maternity leave may cause employers to hire fewer women, since maternity leave increases the labour cost of women. This means that the selection of women into wage employment is likely to follow different processes from that of men. If that is the case, then the selection processes are not random, and therefore the distribution of ε_{if} and ε_{im} in equations (2a) and (2b) is not the same and hence the conditional mean of ε_i in equation (1) is not zero. Thus the correction involves first estimating the equation:

$$prob(E_i = 1) = a + \tau S_i + v_i \quad (4)$$

where E_i is wage employment of individual *i*, S_i represents the vector of explanatory variables, and v_i is the idiosyncratic error term, which is assumed to have a conditional mean of zero. Heckman (1979) has shown that under setting assumptions, equation (1) can be represented as:

$$lnw_i = \alpha + \delta F_i + \beta X_i + c\gamma_i + u_i \quad (5)$$

where $\gamma_i = \frac{\phi(\mu P_i)}{\Phi(\mu\psi)}$ and ϕ, Φ are the standard normal density and the normal distribution, respectively. If we assume that u_i has a conditional mean of zero, equation (5) can consistently be estimated. The identification of the Inverse Mills Ratio (IMR) is attained by the exclusion restriction assumption.

Like equation (1), we can separate equation (5) by gender as:

$$lnw_{if} = \alpha_f + \beta_f X_{if} + c_f\gamma_{if} + u_{if} \quad (6a)$$

$$lnw_{im} = \alpha_m + \beta_m X_{im} + c_m\gamma_{im} + u_{im} \quad (6b)$$

The total wage gap under the assumption of single selection can be shown to be:

$$\overline{lnw}_m - \overline{lnw}_f = (\overline{X'}_m - \overline{X'}_f)\hat{\beta}_p + \overline{X'}_m(\hat{\beta}_m - \hat{\beta}_p) + \overline{X'}_f(\hat{\beta}_p - \hat{\beta}_f) + c_m\gamma_{im} - c_f\gamma_{if} \quad (7)$$

Equation 7 can be re-written as:

$$\overline{lnw}_m - \overline{lnw}_f - c_m\gamma_{im} + c_f\gamma_{if} = (\overline{X'}_m - \overline{X'}_f)\hat{\beta}_p + \overline{X'}_m(\hat{\beta}_m - \hat{\beta}_p) + \overline{X'}_f(\hat{\beta}_p - \hat{\beta}_f) \quad (8)$$

The left-hand side of equation (8) is the wage gap that accounts for selection and the last two terms on the right of equation (8) represent the sum of male advantage and female disadvantage in the treatment of the characteristics. The last two terms in equation (8) are different from equation (3) because equation (8) is consistently estimated if the data-generating mechanism follows univariate sample selection.

Double selection

The wage of a worker can be observed only when the worker is employed, and this status depends on the decision of the worker to enter the labour market and the employers' decision to hire that worker (Abowd and Farber 1982; Mohanty 2001). Apart from employers' selectivity in hiring, some workers (especially women) self-select themselves into self-employment due to its flexibility compared with wage employment. This suggests that the wage equations follow a double selection process and therefore a consistent estimate can be obtained only when one considers both the selection into labour force participation and the hiring decision (Mohanty 2001; Tunali 1986).

We estimate the wage equation using the double selection correction procedure proposed in Mohanty (2012). The sample selection captures both labour force participation and paid employment as follows:

$$prob(E_i = 1) = a + \tau S_i + e_i \quad (9a)$$

$$prob(l_i = 1) = a + \mu P_i + v_i \quad (9b)$$

The parameters in equation (9a) have already been defined in equation (3): $l_i = 1$ is labour force participation of individual *i* and P_i is a vector of explanatory variables. We first assume that there is no correlation between v_i and e_i. In that case, we follow Heitmueller (2006) and estimate the two correction terms (IMR) by first estimating equation (9a) and calculating the IMR (λ_{1i}) and then also estimating equation (9b) and the IMR (λ_{2i}). In the second instance, we assume that v_i and e_i are correlated. In the instance of correlation between v_i and e_i, we follow the approach suggested by Mohanty (2012) to estimate the correction terms, with the assumption that equations (1), (9a), and (9b) follow a trivariate normal distribution. Mohanty (2012) shows that the two correction terms are estimated as:

$$\lambda_{1i} = \frac{\phi(\mu P_i)\Phi[(\tau S_i - \rho\mu P_i)/\sqrt{1-\rho^2}]}{F(\mu P_i, \tau S_i, \rho)}$$

$$\lambda_{2i} = \frac{\phi(\tau S_i)\Phi[(\mu P_i - \rho\tau S_i)/\sqrt{1-\rho^2}]}{F(\mu P_i, \tau S_i, \rho)}$$

where ϕ is a univariate normal density function, Φ is a univariate standard normal distribution function and F (.) is a bivariate standard normal distribution function. In the case of the double selection correction, equation (1) can consistently be estimated as follows:

$$lnw_i = \alpha + \delta F_i + \beta X_i + c_1\lambda_{1i} + c_1\lambda_{1i} + u_{1i} \quad (10)$$

Like equation (8), the wage decomposition for the double selection correction can be consistently estimated as follows:

$$\overline{lnw}_m - \overline{lnw}_f - c_{1m}\lambda_{1im} - c_{2m}\lambda_{2im} + c_{1f}\lambda_{1if} + c_{2f}\lambda_{2if} = \left(\overline{X'}_m - \overline{X'}_f\right)\hat{\beta}_p + \overline{X'}_m\left(\hat{\beta}_m - \hat{\beta}_p\right) + \overline{X'}_f\left(\hat{\beta}_p - \hat{\beta}_f\right) \quad (11)$$

4 Data and descriptive statistics

Individual information is taken from the latest nationally representative household survey, Ghana Living Standards Survey Seven (GLSS 7). A two-stage stratified sampling design was used to collect information on individuals. In the first stage, 1,500 enumeration areas (EAs) were selected as the primary sampling units (PSUs) and at the second stage, 15 households were selected systematically from each of the PSUs. A total of 15,000 households were selected across the country, of which 14,009 were successfully interviewed. A total of 31,305 working-age (15–60 years) individuals were interviewed, of whom women constituted 52.7 per cent. We excluded 269 observations due to missing information. As in many other studies, we excluded from the sample people who were still in school and the disabled. Due to problems associated with measuring the wages of unpaid entrepreneurs or employees, the study focused on wages reported by paid employees. Respondents provided different time units of payments and we converted all of them into a monthly payment.[6] In this paper, 'married' refers to individuals that are either customarily or legally married as well as to two individuals of opposite sexes who are cohabiting. 'Literate' as used in this paper refers to individuals who can read and write some basic tests in English and solve some basic maths problems administered to them during the survey.

Table 1 provides descriptive statistics on demographics, education, location, parental education, and employment-related characteristics by gender. Columns (1) and (2) present characteristics of those in paid employment, columns (3) and (4) are for those in non-paid employment, and the rest of the columns present characteristics of individuals out of the labour force. Non-paid employees are on average older and more likely to be married than their counterparts in paid employment. Among the three groupings, those who are out of the labour force have the smallest proportion that are married. The table suggests that a greater proportion of wage employees are from the Akan tribe, as compared with non-paid employees. For example, 49 per cent of men in paid employment are Akan but only 33 per cent of men in non-paid employment are Akan. People in paid employment tend to be literate and have more years of schooling than those in non-paid employment and those who are not in the labour force. It can also be seen from the table that people living with household members who are in wage employment are more likely to be in wage employment themselves. Similarly, the table suggests that people in paid employment have parents that have better educational characteristics than those in non-paid employment or those not in the labour force. Access to wage employment often goes beyond personal characteristics to include a social network. This means that people with parents with higher educational qualifications or living with household members who are in wage employment are likely to possess better opportunities to enter wage employment.

Regarding gender differences, the table shows that a greater share of men are in wage employment than women. On the other hand, more women are in non-paid employment than men. Women in paid employment are more likely to be heads of households and less likely to live with children or a person over 60 years old than their counterparts in non-paid employment and those who are out of the labour force. Compared with men, women in paid employment are younger and less likely

[6] In the data, 69.7 per cent of the wage earners report receiving monthly payment, 9.2 weekly payment, and 19.7 per cent daily payment, and the remaining 1.4 per cent report other time units.

to be married or heads of a household. Generally, men tend to possess a higher education than women. For example, while the years of education of men in paid employment, non-paid employment, and out of the labour force are 10.5, 6.3, and 6.97, those of women are 10, 4.7, and 6.03, respectively. The table also indicates that 52 per cent of women in wage employment live in urban areas but only 35 per cent in urban communities, and that urban women are comparatively more often in non-paid employment than their male counterparts. Finally, we see that men work more hours than women and are also more likely to engage in permanent employment than women. On average, men receive a monthly payment of GH¢ 872.62 while that of women is GH¢600.61.[7]

Table 1: Descriptive statistics

	In labour force				Out of labour force	
	In paid employment		Not in paid employment			
	(1) Men	(2) Women	(3) Men	(4) Women	(5) Men	(6) Women
Demographics						
Age in years (mean)	35.04	33.5	37.26	37.5	28.10	31.01
Married	0.49	0.42	0.60	0.61	0.25	0.41
Household size (mean)	4.20	4.50	5.82	6.10	6.19	5.94
Household head	0.78	0.34	0.76	0.25	0.33	0.13
1 if children below 5 in hh	0.43	0.47	0.56	0.59	0.41	0.51
1 if aged 60+ in hh	0.11	0.17	0.18	0.22	0.27	0.27
1 if any other member in the hh is a wage employee	0.23	0.39	0.01	0.02	0.05	0.04
Akan tribe	0.49	0.47	0.33	0.38	0.34	0.37
Mole tribe	0.18	0.18	0.26	0.23	0.35	0.32
Ewe tribe	0.14	0.15	0.12	0.12	0.07	0.07
Other tribes	0.20	0.20	0.30	0.27	0.23	0.24
Education						
Literate	0.64	0.59	0.37	0.24	0.39	0.33
Years of schooling (mean)	10.5	10.00	6.3	4.7	6.97	6.03
Location						
1 if urban	0.47	0.52	0.28	0.35	0.43	0.44
Parental education						
1 if parent has a certificate	0.47	0.53	0.24	0.27	0.27	0.27
Employment-related variables						
Share in employment	0.28	0.11	0.49	0.61	-	-
Weekly hours worked (mean)	35.6	32.95	1.89	0.67		
Monthly wage	872.62	600.61	-	-	-	-
1 if in permanent job	0.77	0.77	-	-	-	-
N	3,146	1,450	5,609	8,359	1,361	1,849

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

Source: authors' calculations based on the GLSS7 dataset.

Table 2 gives the distribution of females and males in wage employment across occupations. The table suggests that women in wage employment are highly concentrated in professional jobs and

[7] GH¢900.3 is equivalent to US$200 in 2017 (the year in which the survey was conducted) and GH¢611 is equivalent to US$136.

service and sales occupations, whereas men in wage employment are clustered in factory, machine operating, and assembling jobs, professional jobs, and craft and related jobs. For example, 20.5 per cent of men are employed in factory work, machine operating, and assembling, whereas only 1.5 per cent of women are in those occupations; and 28.5 per cent of women in paid employment are professionals compared with only 19.5 per cent of men. The occupational distribution suggests that women in paid employment prefer to work in certain types of occupation. For example, more than 55 per cent of the women in paid employment are employed as professionals or service and sales workers.

Table 2: Employment shares of wage employment by gender and occupations

Occupation	**Employment share (percentages)**	
	Men	**Women**
Managers	4.75	4.09
Professionals	19.5	28.6
Technicians and associate professionals	5.2	5.7
Clerical support workers	4.0	5.9
Service and sales workers	14.9	27
Skilled agriculture and fishery workers	4.5	2.4
Craft and related trades workers	16.5	10
Plant machine operators and assemblers	20.5	1.5
Basic occupations	10	15.2

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

Source: authors' calculations based on the GLSS7 dataset.

Figure 1 presents the relationship between wages and years of schooling by gender. The graph shows a high gender wage gap among people with fewer years of education but the gap significantly reduces as years of education increase, becoming almost zero at very high levels of education. The results portrayed in Figure 1 suggest that the gender wage gap in Ghana exhibits a sticky floor. This may be because individuals with more years of education are likely to earn higher wages than those with fewer years of education.

Figure 1: Relationship between wage and years of schooling

Source: authors' estimation based on GLSS7 dataset.

Figure 2 presents a kernel density showing the gender wage gap between formal and informal workers and also between rural and urban workers. Figure 2 suggests that, except for formal wage employment, the gender wage gap exists for the rest of the classifications in the graph.

Figure 2: Kernel densities of log wage by urban–rural and formal-informal sector

Source: authors' estimations based on GLSS7 data.

5 Results

5.1 Different selection in the wage equation

We start our analysis of the sample selection correction of the wage equation by estimating the two univariate and the bivariate probit models discussed in Section 3. These regressions will help us to understand how the selection variables shape labour force participation and employers' hiring decisions. To identify the effect of selection on the wage equation and to purge our estimates of selection bias, we use some variables as exclusion restrictions. We assume that being married, having a wage worker in the household, the size of a household, being a household head, and the educational level of parents will affect labour force participation and the probability of getting paid employment but not affect the size of one's wages. As explained in Section 3, a high level of parental education and having a household member in paid employment improves one's chances of securing wage employment. We therefore use a dummy to represent a high level of parental education and having a household member in wage employment as the exclusion restriction for the paid employment equation, and being married, having a large household, and being a household head as the exclusion restriction for the participation equation.

We estimate the probit models separately for men and women. Table 3 presents the marginal effects for the probit models for men and Table 4 presents the marginal effects for women.

Table 3: Labour market status based on different selection processes: marginal effects for men

	(1)	(2)	(3)	(4)
	Univariate probit estimations		Bivariate probit estimations	
Variables	**Participation**	**Employed**	**Participation**	**Employed**
1 if married	0.0076	-0.0075	0.0067	-0.0103
	(0.0085)	(0.0107)	(0.0080)	(0.0139)
1 if urban	-0.0440***	0.1047***	-0.0406***	0.1428***
	(0.0086)	(0.0131)	(0.0080)	(0.0179)
Literate	0.0314***	0.0453***	0.0293***	0.0524***
	(0.0103)	(0.0118)	(0.0095)	(0.0160)
Age in years	0.0258***	0.0080***	0.0244***	0.0041
	(0.0017)	(0.0030)	(0.0016)	(0.0052)
Age*Age	-0.0003***	-0.0001***	-0.0003***	-0.0001
	(0.0000)	(0.0000)	(0.0000)	(0.0001)
1 if basic education	-0.0129	0.0108	-0.0127	0.0161
	(0.0088)	(0.0132)	(0.0081)	(0.0169)
1 if secondary education	0.0044	0.0879***	0.0023	0.1118***
	(0.0113)	(0.0154)	(0.0107)	(0.0199)
1 if tertiary education	0.0188	0.1838***	0.0145	0.2345***
	(0.0155)	(0.0194)	(0.0151)	(0.0265)
1 if Akan tribe	-0.0048	0.0403***	-0.0050	0.0524***
	(0.0110)	(0.0131)	(0.0104)	(0.0180)
1 if Mole tribe	-0.0252**	0.0057	-0.0234**	0.0127
	(0.0125)	(0.0156)	(0.0117)	(0.0217)
1 if Ewe tribe	-0.0020	0.0393**	-0.0013	0.0513**
	(0.0138)	(0.0177)	(0.0130)	(0.0230)
1 if a child below 5 years in the hh	0.0112	0.0287***	0.0103	0.0347***
	(0.0070)	(0.0103)		
			(0.0066)	(0.0132)
Household size	-0.0001	-0.0206***	0.0000	-0.0262***
	(0.0011)	(0.0021)	(0.0010)	(0.0026)
Total of the aged 60+ in hh	-0.0082	0.0004	-0.0074	0.0020
	(0.0096)	(0.0144)	(0.0091)	(0.0187)
Household head	0.0808***	0.0869***	0.0753***	0.0931***
	(0.0094)	(0.0174)	(0.0086)	(0.0244)
1 if hh member with wage employment		0.4738***		0.6075***
		(0.0178)		(0.0261)
1 if a parent has a minimum of basic education certificate		0.0098		0.0133
		(0.0122)		(0.0157)
Rho				-0.3372*
				(0.1852)
Observations	11,264	9,917	11,264	11,264

Note*:* sample is individuals aged 15–60 years. Other tribe is the reference group for ethnic group. No educational certificate is the reference group for education. Standard errors clustered at the district level in parentheses below. p-values: *<0.05; **<0.01; ***<0.001.

Source: authors' construction based on GLSS7 data.

Table 4: Labour market status based on different selection processes: marginal effects for women

	(1)	(2)	(3)	(4)
	Univariate probit estimations		Censored bivariate probit estimations	
Variables	**Participation**	**Employed**	**Participation**	**Employed**
1 if married	0.0303***	-0.0269***	0.0297***	-0.0273***
	(0.0082)	(0.0056)	(0.0081)	(0.0056)
1 if urban	-0.0370***	0.0195***	-0.0364***	0.0200***
	(0.0096)	(0.0060)	(0.0094)	(0.0062)
Literate	0.0159**	0.0215***	0.0155**	0.0211***
	(0.0073)	(0.0065)	(0.0072)	(0.0065)
Age in years	0.0304***	0.0032**	0.0299***	0.0026
	(0.0016)	(0.0016)	(0.0016)	(0.0017)
Age*Age	-0.0004***	-0.0001***	-0.0004***	-0.0000**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
1 if basic education	-0.0320***	0.0038	-0.0314***	0.0043
	(0.0089)	(0.0080)	(0.0087)	(0.0080)
1 if secondary education	0.0165	0.0998***	0.0159	0.0991***
	(0.0120)	(0.0098)	(0.0118)	(0.0095)
1 if tertiary education	-0.0100	0.1362***	-0.0102	0.1358***
	(0.0189)	(0.0113)	(0.0187)	(0.0123)
1 if Akan tribe	0.0013	-0.0050	0.0014	-0.0050
	(0.0109)	(0.0077)	(0.0107)	(0.0078)
1 if Mole tribe	-0.0166	0.0059	-0.0162	0.0062
	(0.0128)	(0.0116)	(0.0126)	(0.0116)
1 if Ewe tribe	0.0325**	-0.0018	0.0321**	-0.0023
	(0.0138)	(0.0093)	(0.0136)	(0.0094)
1 if a child below 5 years in the hh	0.0215***	0.0093*	0.0211***	0.0089
	(0.0079)	(0.0056)	(0.0078)	(0.0056)
Household size	-0.0005	-0.0096***	-0.0005	-0.0095***
	(0.0011)	(0.0015)	(0.0011)	(0.0015)
Total of the aged 60+ in hh	-0.0065	0.0245***	-0.0063	0.0245***
	(0.0076)	(0.0073)	(0.0075)	(0.0074)
Household head	0.0563***	0.0492***	0.0555***	0.0482***
	(0.0087)	(0.0071)	(0.0086)	(0.0074)
1 if hh member with wage employment		0.2591***		0.2581***
		(0.0073)		(0.0147)
1 if a parent has a minimum of basic education certificate		0.0096		0.0096
		(0.0068)		(0.0067)
Rho				-0.073
				(0.0846)
Observations	13,656	11,840	13,656	13,656

Note*:* sample is individuals aged 15–60 years. Other tribe is the reference group for ethnic group. No educational certificate is the reference group for education. Standard errors clustered at the district level in parentheses below. p-values: *<0.05; **<0.01; ***<0.001.

Source: authors' construction based on GLSS7 data.

The probability of participating in the labour force or engaging in paid employment increases with age for both sexes. The effect of age on labour force participation is stronger for women, but in the case of wage employment the effect is stronger for men. Apart from men with a basic education certificate, labour force participation for the other educational levels is not different from the reference group (no educational certificate) for both men and women. For both sexes, possessing a secondary or a tertiary education certificate leads to a higher probability of being in wage

employment than having no educational certificate. The effect of having an educational certificate on wage employment is stronger for men. This points to the traditional roles of men and women, whereby men are seen as breadwinners for the household. The role of men as breadwinners is likely to force men with educational certificates to intensify their search for wage employment relative to women. Literacy has a positive impact on labour force participation and paid employment for both men and women. Although marriage increases labour force participation for women, it has a negative effect on women in wage employment; but it affects neither participation nor wage employment for men. This is because many Ghanaian homes expect married women to do the housework and childcare activities, which are likely to reduce women's participation in wage employment as wage employment is less flexible than other forms of employment.

The tables show that women living in a household with children below 5 years are more likely to participate in the labour force and, at the 10 per cent confidence level, are more likely to be engaged in paid employment. On the other hand, men living in a household with children below 5 years are more likely to engage in paid employment but their labour force participation is statistically not different from those not living with children below 5 years. Income effect could be a possible explanation for the positive association between men in a household with children under 5 years old and wage employment.

Older people in a household may help in taking care of the children in the household and this may help in the labour force participation of women living in such a household. On the contrary, older people may require care and this may affect the labour force participation of the active population in that household. This means that the direction of having an older person in the household cannot be determined a priori. The results in Tables 3 and 4 suggest that an older person in the household has no effect on the labour force participation of either men or women. However, women living in a household that has an older person are more likely to be engaged in paid employment.

Household heads are more likely to participate in the labour force and also to be in paid employment; the impact is, however, greater among men than women. Our results suggest no effect of parents' education on wage employment but we find that people living with household members that engage in wage employment are more likely to be in wage employment. This finding points towards the network effect discussed in Section 4.

The significant differences in the marginal effects for the regression results on men and women demonstrate that the selection processes into participation and wage employment are not the same for both sexes. For example, marriage does not affect the labour force participation or wage employment of men but it does affect women's. Moreover, while men from the Akan and Ewe tribes are more likely to engage in paid employment compared with the reference group, the regression results for women suggest no significant difference in wage employment across tribes. The two tables also show that, although having a child below 5 years in the household does not affect the participation of either men or women, there is statistical evidence of its affecting the wage employment of women but not that of men. The results in Table 3 and 4 are an indication of men having different selection processes from women.

5.2 Determinants of wage employment

As discussed in Section 3, we estimate the Mincerian wage equation for men and women separately. If there is no selection, then a simple OLS can consistently estimate the parameters. However, if there is a selection problem and we fail to control for the sample selection, then OLS regression will be biased. The regressors for the wage equation include an urban dummy, a literacy dummy, age, education, hours worked, and a dummy of a regular permanent wage employee in the household. The impact of education on wage is likely to be non-linear and therefore we categorize

education into four groups: no educational certificate, basic education certificate, secondary certificate, and tertiary education. We control for regional dummies and dummies of the time units reported for wage payment (i.e. daily, weekly, monthly, others). The dummies of the time units reported for the wage payment are controlled in the regression equation to reduce measurement errors that may arise as a result of converting them to monthly wages.

The dependent variable in Table 5 is the logarithm of wages. Compared with the reference group, the return on higher education is significant for both men and women, and the return increases as the level of education also increases. The table shows that the return on higher education is greater for women than for men. This pattern is robust for all the specifications. Compared with the reference group, the return on basic education is significant only at the 10 per cent level for men in the specifications with no correction and the one with a single sample selection.

Table 5 indicates that men living in urban communities are more likely to receive higher wages than their counterparts in rural communities but the wages of women living in urban communities are not statistically different from those in rural areas. The table also shows that wages increase with age, and the results portray evidence of a concave effect for both women and men. The concavity of age–earnings is robust in all the specifications apart from the univariate double selection correction. Literacy has a positive effect on the earnings of women, but not men, and it is robust for all the specifications apart from the univariate double selection correction, which is not significant. Permanent regular jobs provide higher monthly returns than temporary jobs; the effect is stronger among males. Total hours worked does not have any effect on either men or women and this is consistent across all specifications.

The results point to two-tier wage employment in the country, where those engaged in formal employment who would have received remuneration for overtime work hardly get the opportunity to work overtime, whereas workers in informal wage employment are often asked by their employers to work overtime when there is a need for it, but they rarely receive additional compensation for the overtime work.

Table 5: Factors affecting monthly wages by gender, controlling for selection

	(1)	(2)	(3)	(4)	(5)	(6)	(8)	(9)
	No selection		Selection					
			Single selection (simple correction)		Double selection (univariate correction)		Double selection (bivariate correction)	
VARIABLES	**Women**	**Men**	**Women**	**Men**	**Women**	**Men**	**Women**	**Men**
1 if urban	0.0243	0.0951**	0.0090	0.0760**	0.0490	0.1451***	0.0058	0.1104***
	(0.0462)	(0.0432)	(0.0432)	(0.0342)	(0.0475)	(0.0401)	(0.0500)	(0.0282)
Literate	0.1346**	0.0616*	0.1294***	0.0514	0.0749	-0.0005	0.1440***	0.0592**
	(0.0587)	(0.0352)	(0.0489)	(0.0357)	(0.0510)	(0.0430)	(0.0558)	(0.0286)
Age in years	0.0624***	0.1069***	0.0582***	0.1044***	0.0109	0.0363*	0.0646***	0.0955***
	(0.0117)	(0.0112)	(0.0119)	(0.0093)	(0.0212)	(0.0217)	(0.0127)	(0.0100)
Age*Age	-0.0006***	-0.0012***	-0.0005***	-0.0011***	0.0001	-0.0003	-0.0006***	-0.0010***
	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0003)	(0.0003)	(0.0002)	(0.0001)
1 if basic education	0.1833***	0.0753*	0.1774***	0.0725*	0.2180***	0.1127***	0.1743***	0.0818**
	(0.0642)	(0.0433)	(0.0627)	(0.0435)	(0.0772)	(0.0354)	(0.0599)	(0.0357)
1 if secondary education	0.7462***	0.3534***	0.6918***	0.3373***	0.7029***	0.3380***	0.7199***	0.3568***
	(0.0602)	(0.0438)	(0.0683)	(0.0481)	(0.0798)	(0.0432)	(0.0613)	(0.0411)
1 if tertiary education	1.2934***	0.8759***	1.2236***	0.8404***	1.2348***	0.8530***	1.2525***	0.8828***
	(0.0759)	(0.0516)	(0.0772)	(0.0556)	(0.0880)	(0.0498)	(0.0812)	(0.0504)
Total hours worked in a week	0.0001	-0.0001	0.0002	-0.0001	0.0003	-0.0002	0.0003	-0.0000
	(0.0011)	(0.0009)	(0.0009)	(0.0007)	(0.0009)	(0.0008)	(0.0009)	(0.0007)
Permanent employment	0.3256***	0.3535***	0.3227***	0.3506***	0.3147***	0.3357***	0.3241***	0.3507***
	(0.0515)	(0.0420)	(0.0490)	(0.0369)	(0.0419)	(0.0380)	(0.0418)	(0.0405)
Inverse Mills Ratio (1)			-0.0855**	-0.0662*	-0.0929***	-0.0453	-0.0396	-0.2553*
			(0.0344)	(0.0390)	(0.0347)	(0.0494)	(0.1397)	(0.1377)
Inverses Mills Ratio (2)					-0.7819**	-1.1580***	0.4034***	0.1402
					(0.3177)	(0.3499)	(0.1295)	(0.1758)
Constant	4.0321***	4.0799***	4.3215***	4.2602***	5.4945***	5.8910***	4.0487***	4.4269***
	(0.2190)	(0.2231)	(0.2432)	(0.1917)	(0.4988)	(0.5146)	(0.2862)	(0.2344)
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dummies of time units of wage payment	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,450	3,146	1,450	3,146	1,450	3,146	1,450	3,146

Notes: sample is individuals aged 15–60 years. No educational certificate is the reference group for education. Bootstrapped standard errors in parentheses below. p-values: *<0.05; **<0.01; ***<0.001.

Source: authors' construction based on GLSS7 data.

5.3 The gender wage gap across specifications

The selection equations presented in Tables 3 and 4 indicate that selection into labour force participation and paid employment cannot be ignored, since the tables show that some of the factors affecting participation and paid employment for women are not the same as those for men. Table 5 also provides evidence on how the selection processes shape the wage equation. For example, the IMR for sample selection into wage employment is significant in the univariate simple correction and univariate double selection correction specifications for women but insignificant for all the sample selection correction specifications for men. We also see from the table that the IMR for the selection due to participation is significant in both the univariate and bivariate double selection correction for women but insignificant for men in the bivariate equation. It is found in Table 3 that the correlation between the error terms of the participation equation and the paid employment equation cannot be ignored at the 10 per cent significance level, but regression evidence in Table 4 suggests that it can be ignored.

Table 6 provides regression results on the gender wage gaps for four different specifications: no sample selection correction, univariate simple sample selection correction, univariate double sample selection correction, and bivariate double sample selection correction. Column (1) of the table presents results for the average total wage gap and column (2) presents the part of the wage gap that is due to differences in returns. Column (1) shows that the average total gender wage gaps are positive and significant for all the four specifications. However, their magnitudes differ significantly across specifications. The average total gender wage gap is highest for the bivariate double selection correction (64.71 percentage points)[8] and lowest for the univariate simple correction (41.91 percentage points). Column (2) provides results of the gap that occurs as a result of the differences in returns. As with the average total wage gap, all the estimations in column (2) are significant and they are robust for all specifications.

Table 6: Gender wage decomposition by different sample correction processes

	(1)	**(2)**
	Total wage gap	**Part due to differences in returns**
1. Controlling for observables only	$wg = \overline{lnW_m} - \overline{lnW_f}$	$rg = \bar{X}_m'(\hat{\beta}_m - \hat{\beta}_p) + \bar{X}_f'(\hat{\beta}_p - \hat{\beta}_f)$
	0.410***	0.337***
	(0.0303)	(0.0251)
2. Controlling for observables and selection	$\overline{lnW_m} - \overline{lnW_f}$-$(\varphi_m h_m - \varphi_f h_f)$	$\bar{X}_m'(\hat{\beta}_m - \hat{\beta}_p) + \bar{X}_f'(\hat{\beta}_p - \hat{\beta}_f)$
2.1 Univariate simple correction	0.350***	0.274***
	(0.0674)	(0.0656)
2.2 Univariate double selection correction	0.371***	0.314***
	(0.1170)	(0.1155)
2.3 Bivariate double selection correction	0.499***	0.426***
	(0.0821)	(0.0817)

Note: sample is individuals aged 15–60 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 or (exp(rg)-1)X100.

Source: authors' construction based on GLSS7 data.

The decomposition presents results for three wage gaps: total wage gap; explained wage gap (male characteristics vs. female characteristics); and unexplained gap. Although we report the total wage

[8] (exp(0.499)-1)X100

gap and unexplained wage gap, the total wage gap = explained wage gap and unexplained wage gap; therefore, once we present two of the gaps, the other can be implied. From the table it can be seen that the explained wage gap is positive, which indicates that some proportion of the total wage gap is explained by better observable characteristics of men (i.e. the covariates used in the regression).

Table 7 provides estimates of the gender wage gap for specific sub-groups. Column (1) presents the results of the average total wage gap and column (2) shows the part of the wage gap that is a result of differences in returns. Columns (2) and (4) provide Welch's t-statistics, which are used to test the equality of the wage gap between two related sub-groups.

The results in column (1) of Table 7 show that the gender wage gap is significant for informal wage employment in all the specifications. However, in the case of formal wage employment, the gender wage gap shows significance for no correction and univariate single correction specifications but insignificance for the two double selection correction specifications. In all the four specifications, the result shows a smaller average total gender wage gap in the formal sector. Welch's t-statistics (columns 2 and 4) indicate that the gender wage gap in the formal sector is significantly different from the informal sector. Women in the informal sector receive a far lower wage than their male counterparts but gender wage inequality significantly reduces for formal wage employees. It can also be seen from both sectors that only a small proportion of the observed differences in the wage inequalities is due to differences in observable characteristics. This observation points to the fact that labour regulations and other affirmative policies that seek to protect women benefit women in formal wage employment more than their counterparts in informal wage employment.

The table reveals a significant gender wage gap in both urban and rural communities. The magnitude in all the specifications except the bivariate double selection correction indicates that the gender wage gap in urban areas is smaller than in rural areas. For example, while the average total gender wage gap for rural dwellers is 0.47, 0.563, and 0.508 log points in the specifications with no sample correction, univariate simple correction, and univariate double selection correction, respectively, it is only 0.394, 0.261, and 0.336 log points for urban dwellers using the same specifications. However, Welch's t-statistics indicate that the difference in the gender wage gap of people living in urban areas is statistically not significantly different from people living in rural areas for all the specifications apart from the univariate single correction, which is significant for the total wage gap and significant at the 10 per cent confidence level for the part that is as a result of the difference in returns.

The regression results for the educational levels indicate no gender wage gap for people with tertiary education certificates in all the specifications. The gender wage gap is highest for people with a basic education certificate and the gap consistently reduces at higher levels of education in all the specifications apart from the bivariate double selection correction, which shows a smaller gender wage gap for those with secondary than those with tertiary education. Depending on the correction method, the gender wage gap of individuals with basic education, secondary education, and tertiary education ranges from 56 to 129.1 percentage points, 0.4–21.4 percentage points, and 2.3–48.6, respectively. The results in column (3) of Table 7 indicate that only a small proportion of the average total wage gap is explained by observable characteristics. It can further be observed in Table 7 that men generally possess better observable characteristics that make them earn higher wages than women. The Welch's t-test shows that the wage gap of people with at most basic education is significantly different from those with secondary and tertiary education. However, the average wage gap for those with secondary education is not different from those with tertiary.

Table 7: Gender wage decomposition of sub-groups by different selection processes

	(1) Total wage gap	(2) Welch's t-statistics	(3) Part due to differences in returns	(4) Welch's t-statistics
1. No correction	$\overline{lnW_m} - \overline{lnW_f}$		$\bar{X}_m'(\hat{\beta}_m - \hat{\beta}_p) + \bar{X}_f'(\hat{\beta}_p - \hat{\beta}_f)$	
Formal	0.137***(0.0411)		0.0942**(0.0367)	
Informal	0.606***(0.0370)	**8.50**	0.572***(0.0358)	**9.32**
Urbanization				
Urban	0.394***(0.0396)		0.340***(0.0336)	
Rural	0.470***(0.0606)	1.05	0.3295***(0.0488)	**0.17**
Education				
Basic education	0.575***(0.0590)		0.469***(0.0464)	
Secondary education	0.186***(0.0520)		0.054***(0.0493)	
Tertiary education	0.079*(0.0447)	[**4.94**]^a [**6.70**]^b [1.57]^c	0.050*(0.0474)	[**6.12**]^a [**6.31**]^b [0.06]^c
2. Controlling for observables and selection	$\overline{lnW_m} - \overline{lnW_f}$-$(\varphi_m h_m - \varphi_f h_f)$		$\bar{X}_m'(\hat{\beta}_m - \hat{\beta}_p) + \bar{X}_f'(\hat{\beta}_p - \hat{\beta}_f)$	
2.1 Univariate simple correction				
Formal	0.238**(0.0679)		0.189***(0.0900)	
Informal	0.481***(0.0863)	**2.21**	0.445***(0.0880)	**2.31**
Urbanization				
Urban	0.261***(0.0687)		0.205***(0.0682)	
Rural	0.563***(0.1068)	**2.38**	0.424***(0.1019)	**1.78**
Education				
Basic education	0.445***(0.1245)		0.339***(0.1248)	
Secondary education	0.194**(0.0859)		0.060(0.0845)	
Tertiary education	0.023(0.0821)	[**1.66**]^a [**2.83**]^b [1.44]^c	0.012(0.0837)	[**1.85**]^a [**2.34**]^b [0.61]^c
2.2 Univariate double selection correction				
Formal	0.206(0.1625)		0.166(0.1587)	
Informal	0.635***(0.1723)	**1.81**	0.6156***(0.1715)	**1.93**
Urbanization				
Urban	0.336**(0.1411)		0.295**(0.1367)	
Rural	0.508**(0.1855)	0.74	0.3910**(0.1887)	0.41
Education				
Basic education	0.861***(0.2681)		0.769***(0.2716)	
Secondary education	0.146(0.1929)		0.080(0.1942)	
Tertiary education	0.121(0.1774)	**[2.16]^a [2.30]^b** [0.96]^c	0.087(0.1840)	**[2.06]^a [2.08]^b** [0.02]^c
2.3 Bivariate double selection correction				
Formal	0.218*(0.1223)		0.178(0.1227)	
Informal	0.729***(0.1000)	**3.24**	0.694***(0.0983)	**3.28**
Urbanization				
Urban	0.495***(0.1008)		0.441***(0.0977)	
Rural	0.454***(0.0997)	0.29	0.3139***(0.0956)	0.93
Education				
Basic education	0.829***(0.1403)		0.735***(0.1440)	
Secondary education	0.004(0.1556)		-0.124(0.1551)	
Tertiary education	0.396*(0.2066)	[**3.94**]^a [**1.73**]^b [1.52]^c	0.366*(0.2106)	[**4.08**]^a [1.45]^b **[1.89]^c**

Notes: sample is individuals aged 15–60 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 or (exp(rg)-1)X100. Welch's t-statistics are 5% or 10% significant if |t|>1.96 or |t|>1.61, respectively. [.]^a,[.]^b, and [.]^c are tests of mean equality between basic education and secondary, basic education and tertiary, and secondary and tertiary, respectively.

Source: authors' construction based on GLSS7 dataset.

A piece of striking evidence from the regression results is the consistent reduction in the gender wage gap at increasing levels of education for all specifications apart from the bivariate double selection correction. This evidence can be interpreted as a form of sticky floor. Another insight from the results in the regressions of both formal–informal and various educational levels is that women with a lower educational certificate are more likely to be in informal wage employment, where policies that protect them are generally missing.

Our findings suggest that labour market regulations may have an impact on gender wage inequality in Ghana. The findings that the wage gaps are smaller in formal employment and for people with tertiary education are consistent with the following explanation. If employers believe that maternity and childcare may affect women's productivity, then statistical discrimination induces employers to pay women lower wages because they expect high average female labour costs. However, labour market regulations and affirmative action policies that protect women can easily be monitored in the formal sectors. Therefore, formal wage employment protects women and thus minimizes discrimination against women in the workplace. This finding is consistent with studies in other African countries where wage employment is very small compared with self-employment. We also find that the gender wage gap reduces when the level of education increases, a result that has commonly been seen in the literature on the gender wage gap in SSA. This finding is often explained by statistical discrimination in low-wage jobs, where labour regulations are often absent. We therefore argue that the formalization of businesses and implementation of affirmative policies that target female participation in secondary and tertiary levels of education may reduce the gender wage gap.

5.4 Correct specification of the wage equation

The regression results presented in Tables 3 and 4 showed that the selection processes into labour force participation and wage employment for men are different from those for women. This suggests that the double selection correction is appropriate. Nevertheless, we use the JA test developed by Fisher and McAleer (1981)[9] to determine which of the model specifications is most appropriate. In the first part of Table 8, we use the JA test to compare the univariate single correction and no correction specifications. The next part of Table 8 compares univariate single correction and univariate double selection correction, and the final part compares univariate double selection correction and bivariate double selection correction. Results from the table show that the univariate single correction is a better specification than the specification that does not correct for sample selection. However, all the estimations presented in Table 8 suggest that the specifications with double selection correction are superior to the wage equation that corrects for only one sample selection.

We also test for the more valid specification among the two double selection correction specifications. Our results suggest that in the Ghanaian case the univariate double selection correction is superior to the bivariate double selection correction. This is because the JA t-statistics fail to reject the null of the bivariate double selection correction but do reject the null of the univariate double selection correction at the 5 per cent confidence level. Given that the rho in Table 3 is significant only at the 10 per cent confidence level and that of Table 4 is not significant,

[9] Hypothesis (1) is obtained by first estimating equation (1) in Section 3 in addition to the IMR obtained for the case of single sample selection and then obtaining the predicted values of the log wage. We then regress the predicted log wage on the covariates in equation (1) and then obtain another predicted value for the dependent variable. Finally, we regress the log wage on the two predicted values and test for significance of the last predicted variable. We can similarly obtain the JA test results for the rest of the hypothesis. For more information about how the JA specification test is conducted see Fisher and McAleer (1981); Mohanty (2001).

it is not surprising that the univariate double selection correction is superior to the bivariate double selection correction.

Table 8: Model specification test

Hypothesis	JA t-statistics
No correction vs. univariate single correction	
The specification with no correction is not valid	<0.01
The univariate single correction is not valid	6.42
Univariate simple correction vs. univariate double selection correction	
The univariate simple correction is not valid	<0.01
The univariate double selection correction is not valid	6.79
Univariate double selection correction vs. bivariate double selection correction	
The univariate double selection correction is not valid	2.26
The bivariate double selection correction is not valid	0.05

Note: JA t-statistics are 5% or 10% significant if |t|>1.96 or |t|>1.61.

Source: authors' calculations.

The results shown in Table 8 point to the fact that the bivariate double selection correction overestimates the gender wage gap. In Table 6, the wage gap without sample selection correction is 0.410 log points, but it is 0.371 log points according to the univariate double selection correction and 0.499 according to the bivariate double selection correction. The univariate double selection correction in Table 5 shows that women are negatively selected into wage employment. This implies that the observed female wage after controlling for observables is underestimated. In the case of participation, there is a negative selection effect for both men and women. Again, this implies that the observed wages after controlling for observables are underestimated for both men and women. Although the magnitude of the IMR for participation is bigger for men, the decomposition results in Table 6 show that the effect of ignoring selection into wage employment is stronger than selection into participation. Therefore, the average total gender wage gap is smaller for the univariate double selection correction than the gender wage gap that does not correct for sample selection. In the case of the bivariate double selection correction, Table 5 suggests a positive selection of women as a result of labour market participation. This suggests that the observed female wage after controlling for observables is overestimated. Therefore, using the bivariate double selection correction provides a larger gender wage gap than the observed wage gap after controlling for observables only.

The results from Tables 3, 4, 5, 6, and 8 demonstrate that the univariate double selection correction is the appropriate model to use. Both the specification without sample selection correction and the bivariate double selection correction overestimate the gender wage gap, while the univariate simple correction underestimates the gender wage gap because it fails to account for negative selection into labour force participation by both men and women. In other words, all the model specifications point towards a gender wage gap in Ghana. However, employing the right sample selection correction will provide a consistent estimate.

6 Conclusion

In this study, we investigated the gender wage gap in Ghana and then demonstrated how the gender wage gap can be biased if self-selection into labour force participation and selection into

paid employment are not addressed. The study provides results of a wage equation that does not correct for sample selection, another equation that corrects for a single sample selection, and an equation that corrects for double sample selection. For the case of the double selection correction, we present results that assume a correlation between the error terms of the two selection equations and a result for one that does not assume a correlation between error terms of the two selection equations. Our findings indicate that the average total gender wage gap is positive and significant irrespective of the sample selection correction method. The average gender wage gap for the estimate without sample selection correction is high but this conceals the differences in sample selection of men and women in terms of labour force participation and paid employment. When we ignore double selection correction and concentrate on univariate simple correction, the gender wage gap is lowest (41.91 per cent) but this also conceals the fact that the self-selection in labour force participation of men and women may differ. Our findings point to the fact that the gender wage gap that is a result of differences in observables is less than 2.5 per cent irrespective of the specification. We find that the gender wage gap is smaller among formal wage employees and the gap also decreases with an increase in the level of education.

The smaller gender inequalities in the returns of productive characteristics in formal employment are a good thing for women and the country at large. First, women in formal jobs averagely receive higher wages than those employed in informal jobs. Second, the lesser gender wage inequalities in formal employment mean that an increase in formalization of business enterprises will reduce the total gender wage gap in the country. Finally, given that women need to take maternity leave and sometimes have to neglect their work responsibilities in favour of childcare, the earnings per work output of women in formal wage employment are likely to be higher than those of men in formal wage employment if the benefits of maternity leave and time off for childcare and household chores are quantified and added to their wages. Additionally, efforts to increase women's participation in higher education will decrease the gender wage gap.

A worker's wage can be observed only when the worker decides to participate in the labour market and obtains wage employment. Any wage equation that ignores the above two selection processes will result in omitted variable misspecification and may therefore lead to a biased estimate. Correcting for double selection in the wage equation not only improves the specification of the wage equation, but also allows simultaneous estimation of the worker's participation and the employer's hiring decisions. The study therefore argues that double selection correction should always be considered in wage equations, especially in studies that focus on the gender wage gap, since the selection of males into labour force participation or wage employment may be different from that of women. Further research is needed, first to extend the analysis to earnings of self-employed workers and, second, to assess how the gender wage gap may be affected when participation is defined to include only those in the labour force who have searched for paid employment.

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