

# Ceilings or floors? Recent evidence on gender wage gaps in Ghana

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## Abstract

Improvements in the economic conditions of women as well as reducing gender based inequalities have become topical in recent global initiatives. Such gender based outcomes in the labour market manifest in gender segregation of occupations and gender wage gaps. Studies on the gender wage gap have until recently estimated Mincerian-type wage equations and decompose the mean wage gap between males and females using the technique proposed by Oaxaca (1973) and Blinder (1973). This technique has been criticised for focusing on the mean gap and ignoring the possibility that the source of the wage gap may differ along the wage distribution. One alternative decomposition technique proposed is quantile decomposition which estimates the gender wage gap at different points in the wage distribution, the application of which leads to sticky floors and glass ceilings. Using the recent wave of the Ghana living standards survey (GLSS 6), this study adopts the unconditional quantile regression and decomposition technique based on the re-centred influence functions by Fortin et al., (2011) to assess the determinants of wages in Ghana by sector and locality and investigate gender wage gaps along the wage distribution. Consequently, we find evidence of significant gender effects on wages and the presence of sticky floors in formal sector employment as well as in both rural and urban labour markets in Ghana.

## 1. Introduction

Gender differences in economic outcomes have attracted considerable attention in research and public policy. Reducing gender-based inequalities as well as improving the economic conditions of women has been a central target of global development goals since the turn of the century. One area where such disparities are evident is the labour market. Two manifestations of such disparities in the labour market is the gender segregation of occupations and gender wage gaps. For example, women are disproportionately employed in unpaid jobs and the informal sector (ILO, 2015). In traditional societies, social and cultural traditions may segregate women with similar characteristics as men into low-paying jobs that accommodate females' larger household responsibilities (Carrillo et al., 2014).

Globally, men earn higher than women on average (Nopo, 2008; UN, 2010; Nopo et al., 2012; ILO, 2015). The gender wage gap has been attributed to differences in productivity characteristics, particularly human capital endowments and labour market experience; and the returns to these characteristics owing to discrimination against women. ILO (2015), postulates that increasing gender wage gaps may exacerbate inequality among households in transitional and developing countries. Chi & Li (2008) suggests structural transformation and transitioning to market economies may raise gender wage gaps due to increasing returns to productivity characteristics in the presence of male-female productivity differences. To this end, policies to reduce gender wage gaps in developing countries have focused on improving female education and encouraging female employment in the wage sector. Chen et al., (2012), cautions that such a strategy may not successfully bridge the wage gap.

Until recently, studies on the gender wage gap have estimated Mincerian-type wage equations and decompose the mean wage gap between males and females using the technique proposed by Oaxaca (1973) and Blinder (1973). The classical Oaxaca-Blinder methodology decomposes the mean wage gap into a component due to differences in labour market endowments and a component due to differences in the returns to these characteristics. This technique further assesses the contribution of each covariate to the mean gap. However, the Oaxaca-Blinder method has been criticised by various scholars. By focusing on the mean gap, the Oaxaca-Blinder technique ignores the possibility that the sources of the wage gap may differ along the distribution (Gardeazabal & Ugidos, 2004; del Rio et al., 2011). The standard decomposition technique is sensitive to the choice of a base group (Oaxaca & Ransom, 1999; Gardeazabal & Ugidos, 2004). Barsky et al. (2002) establishes that estimates of the Oaxaca-Blinder technique are consistent when the wage structure and composition effect of the conditional expectations are linear. As a result, a number of alternative decomposition techniques have been proposed; such as Nopo (2008); DiNardo et al. (1996), Machado & Mata (2005) and Firpo et al., (2009). Whilst Nopo (2008) is based on a matching technique, the other group of studies are based on the quantile regression technique.

The application of the quantile regression approaches to decomposing the gender wage gap has led to two scenarios – *sticky floors* and *glass ceilings*. Sticky floor refers to a situation where the gender wage gap is larger at lower percentiles of the distribution whilst glass ceiling describes a situation where the wage gap is significantly higher at the top of the wage distribution (Carrillo et al., 2014). Albrecht et al. (2003) finds evidence to support the glass ceiling hypothesis in Sweden whilst Arulampalam et al. (2007) finds that the gender wage gap is larger at the bottom of the wage distribution in selected European countries. Following these examples, a number of studies have sought to examine the existence of sticky floors and glass ceilings across countries and regions. However, evidence of the gender wage gap at different quantiles remains limited for Sub Saharan Africa. Nordman & Roubaud (2009) attributes this lack of evidence to the absence of individual labour force data in the region.

Chi and Li (2008) examines the gender wage gap along the earnings distribution in urban China from 1987 to 2004, and find gender differentials in earnings increased over the period. They further find larger gaps at the lower end of the distributions, thus, providing evidence of sticky floors in Urban China. Chi and Li (2008) attributes the gender wage gap to differences in returns to labour market endowments. Particularly, the sticky floor arises from low-paid females with low education in private production enterprises. Magnani & Zhu (2012) on the other hand finds the existence of larger gender wage gaps at the top of the wage distribution among migrant workers in China. The results from Magnani & Zhu (2012) confirm the dominance of discrimination against women to perpetuating the gender wage gap especially at the lower wage distribution. The key drivers of wage inequality among migrants in China are education and occupational characteristics (Magnani & Zhu, 2012). Their results further suggest gender based segregation of occupations to the persistence of wage gaps in China.

There seems to exist sectoral differences in the wage gap across distributions. In a study of Australia, Joo Kee (2006) finds that the wage gap is relatively constant across the distribution in the public sector. However, the private sector experiences a glass ceiling. This phenomenon was attributed to the adoption of different pay systems across sectors. The public sector pay structure is unified, thus

promoting convergence of wages. The wage gap in Australia results from returns to individual characteristics (Joo Kee, 2006). Mandel & Semyonou (2014) examines the sources of convergence between male-female earnings in the United States between 1970 and 2010 in the public and private sectors. Most of the reduction in the wage gap is explained by a reduction in differences in returns to covariates. Hours of work became the major source of earnings differentials, particularly in the private sector (Mandel & Semyonou, 2014). Declining gender segregation led to a reduction in private sector wage gaps whilst in the public sector segregation continues to entrench gender gaps (Mandel & Semyonou, 2014).

A number of studies have been conducted across Europe. These studies have produced differing results on the gender gaps along the wage distribution. Christofides et al. (2013) examine the gender wage gap in twenty-six European countries. They find that the gap along the distribution depends on country-specific institutions and policies. The wage gap in Europe was driven by returns effect. Arulampalam et al (2007), using a harmonised dataset of eleven European countries, adopts a methodology that estimates the component of the wage gap that is attributable to differences in the returns to individual characteristics. They find existence of significant country and sector differences in the estimated wage gap. These differences arise primarily from differences in national policies – particularly childcare provision and wage setting (Arulampalam et al., 2007). Christofides et al. (2013) and Arulampalam et al. (2007) highlight the importance of country specific studies due to heterogeneity of labour market institutions.

In a study on Italy, Mussida & Picchio (2014) find evidence of sticky floors at low levels of education and glass ceilings at higher educational attainment. Controlling for sample selection induced by unobservables, Mussida & Picchio (2014) finds that the estimated wage gap increases at the bottom of the distribution. The gender gap in Italy was consequently concluded to result from differences in the returns to characteristics. Using data from the Ukrainian Longitudinal Monitoring Survey, Pignatti (2012) estimates gender wage differentials in Ukraine from 2003 to 2007 and concludes that the gender wage gap remained constant over the period. This is attributed to a deterioration of women's labour market characteristics and a reduction in discrimination against women. An analysis by the sector of employment however reveals a reduction in wage gaps in the public sector whilst the gap increased in the private sector. Pignatti (2012) confirms the role of gender occupational segregation to wage inequalities. Gardeazabal & Ugidos (2005) applies a quantile based decomposition technique to the Spanish Survey of Wage Structures and finds evidence of a sticky floor. Their results indicate that at the bottom of wage distribution, discrimination accounts for a significant portion of gap whilst differences at the top of the distribution are accounted for by differences in labour market endowments. Another evidence for Spain is offered by de la Rica et al. (2007) who find larger gender gaps at the upper distribution of wages for highly educated workers as well as sticky floors among low educated workers. de la Rica et al. (2007) explain that the larger wage gaps at the bottom of the distribution is due to discrimination against low-educated women, who have lower labour force participation rates.

Across urban labour markets in twelve Latin American countries, Carrillo et al. (2014) find evidence of both glass ceilings and sticky floors. Generally, working women had higher human capital

endowments than men along the wage distribution, however there exist significant wage gaps favourable to men. The study indicates that this situation of high human capital attainment of women hides the true measure of discrimination against women in the studied countries. Carrillo et al (2014) establishes a relationship between the size of the returns effect, economic development and income inequality in the sampled countries. Differentials in wages at the bottom of the distribution were found to be high in least developed countries with high income inequality; whilst the size of the wage gap at the top of the distribution was larger for developed countries with low income inequality. Nopo (2008) employs a matching technique to decompose gender wage gaps in Peru. A major advantage of the matching decomposition is that it compares between groups of similar characteristics. Nopo (2008) finds that average gap is mainly driven by differences at the top percentile of the wage distribution. The source of gender differential differed by educational attainment – the unexplained component is larger and significant among highly educated workers.

Studies on Sub Saharan Africa have been limited. Hinks (2002) studies gender wage differentials across racial groups in South Africa. Across all groups, females earned lower compared to their male counterparts. However, the wage gaps are pronounced among white and coloured women compared to blacks. Hinks (2002) further finds that racial discrimination dominates gender discrimination in post-Apartheid South Africa. Nordman & Wolff (2008) finds that in Mauritius wage differentials may not necessarily be as a result of gender discrimination practices in the labour market, but occupational segregation. However, controlling for heterogeneity in firm characteristics, they find a reduction in the wage gap in both countries. Further, firm characteristics account for a larger portion of the explained component of the wage gap. This phenomenon may be attributed to gender-specific sorting of workers across firms at different wages. Nordman & Roubaud (2009) reassesses the gender gap in Madagascar, and finds gender wage gap is primarily driven by gender differences in educational attainment rather than labour market attachment. The use of potential labour market experience underestimates the gender wage gap across sectors. Nordman & Roubaud (2009) finds wage gaps favours women in public formal sector, while in private formal and informal sectors it favours men.

To date, the only study on the gender wage gap in Ghana is Baah-Boateng (2012). Using the fifth wave of the Ghana Living Standards Survey, Baah-Boateng (2012) decomposes the mean gender wage differentials. The findings show a large wage gap against women across all occupational groups and evidence to support sectoral differences in gender wage differentials, with larger gap in self-employment compared to paid employment. The study further shows that the gender wage gap emanates from discrimination against women. This study differs from Baah-Boateng (2012) in three significant ways. First, this study uses recent wave of the GLSS dataset, which enables the authors to assess the sources of the gender wage gap in Ghana at the end of the Millennium Development Goals (2015) and the start of the Sustainable Development Goals (2015-2030). Second, the paper assesses the determinants of wages in Ghana across sectors and localities at selected quantiles along the wage distribution, using an unconditional quantile approach. Third, the study adopts a quantile regression decomposition technique based on the re-centred influence functions proposed by Fortin et al., (2011). The use of the quantile decomposition technique enables us to examine the gender gap along the wage distribution beyond the mean – particularly examining the existence of sticky floors and glass

ceilings in the Ghanaian labour market. Additionally, the study examines the gender wage gaps within two sectors of employment (formal and informal). A within-sector analysis provides an understanding of variation in gender wage gaps across employment types, as well as an indication of the role of gender based occupational segregation.

The remaining sections of the paper is organised as follows; Section 2 discusses the quantile regression decomposition based on the re-centred influence function. Section 3 presents a description of the data sources, variables and summary statistics. Section 4 presents and discusses the results of the empirical analysis, while section 5 concludes the study with a summary of key findings and provides policy recommendations for reducing gender wage gaps in Ghana.

## 2. Methodology – Unconditional quantile regression decomposition technique

This section discusses the methodology employed to decompose the gender differentials in wages in Ghana. To identify the factors that contribute to the gender differences along the wage distribution, the study adopts the unconditional quantile regression based decomposition technique proposed by Fortin et al., (2011) based on the re-centered influence function. As stated earlier, the traditional Oaxaca-Blinder decomposition focuses on differences at the mean. Thus, the technique is unable to determine the differential effects of covariates and returns on the wage of males and females at different quantiles of the wage distribution.

Consider a Mincerian wage function of the form  $W_i^m = \beta_i^m X_i^m + \varepsilon_i^m$  for males and  $W_i^f = \beta_i^f X_i^f + \varepsilon_i^f$  for females; where  $W_i^m$  and  $W_i^f$  are the logarithms of monthly wages,  $\beta_i^m$  and  $\beta_i^f$  are vectors of estimated parameters and the vectors  $X_i^m$  and  $X_i^f$  contains covariates that determine monthly wages including human capital endowments such as education and labour market experience; for males and females respectively.  $\varepsilon_i^m$  and  $\varepsilon_i^f$  are random error terms.

The unconditional quantile estimator is based on the re-centered influence functions. For some distributional statistics,  $v(F)$ , the influence function;  $IF(W, v, F)$  represents the influence of a change in the distribution of the covariates on the distribution statistic. ( $F$  is a class of distribution functions, in this case, the kernel density function.) Firpo et al. (2009) consider the  $\theta$  th quantile,  $q_\theta$  as the distributional statistic  $v(F)$  and show that the unconditional expectation of the influence function is zero, that is  $E[IF(W, v, F)] = 0$ . Firpo et al. (2009) define the distributional re-centered influence function as  $RIF(W, v, F) = IF(W, v, F) + v(F)$ . For any statistic of interest, defined as the  $\theta$  th quantile, the RIF at the given  $q_\theta$  is computed as

$$RIF(W, q_\theta) = q_\theta + \frac{\theta - \phi(W \leq q_\theta)}{f_w(q_\theta)} \quad (1)$$

where  $q_\theta$  is the  $\theta$  th quantile of the unconditional distribution of the outcome variable  $W$ ;  $f_w(q_\theta)$  captures the probability density of  $W$  evaluated at the  $\theta$  th quantile estimated using the kernel density method;  $\phi(W \leq q_\theta)$  is an indicator function determining whether the variable outcome lies below the

$\theta$  th quantile or not. The expectation of the RIF at the  $\theta$  th quantile is equal to the  $\theta$  th quantile; that is  $E[RIF(W, v, F)] = v(F)$ .

If the specification of the unconditional quantile regression is linear, an ordinary least squares (OLS) regression of the following can be estimated

$$RIF(W, q_\theta) = \beta X + \varepsilon \quad (2)$$

The OLS estimates of the coefficients are consistent estimators of the unconditional partial effects;  $\partial(q_\theta) / \partial(X)$ . If the statistic of interest is the mean, then the estimation of the RIF regression becomes exactly the OLS.

Similar to the classical Oaxaca-Blinder decomposition technique, the quantile based approach proposed by Fortin et al., (2011) involves a two-stage procedure. First, for each estimator at the  $\theta$  th quantile, the raw differences between the distribution of males and females are decomposed into an endowment or covariate effect and a coefficient or returns effect based on the parameters estimated at the  $\theta$  th quantile of the wage distribution. In studies of the gender wage gap, the coefficient or returns effects are attributed to discrimination against women. The second procedure of the technique involves dividing the endowment and coefficient components into the contribution of each specific covariate.

The quantile decomposition technique is derived as follows:

Let  $W_\theta^j = \bar{X}^j \beta_\theta^j$  where  $W_\theta^j$  is the  $\theta$  th unconditional quantile of the log of monthly wages,  $\bar{X}^j$  represents the vector of average covariates and  $\beta_\theta^j$  is the estimate of the unconditional quantile partial effects.  $j = m; f$  for males and females, respectively.

Consider the counterfactual wage structure  $W_\theta^* = \bar{X}^m \beta_\theta^f$  which is the counterfactual quantile of the unconditional counterfactual wage distribution. The counterfactual wage structure represents the distribution of wages that would have prevailed for males if they are assigned females' characteristics. The gender wage gap at a given quantile is decomposed as

$$\begin{aligned} W_\theta^m - W_\theta^f &= [W_\theta^m - W_\theta^*] + [W_\theta^* - W_\theta^f] \\ &= [\beta_\theta^f (\bar{X}^m - \bar{X}^f)] + [\bar{X}^m (\beta_\theta^m - \beta_\theta^f)] \end{aligned} \quad (3)$$

The first term on the right-hand side of the equation (3) represents the endowment or covariate effect' which shows the contributions of differences in the distribution of individual characteristics to the wage gap at the unconditional quantile. The second term of the equation captures differences in the returns to characteristics, in this case discrimination against women at the  $\theta$  th unconditional quantile of the wage distribution. The endowment and returns effects can be decomposed further into the contribution of each covariate, specified in equation (4) as:

$$W_\theta^m - W_\theta^* = \sum_{k=1}^K [\beta_{k,\theta}^f (\bar{X}_k^m - \bar{X}_k^f)] \quad (4a)$$

$$W_{\theta}^* - W_{\theta}^f = \sum_{k=2}^K [\bar{X}_k^m (\beta_{k,\theta}^m - \beta_{k,\theta}^f)] \quad k = 1, \dots, K \quad (4b)$$

Where, equations 4a and 4b represent endowment and returns effects, respectively.

### 3. Data Sources, Variables and Descriptive Statistics

The data for the empirical analysis is sourced from the sixth round of the Ghana Living Standards Survey conducted in 2012/2013 by the Ghana Statistical Service with the support of the World Bank. The GLSS is a nationally representative survey that sampled 16,772 households in 1,200 enumeration areas and contains 72,372 household members. The dataset contains detailed information on a variety of topics including community level characteristics, the demographic characteristics of households, education, health, employment and time use, migration, agriculture, nonfarm business, remittances, expenditures, financial services and poverty status. Unlike the earlier five rounds of survey, the sixth round includes a comprehensive labour force module. For the purpose of our analysis, we focus on employed individuals who report a positive wage. This restriction is necessitated due to our specific objective of analysing wage gaps for which reason individuals in subsistence agriculture predominantly found in rural areas are excluded.

**Table 1: Descriptive statistics**

Variable	Total		Male		Female	
	Mean	Std Dev.	Means	Std Dev.	Mean	Std Dev.
Wages (GHC)†	493.77	1742.12	585.78	2082.65	382.91	1201.36
Age	37.46	11.50	37.61	11.61	37.28	11.37
Tenure	11.55	10.05	11.55	10.05	9.42	9.72
Hours of work	6.23	3.00	6.41	2.95	6.01	3.04
<b>Percentages</b>						
Marital status						
Union	69.24		56.68		43.32	
Single	30.76		50.08		49.92	
Location						
Urban	54.94		50.89		49.11	
Rural	45.06		59.24		40.76	
Sector of employment						
Formal sector	31.65		70.02		29.98	
Informal sector	68.35		47.53		52.47	
Educational status						
No Education	29.01		44.50		55.50	
Basic Education	44.93		56.22		43.78	
Secondary	12.53		64.36		36.64	
Vocational/Technical	6.00		53.11		46.89	
Tertiary	7.52		69.52		30.48	
Number of Observations	11,509		54.65		45.35	

†: Ghana Cedis. Source: Authors' own computation from the GLSS 6

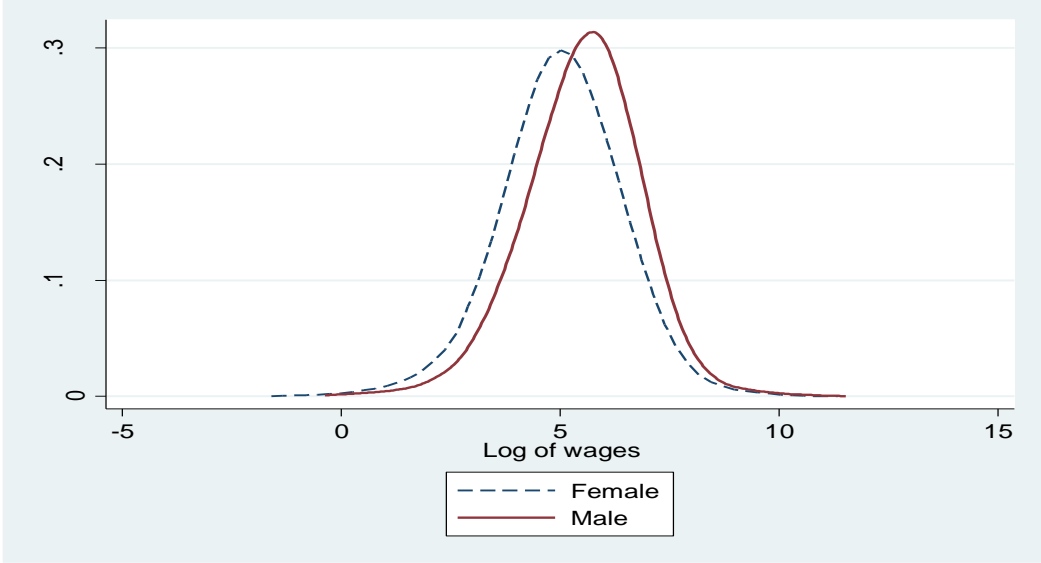
Table 1 presents descriptive statistics of variables used with further insight into the data through proportions presented. Overall, our sample consists of 11,509 labour force participant in active employment out of which 55 percent are males and 45 percent females. 55 percent of this sample are

urban dwellers with the remaining 45 percent residing in rural areas, this notwithstanding, 69 percent of sample work in the informal sector while 31 percent are in the formal sector. Based on the specific objective of the study to examine wage gaps in Ghana, we focus on individuals with positive earnings out of which workers are grouped into formal and informal sectors. Formal sector workers are consequently workers with explicit employment contract in a more institutionalised setting whereas informal sector workers are under diverse non-formal arrangements (family, verbal agreements, etc) consisting of own account workers and the self-employed with employees (entrepreneurial group).

Overall proportions presented in table 1 by educational attainment with further disaggregation by sex shows differences in educational attainment between males and females. While proportion of males increase along the educational ladder that of females generally decreases, except for vocational and technical education.

Average monthly earnings per month is 493.77 Ghana Cedis (GHC) equivalent to 259.13 US dollars<sup>1</sup> although wages are widely dispersed around the mean, males on average earn more than females despite the wide variation in wages among both males and females. Since the mean can be misleading measure of central tendency based the skewed nature of earnings, we further look at the median and kernel density distribution of wages for insight into the wage pattern. The median shows a consistent pattern with males earning a median wage of 265.64 GHC while females earn 154.43 GHC per month. Kernel density estimates of wages shown in figure 1 similarly indicates a consistent pattern with males earning relatively more than females although there is an overlap in the distribution for both males and females, the distribution for males is dominant at higher wages.

Figure 1: Kernel density distribution of wages by sex in Ghana



<sup>1</sup>At an annual average exchange rate of 1.95 GHC to 1 dollar for 2012



Figure 2: Kernel density distribution of wages by sex in urban Ghana

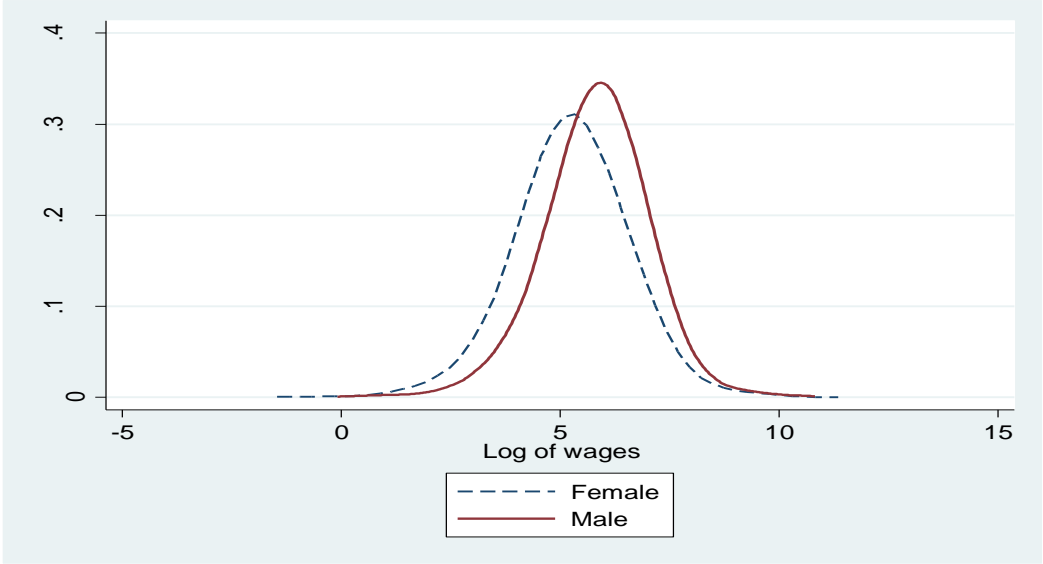
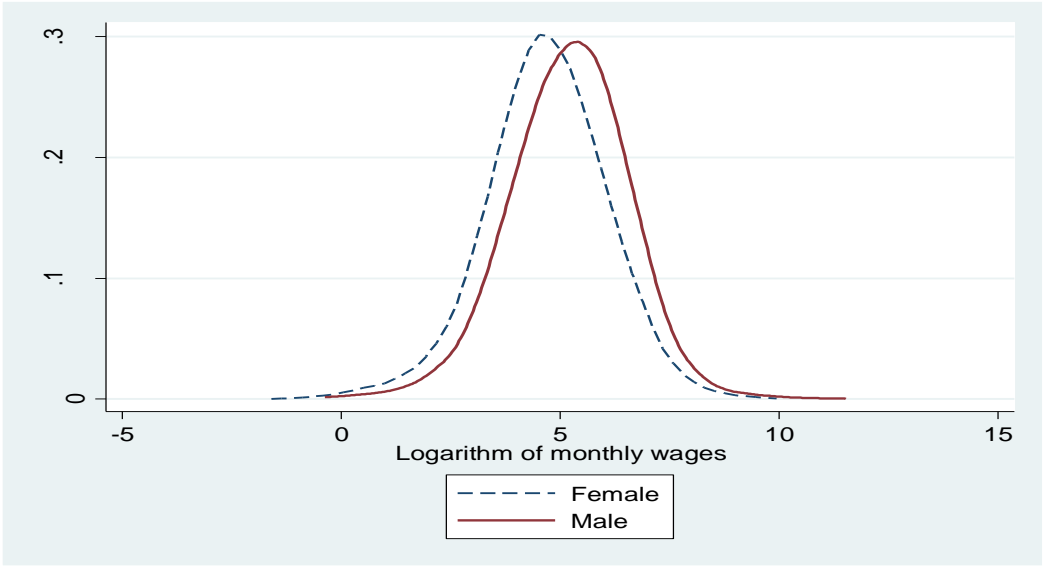


Figure 3: Kernel Density Distribution of Wages by Sex in Rural Ghana



Kernel distribution of wages disaggregated of wages by location presented in figure 2 and 3, sheds light on inherent differences in wages in the Ghanaian labour market. Based on the figures, wage differences are shown to exist in both urban and rural Ghana, although these differences are shown to be dominant in urban than in rural areas (yet to be proven statistically), at lower wage levels in rural Ghana, the gap between wages of both sexes is much wider in favour of females.

**4. Results and Discussions**

In this section, we present the results of the determinants of wages as well as the decomposition of gender wage gaps at the mean, 10<sup>th</sup>, 50<sup>th</sup> and 90<sup>th</sup> percentiles. Results are presented for the full sample of respondents, and further disaggregated by location (rural and urban) and the nature of employment (formal and informal). The disaggregation of the sample into different sectors enables us to examine

the extent of gender wage differentials within sectors and localities. This may be particularly important given the wide differences in the characteristics of employment and wages by location and formality.

#### **4.1 The determinants of wages in Ghana**

We examine the determinants of wages in Ghana by estimating RIF-OLS regressions for Mincerian wage functions at the mean and selected percentiles along the wage distribution. The coefficients obtained from the RIF-OLS regressions are explained as the marginal effects of the covariates on the corresponding unconditional quantile of logarithmic monthly wages. In estimating the determinants of wages, a gender dummy is included in the set of explanatory variables to capture the effect of gender on wages. Males are adopted as the reference category for the gender dummy. The coefficient of the female dummy indicates the extent to which gender gaps remain unexplained after controlling for individual characteristics. The results indicate that there exist significant gender effects on wages across locations and sectors.

##### **4.1.1 Determinants of wages for pooled data**

Table 2 shows the estimates obtained from the pooled sample. The results indicate that females in the labour market are at a disadvantage in terms of wages compared to their male counterparts. Females earn lower wages at the mean as well as the selected percentiles for the estimations. The effects of gender on wages are larger at the mean and lower percentiles of the wage distribution. The effects of gender along the wage distribution suggest that estimates based on the mean may be misleading and a quantile estimation is more appropriate.

The relationship between logarithmic monthly wages and age has been documented as an inverted U-shape (Garcia et al., 2001; Magnani and Zhu, 2012). The results confirm the existence of a curvilinear relationship between age and wages in Ghana. Labour market experience is an important covariate in determination of wages in Ghana. Nordman and Rouband (2009) argues that the use of potential experience rather than actual experience for estimating earnings functions may overestimate the returns of experience particularly to women since interrupted work spells are unaccounted for. Due to lack of a measure of actual labour market experience in the GLSS datasets and based on the high positive correlation between age and potential labour market experience, the addition of potential labour market as an explanatory variable is not inappropriate. We however expect a similar relationship between potential labour market experience and wages as Falco et al. (2011) reports.

With regards to the effect of job tenure on wages. Job tenure is defined as the number of years of employment at the current job. Similar to Mussida and Picchio (2014) in a study of Italy, we find that longer job tenure is associated with higher wages at the mean and median of the wage distribution. The positive relationship between job tenure and wages are confirmed by Joo Kee (2006) in Australia. Another important labour market characteristic is the number of working hours per week defined as effort. An increase in the weekly hours of work increase monthly wages, suggesting that the existence of substantial gender differences in time allocations may result in substantial wage gaps.

Table 2: Results of the determinants of wages – pooled data

VARIABLES	OLS	10 <sup>th</sup> percentile	50 <sup>th</sup> percentile	90 <sup>th</sup> percentile
Age	0.122*** (0.007)	0.165*** (0.019)	0.122*** (0.010)	0.063*** (0.013)
Age square	-0.138*** (0.009)	-0.192*** (0.023)	-0.140*** (0.012)	-0.067*** (0.016)
Married	0.160*** (0.025)	0.089 (0.057)	0.127*** (0.036)	0.125** (0.055)
Female	-0.378*** (0.024)	-0.301*** (0.050)	-0.461*** (0.035)	-0.258*** (0.049)
Urban area	0.330*** (0.025)	0.381*** (0.060)	0.341*** (0.036)	0.263*** (0.047)
Tenure	0.004*** (0.001)	0.004 (0.003)	0.006*** (0.002)	0.005 (0.003)
Hours of work	0.051*** (0.004)	0.077*** (0.009)	0.035*** (0.005)	0.046*** (0.008)
Informal sector employment	-0.173*** (0.026)	-0.317*** (0.049)	-0.243*** (0.040)	0.165*** (0.063)
Basic education	0.147*** (0.027)	0.190*** (0.064)	0.151*** (0.039)	-0.004 (0.049)
Secondary education	0.282*** (0.039)	0.340*** (0.082)	0.246*** (0.055)	0.247*** (0.081)
Other education	0.614*** (0.051)	0.405*** (0.080)	0.694*** (0.070)	0.464*** (0.123)
Tertiary education	1.085*** (0.042)	0.463*** (0.072)	0.986*** (0.064)	1.343*** (0.146)
Constant	2.276*** (0.131)	-0.096 (0.372)	2.598*** (0.192)	4.840*** (0.254)
Observations	11,509	11,509	11,509	11,509
R-squared	0.207	0.075	0.167	0.065

Bootstrap Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

We account for the effect of location, which is necessary given the existence of significant spatial differences in economic activities, infrastructure, standards of living as well as access and quality of basic services in Ghana. The estimates from the RIF-OLS regressions indicate that residence in urban areas has a positive effect on wages. These results are not surprising due to the wide variations in employment opportunities by location in Ghana. Employment in rural areas is dominated by agricultural and farm activities where wages are very low and irregular due to the subsistence nature of farm production. Further, a dummy variable that captures the nature of employment is included in the set of explanatory variables with formal sector employment as the reference category. The estimates show that informal sector employment has a negative effect on wages at the mean as well as the 10<sup>th</sup> and 50<sup>th</sup> quantiles. At the 90<sup>th</sup> quantile, informal sector employment leads to higher wages compared to employment in the formal sector. The effect of informal sector employment at the upper

tail of the wage distribution is particularly intriguing as it contradicts a generally held belief that informal sector is characterised by low earnings. However, the relationship established between informal sector employment and their earnings (wages) at the 90<sup>th</sup> percentile may be reflective of returns to entrepreneurial abilities and activities as it's expected that at the 90<sup>th</sup> percentile of wages, persons engaged in informal sector employment are more likely to be enterprise owners rather than employees.

Individual human capital endowments are measured as the highest level of formal education attained. Thus, separate educational dummies are included to estimate the returns to education attainment on wages in Ghana. The results reveal that the returns to educational attainment increases monotonically at the mean and selected percentiles. Thus, as the level of educational attainment increases, the returns to education on wages increase as well. However, the estimated coefficients of educational attainment differ along the wage distribution. For instance, the returns to basic and secondary education are higher at the 10<sup>th</sup> percentile. Equally, the highest return to vocational/technical educational attainment is observed at the median, whilst returns to tertiary education are highest at the 90<sup>th</sup> percentile.

#### **4.1.2 Determinants of wages within localities**

The results from the estimates of the determinants of wages from the pooled data reveal significant locational differences in wages in Ghana. To this end, we proceed to estimate separate RIF-OLS wage functions for rural and urban samples to examine the determinants of wages within localities. By disaggregating the sample by location, we explored whether the covariates of wage determination differ by location. Table 3 presents the estimates of the determinants of wages in rural and urban areas in Ghana.

Across localities, we find evidence of significant gender effects on wages. Females earn lower wages compared to their male counterparts after controlling for other individual characteristics. These results are indicative of gender wage differentials in both rural and urban labour markets in Ghana. The estimated coefficients are observed to be higher in urban areas except at the 90<sup>th</sup> percentile.

The inverted U-shaped relationship between age and wages is confirmed across locations in Ghana. We find that job tenure is a significant determinant of wages in urban labour markets but not in rural areas. The effect of job tenure on urban wages is similar to Messinis (2013). The significance of job tenure in urban labour markets perhaps reflects locational differences in employment types. We expect job tenure to be important in formal employment settings rather than agricultural employment which dominates in rural Ghana. The effect of working hours on wages across location is consistent with the relationships established from the pooled data. At the mean and lower percentiles (10<sup>th</sup> and 50<sup>th</sup>) employment in the informal sector has a negative relationship with wage across both labour markets. However, at the 90<sup>th</sup> percentile informal sector employment exerts a positive effect on wages in urban labour markets.

**Table 3: Determinants of wages within localities - urban and rural areas**

Variables	Urban areas				Rural areas			
	OLS	10 <sup>th</sup> quantile	50 <sup>th</sup> quantile	90 <sup>th</sup> quantile	OLS	10 <sup>th</sup> quantile	50 <sup>th</sup> quantile	90 <sup>th</sup> quantile
Age	0.134*** (0.010)	0.224*** (0.029)	0.156*** (0.014)	0.038** (0.018)	0.107*** (0.009)	0.158*** (0.029)	0.085*** (0.016)	0.092*** (0.016)
Age square	-0.155*** (0.012)	-0.273*** (0.034)	-0.182*** (0.017)	-0.038* (0.021)	-0.118*** (0.011)	-0.173*** (0.034)	-0.095*** (0.020)	-0.103*** (0.019)
Married	0.116*** (0.034)	0.013 (0.085)	0.077* (0.046)	0.095* (0.057)	0.210*** (0.040)	0.260** (0.107)	0.192*** (0.071)	0.082 (0.089)
Female	-0.389*** (0.030)	-0.448*** (0.073)	-0.484*** (0.049)	-0.273*** (0.056)	-0.370*** (0.035)	-0.333*** (0.090)	-0.424*** (0.061)	-0.326*** (0.070)
Tenure	0.014*** (0.002)	0.020*** (0.005)	0.017*** (0.003)	0.013*** (0.004)	-0.002 (0.002)	0.001 (0.004)	0.005 (0.003)	-0.004 (0.004)
Hours of work	0.051*** (0.005)	0.097*** (0.014)	0.026*** (0.007)	0.035*** (0.009)	0.049*** (0.006)	0.064*** (0.016)	0.043*** (0.010)	0.060*** (0.015)
Informal sector empl.	-0.054* (0.032)	-0.343*** (0.079)	-0.127** (0.050)	0.195*** (0.068)	-0.379*** (0.047)	-0.554*** (0.105)	-0.523*** (0.073)	0.071 (0.124)
Basic education	0.148*** (0.038)	0.241** (0.105)	0.139*** (0.054)	-0.063 (0.073)	0.131*** (0.037)	0.127 (0.095)	0.157** (0.062)	0.044 (0.067)
Secondary education	0.299*** (0.050)	0.447*** (0.119)	0.222*** (0.067)	0.106 (0.091)	0.251*** (0.066)	0.248* (0.138)	0.380*** (0.104)	0.104 (0.135)
Other education	0.613*** (0.062)	0.636*** (0.124)	0.598*** (0.089)	0.202 (0.127)	0.590*** (0.108)	0.175 (0.162)	0.698*** (0.123)	0.752*** (0.261)
Tertiary education	1.112*** (0.049)	0.719*** (0.115)	0.955*** (0.082)	0.978*** (0.139)	1.011*** (0.095)	0.241 (0.155)	1.075*** (0.119)	1.710*** (0.332)
Constant	2.264*** (0.181)	-0.855 (0.572)	2.259*** (0.260)	5.698*** (0.339)	2.758*** (0.174)	0.200 (0.576)	3.381*** (0.289)	4.403*** (0.321)
Observations	6,323	6,323	6,323	6,323	5,188	5,186	5,186	5,186
R-squared	0.211	0.083	0.174	0.052	0.140	0.054	0.098	0.054

Bootstrap standard errors in parentheses with 500 replications. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

The returns to educational attainment in the urban sector reveal a significant relationship at the mean, 10<sup>th</sup> percentile and median of the distribution. The returns to education increases as the level of highest educational attainment increases. At the upper tail of the wage distribution, we find returns to tertiary education significant in wage determination for urban areas. In rural labour markets, we observe a significant and increasing relationship between educational attainment and wages. At the 90<sup>th</sup> percentile of the rural wage distribution, returns to vocation/technical and tertiary education are significant in wage determination. At the median and upper tail of wages, the estimated returns to education are larger in rural than urban labour markets.

#### **4.1.3 Determinants of wages within sectors of employment – formal and informal**

In examining the determinants of wages within sectors, estimates based on the pooled sample reveal the existence of significant sectoral effects on wages in Ghana. Particularly, it is observed that informal sector employment has a negative effect on wages at the mean and lower percentiles but a positive effect on wages at the upper tail of the wage distribution. Examining sector-specific wage functions enables us to identify sectoral differences in the determinants of wages. Across sectors and the wage distribution, the estimates reveal significant gender wage effects, with results similar to those of the pooled data and localities in which females earn lower wages. Thus, gender wage differentials are evident within formal and informal sector employment. Results of both formal and informal sector employments are presented in Table 4.

The inverted U-shaped relationship between age and wages are confirmed within sectors of employment in Ghana. We observe significant positive relationships between job tenure and wages in the formal sector. These results confirm our expectation that job tenure may be important to wage determination in the formal employment where longevity of employment may be rewarded. The relationship between hours of work and wages remains positive in employment within formal and informal sectors. At the mean and along the wage distribution in the informal sector, the estimates indicate residing in an urban area has a positive effect on wages. However, the effect of urban residence on wages is significant at the mean and 10<sup>th</sup> quantile within formal sector employment. Two possible explanations could be ascribed to these findings. First, in the formal sector we do not expect wages to differ between rural and urban areas due to the presence of unified wage structures. Second, the positive effect of urban residence on wages in the informal sector may possibly be an indication of the presence of better opportunities to urban residents in the informal sector compared to limited opportunities within the rural agricultural economy. At the mean and median of wage distribution in the formal and informal sectors, we find that all levels of educational attainment have significant and positive effect on wages. At the lower end of the distribution, we observe secondary education as the only significant determinant of wages in the informal sector whilst secondary, tertiary and vocational/technical education are significant in the formal sector employment. At the 90<sup>th</sup> quantile, returns to education have significant effect on wage determination in the informal sector only when the individual has attained secondary or tertiary education. Conversely, in the formal sector acquiring vocational/technical and tertiary education leads to higher wages at the 90<sup>th</sup> quantile.

**Table 4: Determinants of wages within sectors of employment – informal and formal**

Variables	Informal sector employment				Formal sector employment			
	OLS	10 <sup>th</sup> quantile	50 <sup>th</sup> quantile	90 <sup>th</sup> quantile	OLS	10 <sup>th</sup> quantile	50 <sup>th</sup> quantile	90 <sup>th</sup> quantile
Age	0.123*** (0.009)	0.169*** (0.025)	0.111*** (0.012)	0.104*** (0.016)	0.108*** (0.012)	0.187*** (0.031)	0.099*** (0.017)	-0.010 (0.025)
Age square	-0.138*** (0.011)	-0.190*** (0.029)	-0.127*** (0.014)	-0.111*** (0.019)	-0.125*** (0.015)	-0.227*** (0.038)	-0.120*** (0.021)	0.020 (0.032)
Married	0.152*** (0.034)	0.135* (0.076)	0.085* (0.050)	0.123* (0.068)	0.145*** (0.036)	0.044 (0.094)	0.157** (0.066)	0.063 (0.082)
Female	-0.390*** (0.028)	-0.276*** (0.064)	-0.464*** (0.041)	-0.363*** (0.065)	-0.425*** (0.038)	-0.672*** (0.107)	-0.402*** (0.057)	-0.288*** (0.072)
Tenure	-0.000 (0.002)	0.003 (0.003)	0.003 (0.002)	-0.005 (0.004)	0.023*** (0.003)	0.023*** (0.005)	0.029*** (0.004)	0.016** (0.006)
Hours of work	0.060*** (0.005)	0.079*** (0.013)	0.054*** (0.007)	0.048*** (0.012)	0.030*** (0.006)	0.039** (0.015)	0.004 (0.009)	0.032** (0.013)
Urban Residence	0.407*** (0.031)	0.365*** (0.066)	0.496*** (0.041)	0.383*** (0.067)	0.084** (0.037)	0.188* (0.104)	-0.050 (0.052)	0.062 (0.074)
Basic education	0.137*** (0.029)	0.113 (0.069)	0.138*** (0.043)	-0.022 (0.064)	0.135*** (0.051)	0.340** (0.149)	0.183** (0.079)	-0.024 (0.088)
Secondary education	0.271*** (0.055)	0.273*** (0.105)	0.195** (0.078)	0.254* (0.132)	0.291*** (0.058)	0.205 (0.177)	0.347*** (0.094)	0.135 (0.095)
Other education	0.340*** (0.086)	0.197 (0.145)	0.457*** (0.108)	0.301 (0.216)	0.729*** (0.077)	0.827*** (0.162)	0.853*** (0.107)	0.364*** (0.134)
Tertiary education	0.763*** (0.117)	0.227 (0.200)	0.517*** (0.143)	1.309*** (0.391)	1.138*** (0.059)	0.889*** (0.150)	1.292*** (0.101)	0.951*** (0.128)
Constant	2.050*** (0.165)	-0.543 (0.571)	2.494*** (0.230)	4.210*** (0.296)	2.777*** (0.217)	0.026 (0.607)	3.294*** (0.317)	6.520*** (0.454)
Observations	7,866	7,866	7,866	7,866	3,643	3,643	3,643	3,643
R-squared	0.142	0.061	0.114	0.048	0.296	0.108	0.248	0.082

Bootstrap standard errors in parentheses with 500 replications. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 4.2 Decomposition analysis of gender wage gaps

This section presents the results of the Oaxaca-Blinder type decomposition of gender wage differentials based on the RIF-OLS estimations of wages in Ghana. Decomposition of gender wage gaps is undertaken at the mean, as well as the 10<sup>th</sup>, 50<sup>th</sup> and 90<sup>th</sup> percentiles. Decomposition along the wage distribution enables us to examine the presence of glass ceilings or sticky floors in the Ghanaian labour market. The decomposition analysis identifies the component of the wage gap attributable to gender differences in endowments and the part that is due to differences in returns on these endowments. Furthermore, the study analyses the contribution of each covariate to the overall gender wage gap. The estimated gaps reveal that gender-based differences in wages differ substantially at the mean and at various statistics along the wage distribution. These results highlight the shortcomings of wage gaps decomposed at the mean, as it does not reveal the full extent of gender wage differentials. Table 5 presents results for the pooled data decomposition analysis.

### 4.2.1 Decomposition of gender wage gaps from the pooled data

The results of the wage gap decomposition, using the pooled data, show that males earn significantly higher than females in Ghana. The decomposition analysis also reveals that the overall wage gaps emanate from differences in both endowments and returns to these endowments. However, differences in returns to endowments constitute the largest source of gender wage differential. This is an indication that for workers with similar characteristics, males receive higher returns to their endowments relative to females. Along the wage distribution, the largest gender gap is observed at the median. We find that the contribution of the returns effect to the overall wage gaps increases at higher percentiles of the distributions<sup>2</sup>. These results may be taken as indications that labour market discrimination against women are more pronounced at the upper tail of the wage distribution.

At the mean and 10<sup>th</sup> percentile, the results indicate that endowments in terms of employment in the informal sector and hours of work favour males in the labour market. Equally, differences in educational attainment, particularly basic, secondary and tertiary education contribute to the overall wage gap in favour of males. Additionally, male endowment of age is significant at the mean wage gap. However, residence in urban areas closes the wage gap attributable to differences in endowments. Also, returns to job tenure and working hours favour females at the mean and this further closes the gender wage gap, though males receive higher returns on age. At the 10<sup>th</sup> quantile, female returns to hours of work and informal sector employment contribute significantly to closing the estimated wage gap.

Differences in individual characteristics that contribute to the endowment effect of the overall wage gap at the median include hours of work, informal employment, urban residence and educational attainment. Higher male endowments of hours, informal sector employment and educational attainment contribute to the widening of the median wage gap. However, residence in urban areas contributes to closing the median wage gap emanating from endowment effects. We observe that female workers derive higher returns on job tenure, hours, informal sector employment and all forms of post-basic school attainment. Sources of the contributions to the wage gap at the upper tail of the distribution show that females benefit from endowments in informal sector employment and urban residence. However, male endowments of hours, basic and tertiary education widen the wage gap. In

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<sup>2</sup> See Table 9 for computations of the contributions of the source of gender wage gaps in Ghana.



terms of the returns effects, females derive higher returns to job tenure and effort as well as tertiary and other forms of educational attainment.

**Table 5: Gender – wage differential (pooled data)**

Difference	Mean		10th Quantile		50th Quantile		90th Quantile	
	0.514*** (0.023)		0.460*** (0.048)		0.548*** (0.028)		0.360*** (0.035)	
	Endowment	Return	Endowment	Return	Endowment	Return	Endowment	Return
Total	0.122*** (0.014)	0.392*** (0.024)	0.186*** (0.026)	0.274*** (0.051)	0.106*** (0.015)	0.442*** (0.029)	0.019 (0.017)	0.341*** (0.038)
Age	0.043* (0.026)	0.146 (0.497)	0.065 (0.043)	-0.659 (1.042)	0.035 (0.023)	0.291 (0.589)	0.02 (0.014)	1.106 (1.031)
Age square	-0.045* (0.024)	-0.177 (0.249)	-0.071* (0.042)	0.163 (0.521)	-0.037* (0.022)	-0.208 (0.295)	-0.014 (0.01)	-0.718 (0.526)
Married	0.021*** (0.004)	0.200*** (0.033)	0.028*** (0.006)	0.329*** (0.074)	0.017*** (0.004)	0.164*** (0.042)	0.004 (0.005)	-0.002 (0.293)
Tenure	0.005 (0.004)	-0.072*** (0.026)	0.009 (0.009)	0.036 (0.056)	0.002 (0.005)	-0.060* (0.032)	0.001 (0.006)	-0.128*** (0.042)
Hours of work	0.018*** (0.003)	-0.137*** (0.046)	0.025*** (0.006)	-0.205** (0.095)	0.010*** (0.003)	-0.181*** (0.054)	0.008** (0.003)	-0.168** (0.071)
Informal sector empl.	0.045*** (0.007)	-0.075* (0.044)	0.133*** (0.015)	-0.312*** (0.096)	0.054*** (0.008)	-0.161*** (0.055)	-0.040*** (0.01)	-0.018 (0.073)
Location	-0.022*** (0.004)	0.009 (0.032)	-0.044*** (0.008)	0.089 (0.060)	-0.028*** (0.004)	-0.014 (0.034)	-0.016*** (0.004)	-0.014 (0.045)
Basic education	0.006*** (0.002)	0.001 (0.023)	0.008** (0.003)	0.040 (0.048)	0.003** (0.002)	-0.019 (0.027)	-0.001 (0.002)	-0.038 (0.036)
Secondary education	0.012*** (0.003)	-0.010 (0.008)	0.013** (0.006)	-0.009 (0.016)	0.008*** (0.003)	-0.018* (0.009)	0.006* (0.004)	-0.017 (0.013)
Other education	-0.003 (0.003)	-0.005 (0.006)	-0.001 (0.002)	-0.012 (0.013)	-0.002 (0.003)	-0.018** (0.008)	-0.001 (0.001)	-0.039*** (0.01)
Tertiary education	0.043*** (0.005)	-0.008 (0.005)	0.022*** (0.006)	-0.005 (0.011)	0.045*** (0.006)	-0.015** (0.006)	0.053*** (0.007)	-0.026*** (0.009)
Constant	0.519** (0.245)		0.819 (0.514)		0.682** (0.291)		0.573 (0.385)	
Observations	11,509		11,509		11,509		11,509	

Standard errors in parentheses. \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

#### 4.2.2 Decomposition of gender wage gaps within localities

We proceed to decompose gender wage differentials within urban and rural labour markets respectively. The results of the detailed decomposition analysis are presented in Tables 6 and 7 for urban and rural areas, respectively. The estimated differentials show that at the lower tail of wage distributions within localities, male-female wage disparities are larger and converge at the upper tail of the distribution. Thus, the results indicate the presence of *sticky floors* against females in both urban and rural labour markets. Across localised labour markets, we find that returns effects dominate the sources of gender wage differentials. Thus, labour market discrimination is such that females receive lower returns on similar characteristics as their male counterparts, and this is evident in both rural and urban labour markets. The evidence of persistent wage gaps in rural areas where agricultural activities dominate employment may be a reflection of the gendered nature of agricultural production. Generally, males are involved in the cultivation of cash crops or as paid farm labour, with cultivation of cash crops receiving substantial government support through subsidised inputs as well as guaranteed markets and prices. Women, on the other hand, are predominantly engaged in food crop production, which is mainly meant for household consumption.

In urban labour markets, gender differences in endowments of job tenure and hours as well as secondary and tertiary education contribute positively to the wage gap at the mean. In terms of the returns effect, females derive higher returns on tenure and hours, whilst males derive higher returns on age. A look at rural labour markets indicates that male endowments of age, hours, informal sector employment and educational attainment contribute to the wage gap resulting from differences in endowments. However, females derive higher returns on informal sector employment and secondary education in rural labour markets.

At the lower end of the wage distribution, gender gaps are the largest, and the decomposition analysis reveals gender differences in hours, informal sector employment, secondary and tertiary education are significant contributors to the endowment effect in urban areas and favours males. However, returns to informal sector employment favours females at the 10<sup>th</sup> percentile, whilst males derive higher returns on age. Decomposition at the 10<sup>th</sup> percentile in rural areas indicates that endowment effect of the gender wage gap arises from hours, informal sector employment and basic education, with only returns on hours favouring females.

The contribution of endowment effects to the median wage gap is significantly due to differences in hours, job tenure as well as secondary and tertiary education in urban areas. These endowments favour males; an indication that they possess higher levels of these characteristics than females. In the case of rural areas, contribution to endowment differences at the median emanates from higher male endowments of effort, informal sector employment and post basic-school educational attainment. The returns to characteristics at the median of urban wage distribution show that females receive higher returns to their endowments of job tenure and hours; whilst the returns to age contribute to widening the urban median wage gap. In rural labour markets however, we observe that females derive higher returns to hours, informal sector employment and secondary education. The returns derived by females contribute significantly to closing the median rural wage gap.

**Table 6: Gender - wage differential in urban areas**

	Mean		10th Quantile		50th Quantile		90th Quantile	
Difference	0.563*** (0.030)		0.678*** (0.056)		0.644*** (0.033)		0.325*** (0.046)	
	Endowment	Return	Endowment	Return	Endowment	Return	Endowment	Return
Total	0.137*** (0.018)	0.426*** (0.031)	0.274*** (0.034)	0.404*** (0.061)	0.127*** (0.019)	0.517*** (0.035)	0.051** (0.023)	0.274*** (0.050)
Age	0.137*** (0.018)	0.426*** (0.031)	0.047 (0.083)	3.898*** (1.310)	0.019 (0.034)	0.476 (0.749)	0.009 (0.016)	0.962 (1.084)
Age square	0.137*** (0.018)	0.426*** (0.031)	-0.041 (0.079)	-1.889*** (0.647)	-0.017 (0.032)	-0.269 (0.371)	-0.006 (0.013)	-0.431 (0.537)
Married	0.137*** (0.018)	0.426*** (0.031)	0.018*** (0.007)	0.296*** (0.083)	0.014*** (0.004)	0.148*** (0.047)	0.005 (0.004)	-0.003 (0.068)
Tenure	0.137*** (0.018)	0.426*** (0.031)	0.008 (0.009)	-0.095 (0.063)	0.012** (0.005)	-0.102*** (0.036)	0.003 (0.007)	-0.173*** (0.052)
Hours of work	0.137*** (0.018)	0.426*** (0.031)	0.042*** (0.009)	-0.021 (0.122)	0.012*** (0.004)	-0.145** (0.070)	0.012** (0.006)	-0.194* (0.101)
Informal Sector Employment	0.137*** (0.018)	0.426*** (0.031)	0.129*** (0.023)	-0.319*** (0.093)	0.002 (0.012)	0.028 (0.054)	-0.068*** (0.017)	0.055 (0.078)
Basic education	0.137*** (0.018)	0.426*** (0.031)	-0.003 (0.004)	0.030 (0.067)	-0.002 (0.002)	0.023 (0.038)	-0.001 (0.001)	0.062 (0.055)
Secondary education	0.137*** (0.018)	0.426*** (0.031)	0.017** (0.008)	-0.034 (0.024)	0.013*** (0.005)	-0.003 (0.014)	0.014** (0.006)	0.000 (0.020)
Other form of education	0.137*** (0.018)	0.426*** (0.031)	-0.003 (0.003)	-0.018 (0.020)	-0.004 (0.004)	-0.019* (0.011)	-0.002 (0.002)	-0.031* (0.016)
Tertiary education	0.137*** (0.018)	0.426*** (0.031)	0.060*** (0.013)	0.003 (0.017)	0.079*** (0.010)	-0.010 (0.010)	0.086*** (0.012)	-0.001 (0.014)
Constant	0.264 (0.338)		-1.447** (0.658)		0.389 (0.377)		0.028 (0.545)	
Observations	6,323		6,323		6,323		6,323	

Standard errors in parentheses. \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.

**Table 7: Gender - wage differential in rural areas**

Difference	Mean		10th Quantile		50th Quantile		90th Quantile	
	0.533*** (0.036)		0.556*** (0.072)		0.532*** (0.042)		0.423*** (0.053)	
	Endowment	Return	Endowment	Return	Endowment	Return	Endowment	Return
Total	0.170*** (0.019)	0.363*** (0.037)	0.174*** (0.028)	0.382*** (0.074)	0.179*** (0.021)	0.353*** (0.045)	0.034* (0.020)	0.389*** (0.055)
Age	0.067* (0.036)	-0.195 (0.735)	0.060 (0.044)	-2.180 (1.503)	0.038 (0.028)	0.295 (0.878)	0.031 (0.024)	-0.003 (1.106)
Age square	-0.067** (0.034)	-0.067 (0.377)	-0.063 (0.041)	0.879 (0.769)	-0.041 (0.027)	-0.359 (0.446)	-0.035 (0.024)	-0.143 (0.565)
Married	0.025*** (0.006)	0.219*** (0.058)	0.022*** (0.008)	0.217* (0.121)	0.015*** (0.005)	0.201*** (0.073)	0.011** (0.005)	0.018 (0.090)
Tenure	0.000 (0.006)	0.030** (0.044)	0.013 (0.010)	0.056 (0.093)	0.005 (0.007)	0.080 (0.055)	-0.001 (0.008)	-0.006 (0.069)
Hours of work	0.027*** (0.006)	-0.094 (0.062)	0.015** (0.007)	-0.416*** (0.128)	0.016*** (0.006)	-0.176** (0.075)	0.017*** (0.006)	-0.046 (0.094)
Informal Sector	0.073*** (0.010)	-0.230** (0.103)	0.093*** (0.016)	-0.187 (0.211)	0.084*** (0.012)	-0.518*** (0.118)	-0.014 (0.011)	0.027 (0.154)
Basic education	0.010* (0.005)	-0.007 (0.032)	0.022*** (0.008)	0.028 (0.063)	0.013** (0.005)	0.006 (0.037)	-0.005 (0.005)	-0.074 (0.046)
Secondary education	0.010** (0.004)	-0.016** (0.008)	0.004 (0.007)	-0.014 (0.017)	0.017*** (0.006)	-0.017* (0.010)	0.003 (0.006)	-0.023* (0.013)
Other form of education	0.007** (0.004)	0.000 (0.005)	0.002 (0.002)	0.001 (0.013)	0.007* (0.004)	-0.001 (0.007)	0.004 (0.003)	-0.026*** (0.010)
Tertiary education	0.018*** (0.005)	-0.005 (0.004)	0.006 (0.005)	-0.006 (0.009)	0.024*** (0.006)	-0.005 (0.005)	0.023*** (0.006)	-0.042*** (0.010)
Constant	0.727** (0.361)		2.003*** (0.747)		0.848* (0.434)		0.705 (0.549)	
Observations	5,186		5,186		5,186		5,186	

Standard errors in parentheses. \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.10

At the upper tail of the distributions, the gender wage gaps are smallest in both urban and rural areas, with the decomposition analysis indicating male endowments of hours as well as secondary and tertiary educational attainment widens the gap. However, employment of females in the informal sector narrows the gap. We also find that in rural areas, higher male endowments of hours and tertiary educational attainment contribute positively to the portion of the gender wage gap resulting from differences in labour market endowments. The returns effect to gender wage differentials at the upper tail arises from higher female returns to job tenure, hours and tertiary education in urban areas. The wage gap attributable to differences in returns to characteristics show that returns to tertiary and vocational/technical education favours females in rural areas.

#### **4.2.3 Decomposition of gender wage gaps with sectors of employment**

Similar to the decomposition analysis of gender wage within localities, we turn our attention to examining sectoral gender wage gaps. Sector-specific decomposition of gender wage differentials is important for a developing country like Ghana given the wide disparities in wage settings practices and institutions between the sectors. For example, informal sector employment is characterised by self-employment and the absence of job contacts, labour unions as well as institutionalized wage bargaining principles. Tables 8 and 9 provide detailed results of the decomposition analysis.

The quantile decompositions in the formal sector reveal the existence of large gender gaps at lower quantiles of the wage distribution. Thus, there exist *sticky floors* in formal sector employment in Ghana. The convergence of male-female wages at the upper tail of the distribution may be attributed to the presence of formalised wage structures that seek to achieve equity and fairness in wage administration. However, in the informal sector we find that gender wage gap is largest at the median. We further find that female endowments in the informal sector contribute to narrowing wage gaps in the sector. These results indicate that females possess higher endowments than males in the informal sector. Equally, these results may be interpreted as evidence of gender-based occupational segregation which force females with high endowments to be employed in the low-paying informal sector. Across the wage distributions within sectors, discrimination against women (measured by the returns effect) dominates the wage gap.

The endowment effect at the mean wage gap in the formal sector is attributable to higher male endowments of age, job tenure, hours and basic education. However, female endowment of vocational/technical education contributes to narrowing the effect of differences in endowments to the mean wage gap. In terms of returns, females derive higher returns on their possessions of job tenure and post-basic school educational attainment. The mean gender wage gap in the informal sector attributable to differences in endowments shows male have higher levels of age, hours, secondary education and tertiary education. Females on the other hand possess higher endowments of urban residence. The contributions to the returns effect at the mean of informal sector wages reveal that males derive higher returns to age, urban residence and tertiary education; whilst females' returns to job tenure are significantly higher at the mean.

**Table 8: Gender - wage differential in formal sector employment**

Difference	Mean		10th Quantile		50th Quantile		90th Quantile	
	Endowment	Return	Endowment	Return	Endowment	Return	Endowment	Return
	0.469***	(0.043)	0.726***	(0.077)	0.498***	(0.052)	0.235***	(0.054)
Total	0.053**	0.415***	0.152***	0.574***	0.052**	0.446***	0.030	0.205***
	(0.021)	(0.038)	(0.032)	(0.077)	(0.023)	(0.046)	(0.023)	(0.053)
Age	0.176***	0.509	0.427***	1.215	0.178***	0.234	0.023	0.955
	(0.046)	(0.783)	(0.106)	(1.654)	(0.047)	(0.956)	(0.036)	(1.131)
Age square	-0.135***	-0.286	-0.328***	-0.479	-0.133***	-0.074	0.000	-0.359
	(0.042)	(0.386)	(0.095)	(0.812)	(0.041)	(0.471)	(0.028)	(0.554)
Married	0.026***	0.028	0.016	0.051	0.022***	-0.024	0.015	-0.013
	(0.007)	(0.040)	(0.013)	(0.089)	(0.008)	(0.051)	(0.010)	(0.061)
Tenure	0.022***	-0.169***	0.024**	-0.126	0.023***	-0.205***	0.005	-0.250***
	(0.007)	(0.040)	(0.010)	(0.084)	(0.007)	(0.049)	(0.006)	(0.057)
Hours of work	0.011**	-0.136	0.032***	-0.263	0.007	0.004	0.017**	0.018
	(0.004)	(0.091)	(0.011)	(0.182)	(0.005)	(0.106)	(0.007)	(0.124)
Urban area	-0.004	0.014	-0.017**	0.138	-0.001	0.012	-0.011*	-0.043
	(0.003)	(0.080)	(0.008)	(0.141)	(0.004)	(0.082)	(0.006)	(0.096)
Basic education	0.019**	-0.027	0.039**	0.130*	0.004	-0.076**	-0.007	-0.003
	(0.009)	(0.032)	(0.015)	(0.066)	(0.008)	(0.039)	(0.010)	(0.045)
Secondary education	-0.003	-0.082***	-0.005	-0.062	-0.003	-0.124***	-0.002	-0.030
	(0.003)	(0.027)	(0.004)	(0.054)	(0.003)	(0.032)	(0.002)	(0.037)
Vocational/technical	-0.060***	-0.051**	-0.042***	-0.050	-0.053***	-0.156***	-0.018	-0.060*
	(0.011)	(0.026)	(0.016)	(0.052)	(0.011)	(0.031)	(0.011)	(0.036)
Tertiary education	0.002	-0.092***	0.006	0.014	0.008	-0.179***	0.008	-0.017
	(0.013)	(0.025)	(0.011)	(0.052)	(0.014)	(0.032)	(0.014)	(0.036)
Constant	0.706*	(0.412)	0.007	(0.872)	1.035**	(0.504)	0.007	(0.596)
Observations	3,643		3,643		3,643		3,643	

Standard errors in parentheses. \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

**Table 9: Gender - wage differential in informal sector employment**

Difference	Mean		10th Quantile		50th Quantile		90th Quantile	
	Endowment	Return	Endowment	Return	Endowment	Return	Endowment	Return
	0.390***	(0.029)	0.322***	(0.056)	0.398***	(0.034)	0.335***	(0.049)
Total	-0.035**	0.426***	-0.009	0.331***	-0.056***	0.454***	-0.045**	0.380***
	(0.018)	(0.031)	(0.028)	(0.060)	(0.019)	(0.036)	(0.022)	(0.053)
Age	0.097***	0.178	0.080*	-2.066*	0.040*	-0.219	0.046*	0.553
	(0.034)	(0.631)	(0.046)	(1.229)	(0.023)	(0.736)	(0.027)	(1.103)
Age square	-0.114***	-0.140	-0.106**	0.896	-0.054**	-0.036	-0.060**	-0.424
	(0.033)	(0.316)	(0.044)	(0.619)	(0.023)	(0.370)	(0.027)	(0.556)
Married	0.035***	0.357***	0.034***	0.412***	0.022***	0.278***	0.012**	0.145*
	(0.006)	(0.048)	(0.008)	(0.096)	(0.005)	(0.058)	(0.006)	(0.085)
Tenure	-0.013	-0.072**	0.028	0.107	-0.005	-0.023	-0.019	-0.065
	(0.009)	(0.033)	(0.017)	(0.068)	(0.011)	(0.041)	(0.015)	(0.061)
Hours of work	0.008**	-0.107*	0.005	-0.223**	0.004	-0.119*	0.002	-0.291***
	(0.004)	(0.056)	(0.004)	(0.110)	(0.003)	(0.066)	(0.002)	(0.098)
Urban area	-0.076***	0.083**	-0.075***	0.019	-0.087***	0.106***	-0.046***	-0.009
	(0.009)	(0.036)	(0.014)	(0.064)	(0.010)	(0.039)	(0.012)	(0.058)
Basic education	0.006**	-0.004	0.009**	0.043	0.006**	0.007	0.000	-0.028
	(0.003)	(0.030)	(0.004)	(0.058)	(0.003)	(0.035)	(0.003)	(0.052)
Secondary education	0.012***	-0.004	0.009	-0.001	0.010**	-0.004	0.007	-0.012
	(0.004)	(0.007)	(0.007)	(0.015)	(0.004)	(0.009)	(0.006)	(0.013)
Other form of education	0.001	0.000	0.001	-0.005	0.002	0.001	0.000	-0.016*
	(0.001)	(0.005)	(0.001)	(0.010)	(0.002)	(0.006)	(0.001)	(0.009)
Tertiary education	0.009***	0.007**	0.006*	0.001	0.007***	0.002	0.013***	0.005
	(0.003)	(0.003)	(0.003)	(0.006)	(0.003)	(0.003)	(0.004)	(0.005)
Constant	0.126	(0.303)	1.149*	(0.588)	0.459	(0.352)	0.521	(0.529)
Observations	7,866		7,866		7,866		7,866	

Standard errors in parentheses. \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.10



We turn our attention to the gender wage gaps at the lower quantile in formal and informal labour markets. As stated earlier, the largest gender gap in the formal sector is found at the 10<sup>th</sup> percentile. The detailed decomposition analysis reveals that in terms of endowments, males possess higher levels of age, job tenure, hours and basic education whilst females have higher endowments of urban residence and other forms of educational attainment. The returns effect arises from higher female rewards for job tenure and male returns to basic educational attainment. On the contrary, the estimated wage gap is smallest at the 10<sup>th</sup> quantile of the informal wage distribution. The significant contributions to the endowments effect arises from higher male endowment of age, job tenure, basic as well as tertiary educational attainment. Female endowments of urban residence contribute to closing the wage gap at the 10<sup>th</sup> quantile in the informal sector. Females receive higher returns to job tenure compared to males at the lower tail of wages in rural Ghana.

The median wage gap in the formal sector attributable to gender differences in endowments arises from higher male endowments of age and job tenure. Endowments of other educational attainment favours females and contribute to closing the effect of endowments to the wage gap. Females receive significantly higher returns to job tenure and educational attainment than in the formal sector. At the median, males in the informal sector possess significantly higher endowments of age and educational attainment except other forms of education. However, females' urban residence contributes negatively to the median wage gap due to endowments effect. The returns effect on the other hand shows that males receive higher returns on urban residence.

At the upper tail of wage distribution in the formal sector, male advantage in endowments of effort contributes significantly to the endowment effect whilst female receive higher returns on job tenure. The evidence from the informal sector however shows higher female endowment in urban residence as well as returns to effort and other educational attainment contribute to narrowing the upper-tail wage gap. Male endowments of tertiary education in the informal sector widen the wage gap at the 90<sup>th</sup> percentile. Table 9 summarises the contributions of endowment and returns effects to gender wage gaps in Ghana.

**Table 10: Contribution of the sources of gender - wage differentials in Ghana (percent)**

Contributions	Mean		10th Quantile		50th Quantile		90th Quantile	
	EE	RE	EE	RE	EE	RE	EE	RE
<b>Pooled data</b>	23.7	76.3	40.4	59.6	19.3	80.7	5.3	94.7
<b>Sector of employment</b>								
Formal	11.3	88.7	20.9	79.1	10.4	89.6	12.8	87.2
Informal	-9.0	109.0	-2.8	102.8	-14.1	114.1	-13.4	113.4
<b>Location</b>								
Urban areas	24.3	75.7	40.4	59.6	19.7	80.3	15.7	84.3
Rural areas	31.9	68.1	31.3	68.7	30.3	69.7	8.0	92.0

Source: Author's own computation from Tables 4-8. Notes - EE: endowment effects; RE: return effects

## 5. Conclusions and policy recommendations

Reducing gender based inequalities as well as improving the economic conditions of women have been pivotal themes in global development initiatives in recent years. In the labour market, such gender based outcomes have manifested in gender segregation of occupations and gender wage gaps. Further, social and cultural beliefs and practices have contributed to the persistence of gender based labour market outcomes. For example, the maternal responsibility of women in traditional societies confines women to employment in sectors that enables them to combine market production with household chores.

In this paper, we provide evidence of gender-based labour market outcomes by estimating gender wage gaps in the Ghanaian labour market. Using the recent round of the Ghana Living Standards Survey (GLSS 6), we assess the determinants of wages at the mean and selected quantiles of the wage distribution. The study employs the unconditional quantile regression technique based on the re-centred influence functions. Empirical models are estimated for the pooled sample of respondents and further decomposed by location (rural and urban) and sector of employment (formal and informal). We find evidence of significant gender effects on wages in Ghana. Females earn lower compared to their male counterparts along the distribution of wages and across sectors and localities.

We proceed to decompose the gender wage gaps into a component arising from differences in characteristics and a part owing to differences in returns to these characteristics (discrimination). The decomposition analysis further assesses the contribution of each covariate to the gender wage gap. We find evidence of sticky floors in rural, urban and formal sector employment in Ghana. Thus in these sectors, gender wage gaps are larger at the lower quantile of the wage distributions. The results suggest that gender wage gaps decomposed at the mean may be misleading as such mean decompositions do not reveal changes in gender gaps along the distribution of wages. We find that the differences in returns to endowments account for the prevalence of gender wage gaps in Ghana, an indication of discrimination against women leading to gender inequalities in the labour market.

A number of policy recommendations may be drawn from the findings of this paper. First, the presence of sticky floors is indicative that females at the lower end of the wage distribution experience higher wage differentials relative to their counterparts at the upper tail of the distribution. This is largely caused by lower endowment in education on the part of females leading to low wages. As a policy recommendation, the promotion of higher education among females will go a long way to reduce gender wage gaps in the Ghanaian labour market. That is, in spite of recent improvements in gender parity in primary and secondary education, there exist substantial gender gaps in technical, vocational and professional education and tertiary education. Specifically, government attention should be focused on reducing gender disparities in post-secondary higher education in order to reduce gender based differences in labour market outcomes.

Second, a substantial portion of the overall gender wage gap is unaccounted for by labour market characteristics nor endowments of labour. This is attributable to labour market discrimination in Ghana. In this regard, government must implement and enforce labour market regulations and laws protecting the rights of females in the labour market. Third, males have greater endowment in terms of the number of hours of work, however, females have greater returns on hours worked. We therefore recommend policies that will increase female participation rate in the labour market, such as providing females with greater incentives in order to reduce time spent on household activities.

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