The current issue and full text archive of this journal is available on Emerald Insight at:
https://www.emerald.com/insight/0306-8293.htm

Gender differences in extractive activities: evidence from Ghana

William Baah-Boateng and Eric Kofi Twum
University of Ghana Legon and International Institute for Advanced Studies (IIAS), Accra, Ghana, and
Emmanuel Kwaku Akyeampong
Harvard University, Cambridge, Massachusetts, USA and International Institute for Advanced Studies (IIAS), Accra, Ghana

Received 27 May 2021
Revised 8 August 2021
18 October 2021
Accepted 14 February 2022

Abstract

Purpose – The study seeks to examine women's participation in Ghana's extractive growth-driven economy and the quality of this participation in terms of employment status and earnings relative to their male counterparts and establish whether these differences constitute discrimination for policy attention.

Design/methodology/approach – The study adopts both quantitative and qualitative methodological approaches to assess the extent of gender inequality in employment and earnings in the Ghanaian extractive sector and the sources of these differences. It computes three segregation indices to ascertain the degree of unequal gender distribution of employment based on nationally representative labour force and living standards surveys followed by quantitative analysis of gender earnings differences using Oaxaca–Blinder decomposition technique. This is complemented by the results of Focus Group Discussion to go behind the numbers and examine the sources of the employment and earnings differences between men and women in extractive activities.

Findings – The authors observe lower participation of women in the extractive sector, with a considerable degree of gender segregation and existence of gender earnings gap in favour of men due to differences in observable characteristics such as age, education and occupational skills. There is also evidence of existence of discrimination against women and indication of barriers that impede women's involvement in high-earning extractive activities in Ghana. The study suggests measures to remove these barriers and improve women's education particularly in science, technology, engineering and mathematics to address the gender imbalance in extractive activities in Ghana.

Social implications – Women's low involvement in the strong extractive growth-driven process has implication for undermining the effort of empowering women economically.

Originality/value – The study draws argument from the literature and adopts a combination of quantitative and qualitative techniques to establish gender in terms of employment distribution and earnings in favour of males in the Ghanaian extractive sector. This has the effect of undermining women's economic empowerment and exacerbating gender inequality in the country.

Keywords Gender, Discrimination, Earnings, Empowerment, Segregation

Paper type Research paper

1. Introduction

After recovering from economic recession in 1984 on account of the Bretton Woods sponsored economic reform initiated at that time, Ghana's growth has been remarkably strong, averaging 5.7% between 1984 and 2019. Essentially, behind the country's successful growth story has been a remarkable performance of the extractive sector, which comprises mining, quarrying and oil extraction. Indeed, the highest economic growth of 14% ever recorded in the country's history was largely aided by the commencement of commercial oil production in 2011. The extractive sector holds the highest annual average growth rate of 25.6% over 2007–2019 and constitutes the leading foreign exchange earner, accounting for about 67.0% [1] (36.4% from gold and 30.6% from oil) of total export earnings in 2018. The sector also

The authors acknowledge the funding support, under the Growth and Economic Opportunities for Women (GrOW) programme, from the UK Government's Department for International Development, the William and FloraHewlett Foundation, and the International Development Research Center (IDRC), Canada.

0306-8293
DOI 10.1108/IJSE-05-2021-0283

contributes significantly to national revenue, accounting for 16.9% of total revenue in 2019. Even though the sector's contribution to direct employment is quite minimal due to the capital intensity of extractive activities, it is the sector with the second highest average basic hourly earnings in 2015 and provides indirect jobs through upstream and downstream extractive activities. It is estimated that the extractive sector provides direct employment for about 173,000 [2] Ghanaians, representing 1.5% of total employment and about half a million jobs in upstream and downstream activities.

The concern however has been the inclusiveness of the economic benefit from extractive activities particularly along gender lines. As noted by Kotsadam and Tolonen (2016), the discovery of natural resources across Africa brings hope to millions of poor people but there are concerns about possible increase in gender inequality in economic opportunities with mining. Essentially, inclusiveness of growth depends largely on the participation of all citizens in the growth process. The extractive sector is dominated by men who represent about 82% of total employment in 2017 with women accounting for the remaining 18%, an improvement over the 15% women composition in extractive activities in 2015 [3]. This has implication for undermining women's economic empowerment (WEE) in the sector and the entire economy considering its importance in the national economy. Thus, even though economic growth can be seen as a key to enhance WEE, it depends on the source of the growth and the extent of women's involvement in the growth process. Indeed, lack of gender inclusiveness in the growth and development process breeds inequality and perpetuates male dominance in the economic space.

In this paper, we seek to examine women's participation in Ghana's extractive growth-driven economy and the quality of this participation in terms of employment status and earnings relative to their male counterparts. Relevant segregation indices are adopted to examine the extent of gender segregation of employment in extractive activities, followed by analyses of earnings differences along gender lines based on Oaxaca–Blinder regression decomposition technique. The quantitative analysis of gender inequality in employment and earnings is complemented by Focus Group Discussion (FGD) of male and female workers in large and small extractive enterprises to unravel the barriers impeding women's access to or involvement in the extractive activities in Ghana.

2. A review of the literature

Gender differences in the labour market take two main forms – occupational segregation and wage gap along gender lines. Occupational segregation by gender underscores the unbalanced distribution between men and women across occupations in a manner inconsistent with their overall shares of employment, regardless of the nature of job allocation (see Watts and Rich, 1992). This phenomenon tends to feed into differences in compensation such that the group (normally females) confined to low-remunerated occupations and jobs is paid less than its counterparts engaged in well-paid and prestigious occupations and jobs. Essentially, wage differences between the two gender groups tend to reflect wage discrimination if the gap is borne out of subjective factors other than differences in productive characteristics and job tasks.

Occupational segregation and wage differences between two groups are generally explained from economic, institutional and non-economic perspectives (Baah-Boateng, 2014). Within the framework of economic discrimination, Becker (1957) attributes gender differences in the labour market to sheer prejudice of employers against (or in favour of) one group under the taste hypothesis. This manifests in the form of some group of people who are less favoured by employers being confined to less prestigious and low-paid jobs relative to more favoured counterparts on the basis of the employers' prejudice against them. Employers may be compelled to satisfy customers' or workers' taste for discrimination by segregating their workers into different responsibilities and tasks. Under the monopsonist model, females are paid lower than their male counterparts on the assumption of less elastic labour supply curve of females relative to their male counterparts (see Robinson, 1934). In the statistical framework of wage discrimination, female and male workers have the same distribution of abilities, but employers are more accurate judges of the talents of the latter than the former and thus pay the latter lower than the former. To the extent that women, for example, are observed to be less meritorious than men in the marketplace, statistical discrimination is essentially a shortcut mechanism to minimise cost and/or risk while screening for better qualified workers (Tuma, 1995).

Under the human capital framework, education and labour market experience are key productivity variables that influence both the occupational choice of men and women and employers' recruitment decisions. Essentially, differences in human capital endowments between men and women constitute a major source of occupational differences in the extractive sector between the two sexes. As Ward and Strongman (2011) allude, rural communities in Peru, for example, tend to be ill-equipped to apply for jobs in mining companies, since they generally have low levels of education and few qualifications. Thus, the human capital framework under the economic explanation of gender differences best underscores gender differences in extractive activities in Ghana. Indeed, limited education and labour market expertise in science, technology, engineering and mathematics (STEM) such as petroleum and mining engineering and geology account for fewer women in the core extractives activity. On the contrary, the high expertise of women in business, social sciences, law and humanities explains why fewer women in extractives are mostly found in administration.

Occupational segregation as a reflection of gender differences in employment is also explained by the segmentation theory within the broader institutional framework with one segment comprising "female" occupations and another comprising "male" occupations (Doeringer and Piore, 1971). Drawing on the strength of the segmentation model, the crowding hypothesis postulates that the exclusion of women from occupations considered "men's work" tends to undermine women's presence in such extractive activities that require strength and power. In the Global South, women employed by mining companies are noted to be largely either in ancillary or administrative positions in addition to corporate social responsibility and public relations (Chaloping-March, 2006; Lahiri-Dutt and Macintyre, 2006).

The occupational "crowding" that concentrates women in a particular occupation based on their preferences and barriers to alternative occupations is a reflection of feminisation of occupations (Bergmann, 1974). Indeed, social pressures that emphasise the traditional role of women tend to affect the choices of women's occupation such that many women may choose traditional female jobs since information on them is easily available (Baah-Boateng, 2014). According to Becker (1983), women seek jobs with attributes consistent with household production where they have a comparative advantage and also household chores where they bear primary responsibility (Becker, 1983). As Cohn (2000) posits, men in general view work as an expression of masculinity and consequently, men perceive the introduction of women as a threat to their identity as men by invading the province that defines their gender. Thus, the dominance of male in extractive activities is believed to be due to stereotypical idea that mining is a man's job. Even where women have entered in small numbers to take advantage of the better rewards that are offered by many large mining projects, they tend to remain at the bottom of the company hierarchy (Lahiri-Dutt, 2010).

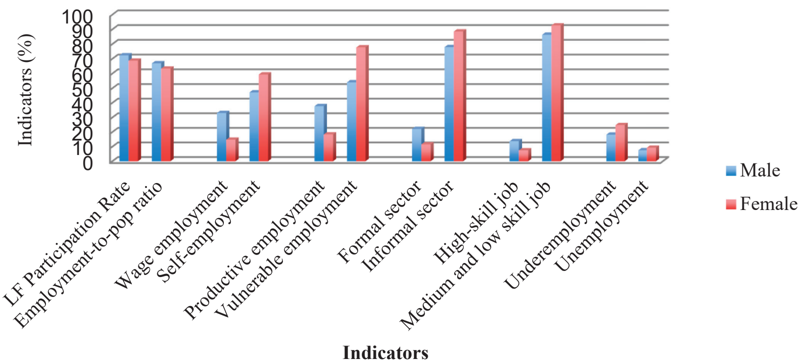
Cultural beliefs and practices associated with exploitation of natural resources in the Global South also explain under-representation of women relative to men in extractive activities. van Hoecke (2006) notes that in many countries women have been considered to bring bad luck if they enter the mine and thus partly account for limited involvement of women in mining. Relatedly, traditional gender stereotypes have largely contributed to the invisibility of women's work in the mines, which makes women obscured and hidden in addition to the number of challenges and discrimination they face in the mining sector.

3. Gender differences in the Ghanaian labour market and the extractive sector: an overview

Gender differences in the Ghanaian labour market clearly favour males based on the key indicators. Figure 1 reports higher labour force participation rate among males than females indicating that males are more economically active than their female counterpart. Similarly, employment-to-population ratio is also higher among males than females suggesting that employment generation benefits males more than females. Consequently, females suffer higher unemployment and underemployment rates than males (see Figure 1). The incidence of quality of employment is also higher for males than females such that about 37% of males as against 18% of females are engaged in productive employment. On the other hand, more than three-quarters (i.e. 78%) of females compared with just about half (i.e. 54%) of males is engaged in vulnerable employment (Figure 1). Indeed, while males dominate wage employment, which is subject to labour regulation and standard with regular earnings, females dominate self-employment particularly own account work, which is noted for irregular income flows and poor job security. The low quality of employment among females relative to males is also evident in the unequal distribution of institutional sector of employment between the two groups. As reported in Figure 1, about 89% of females compared to 78% of males earn their livelihood in the informal sector while on the flip side, females are under-represented in formal sector with only 12% of them as against 22% of males working in the formal sector where earnings are relatively high. These observations are a reflection of lower education and skills of females than males culminating in lower proportion of females than males engaged in high-skill jobs, which are mainly professional and managerial. In contrast, there is a higher representation of females than males in medium- and low-skill jobs including clerical, sales and services and elementary jobs.

3.1 Gender differences in employment in extractives

Employment in the extractive sector is generally gendered. Women are essentially involved in menial jobs such as transportation and ancillary activities in the industrial mining setting, particularly in Artisanal and small-scale mining (ASM). Table 1 reports significant variation in employment along gender lines, with gender parity index of employment of 0.229 in 2010, declining to 0.192 in 2017. The lower composition of women in extractive activities ranging between 15.3% in 2015 and 19.7% in 2010 also confirms the dominance of men in extractive activities in Ghana. Women's participation is better in the informal and small-scale extractive



Source(s): Computed from the 7th Round of the Ghana Living Standards Survey of 2017

Figure 1.
Key labour market indicators by gender in Ghana in 2017 (%)

activities with lower earnings than formal and large-scale activities as evident in the higher gender parity index in the informal extractive settings over 2010–2017 (Table 1). Female composition is also worse in the formal sector where earnings are better with well-defined working conditions, compared to the informal extractive sector. In 2017, women accounted for 7.2% in the formal and large-scale extractive sector, compared to 21.48% in the informal and small-scale sector, suggesting skewed gender composition of extractive activities in favour of men.

Indeed, women in extractives are often found at the lower echelon of the chain with lower and unstable earnings, less job security and are generally vulnerable to employment. Much as the representation of women in the ASM is higher compared to large-scale mining, they largely serve as labourers, cooks and cleaners whilst their male counterparts are engaged in the actual extractive operations. Some of the women in the ASM also operate as part-time workers and are relegated to secondary, labour-intensive processing activities, which expose them directly to dangerous substances such as Mercury.

Disaggregation of employment composition by major activities in extractives also shows gender imbalance. As Table 2 indicates, female composition is highest in quarrying (ranging between 44.3% in 2013 and 48.3% in 2015) where technology usage and education requirement is low. Lowest female composition occurs in the petroleum and gas industry with women accounting for less than 8% of total employment in the petroleum and gas industry. In mining activities, women account for between 12.1% in 2015 and 14.1% in 2013, with women composition better in gold mining than diamond and other mining activities.

3.2 Gender dimension of job position and education in extractives

Essentially, females' under-representation in the extractive sector is largely linked to gender role stereotyping that is perpetuated by culture in addition to their overall lack of education and skill required in the sector. Table 3 confirms the fact that women are less represented in

Indicator/Sector	2010	2013	2015	2017
Gender parity index				
All	0.229	0.179	0.155	0.192
Formal	0.212	0.163	0.149	0.171
Informal	0.253	0.216	0.203	0.249
Share of women (%)				
All	19.7	16.2	15.3	17.1
Formal	10.5	5.8	5.6	7.2
Informal	23.4	21.1	20.9	21.8

Source(s): Computed from 2010 Population Census, GLSS VI and VIII and 2015 Labour Force Survey

Table 1. Gender differences in extractive employment

Extractive activities	2013	2015	2017
Mining	14.1	12.1	13.5
Gold	14.4	10.4	12.0
Diamond and other minerals	12.5	12.8	15.9
Quarrying	44.3	48.3	45.4
Petroleum and gas	7.7	6.3	5.9

Source(s): Computed from the sixth and seventh rounds of the Ghana Living Standards Surveys of 2012/13 and 2016/17, respectively, and 2015 Labour Force Survey

Table 2. Female composition in various extractive activities 2013–2017 (%)

high-skilled extractive jobs, which are associated with high earnings. Men dominate all activities that require high expertise while women are predominantly found in elementary and other ancillary jobs, which do not require much skill or education to accomplish. Generally, women's responsibilities in mineral processing activities range from crushing, grinding, sieving, washing and panning, to amalgamation and amalgam decomposition in the case of gold mining. Essentially, fewer women are concession owners, mine operators, dealers and buying agents, and equipment owners.

Figure 2 further highlights the fact that education and skills are the underlying contributory factors behind the inequality that exists in the extractive sector along gender lines. Education of women in extractives is far lower than men, with the differences being worse in mining and oil extraction than quarrying and thus reinforcing the lower job status of women.

4. Gender segregation of occupation in extractives

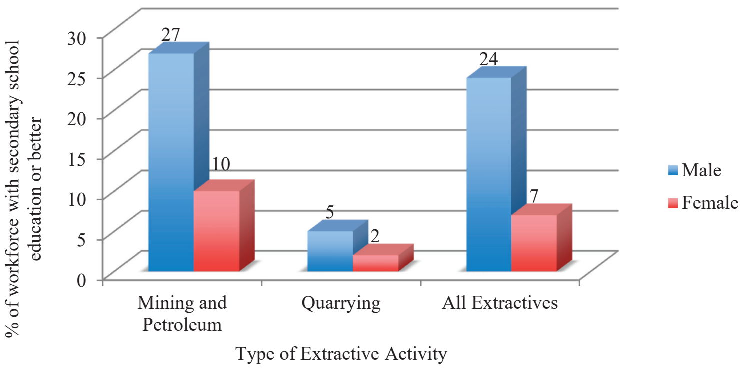
4.1 Index of segregation

Occupational segregation refers to the unbalanced distribution of two distinct groups across occupations in a manner inconsistent with their overall shares of employment, irrespective of the nature of job allocation (see Watts and Rich, 1992; Jonung, 1982). Gender segregation concerns the tendency for men and women to be employed in different occupations from each

Table 3. Job positions in extractive sector 2017 (%)

	Mining and petroleum		Quarrying		All extractives	
Status on the job	Male	Female	Male	Female	Male	Female
High-skilled	11.2	8.5	5.7	1.0	10.8	3.6
Semi-skilled	3.4	2.6	0.9	1.2	2.7	2.3
Production	40.3	26.8	24.2	24.1	39.3	25.1
Elementary	39.6	60.9	65.7	69.1	42.6	65.7
Other	5.5	1.2	3.5	4.6	4.6	3.3
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source(s): Computed from GLSS VII of 2016/17



Source(s): Computed from the 7th Round of the Ghana Living Standards Survey of 2017

Figure 2. Percentage of males and females with secondary + education in extractive sector, 2017

other across the entire spectrum of occupations. The job status or occupation of women differs from that of men in extractives as it is in the entire labour market.

Various studies on occupational segregation have used different measures to assess the extent of occupational distribution along gender or racial lines in the labour market. The outcome of different measures of segregation is largely influenced by the choice of index. However, there is no agreement about the best index in assessing the extent of segregation and as a result, index "wars" break out from time to time [4]. Essentially, none of the segregation indices has proven to be absolutely perfect or without any flaws. As Hakim (1992) notes, the search for a single summary index has become counterproductive with no single index proving to be sufficient. In this study, we apply three key indices widely used in the literature to measure labour segregation namely, Duncan index of dissimilarity (ID), Karmel Maclachlan index (KM) and the size-standardised index of dissimilarity (D_s). Each of the indices takes values ranging from 0 as minimum (when there is no difference between male and female occupational distribution) to 1 as maximum (absolute gender occupational differences).

The Duncan's index proposed by Duncan and Duncan (1955) measures the absolute sum of the difference between the proportion of the female workers and the proportion of the male workers in each job or occupation. It indicates the proportion of males (or females) that would have to change occupations in order to maintain gender ratio of each occupation equal to the gender ratio of workers as a whole. The index is expressed as follows:

$$\mathrm{ID} = \tfrac{1}{2} \sum_{i=1}^{n} \left| \frac{W_i}{W} - \frac{M_i}{M} \right| \quad 0 \leq \mathrm{ID} \leq 1 \tag{1}$$

where $\frac{W_i}{W}$ is the proportion of women in occupation i and $\frac{M_i}{M}$ represents the proportion of men in occupation i. The strength and uniqueness of the ID are based on its simplicity and widespread usage. However, one basic limitation of the index is that the value of ID is sensitive to changes in the occupational structure and sex composition of the workforce (Anker, 1998). Thus, any change in the occupational structure or a change in the sex composition of employment has effect on the value of the index.

The KM index was first proposed by Duncan and developed and advocated by Karmel and Maclachlan (1988) (see Jones, 1992). It is interpreted as the fraction of total employment that would have to relocate with replacement to achieve zero gender segregation, but maintains the occupational structure and the total overall gender shares of employment (Watts, 1994). The KM index is expressed as follows:

$$\mathrm{KM} = {}^{1}\!/_{T} \sum_{i=1}^{n} \left| W_i - a(W_i - M_i) \right| \quad 0 \leq \mathrm{KM} \leq 1 \tag{2}$$

where W_i is the number of women in occupation or job i, M_i is the number of men in occupation i, a is the women's share in total employment or workers and T is the total number of workers under consideration.

The size-standardised dissimilarity index (D_s), proposed by Gibbs (1965) controls for the effect of occupational structure, using all occupations as if they were of the same size, computed over a fixed number of comparable occupational categories [5]. The index is expressed as follows:

$$D_s = \tfrac{1}{2} \sum_{i=1}^{n} \left| \frac{W_i/T_i}{\sum_{i=1}^{n} W_i/T_i} - \frac{M_i/T_i}{\sum_{i=1}^{n} M_i/T_i} \right| \quad 0 \leq D_s \leq 1 \tag{3}$$

where W_i/T_i is the share of women in occupation i and M_i/T_i is the share of men in occupation i. The shape of the occupational distribution does not affect the index since the index standardises each of the ith occupation to the same size. By not allowing changes in the size of the occupations in time to affect the value of the index makes it immune to any occupational effects. Invariably, one notable favourable argument for this index is that the observation of male or female dominance is quite independent of the numbers in the occupation.

4.2 Data, computation and discussion of results

The study uses three nationally representative household surveys i.e. the 6th and 7th rounds of Ghana Living Standards Surveys (i.e. GLSS VI, 2012/13 and VII, 2016/17) and the 2015 Labour Force Survey (LFS). The GLSS VI and VII provide valuable information on the living conditions and well-being of households and cover demographic characteristics, education, health, employment, migration, housing, etc. The LF survey is the first stand-alone survey on labour aimed at collecting basic information and statistics on the labour force situation in Ghana. It collected information on socio-demographic characteristics, employment, wages and earnings, labour underutilisation, status of migrants and agriculture, etc. The GLSS VI captured 14,009 households of 59,864 members while the GLSS VII covered 72,372 individuals in 16,772 households. The LFS covered 5,838 households of 10,931 eligible individuals aged 15 years and above.

The data for computation of segregation indices focused on individual occupation and covered individuals aged 15 years and above and used Microsoft Excel for computation. The results presented in Table 4 indicate that regardless of segregation measure used, occupational gender segregation is higher in extractives than the entire labour market. This implies that the extent to which women's jobs differ from that of men's is greater in extractives than what pertains in the entire labour market. According to Jahn *et al.* (1947), segregation is found to be high if the index is above 0.6 and moderate if it ranges between 0.3 and 0.6. Segregation is judged to be low if the segregation index falls below 0.3. Applying this criterion suggests that the extent of segregation in the extractive sector ranges between moderate and high compared with low-to-moderate in the entire labour market.

4.3 Beyond the quantitative index

To understand the key messages beyond the quantitative results, the study delved into qualitative analysis of gender differences in extractives through FGD of extractive workers. A total of 12 extractive companies were sampled for the FGD, which took place at the site or company's premises. Based on the fact that extractive activities are dominated by gold mining in Ghana, the study sampled five large-scale and five Artisanal and Small-scale gold Mining (ASM) firms. The remaining two firms sampled for the FGD were one large-scale stone quarrying and one large-scale firm in oil and gas extraction [6].

A total of 18 FGDs were organised with an average of 6 participants each. In the oil and gas and stone quarrying, the FGD was organised separately for males and females (i.e. 4 FGD)

Table 4. Index occupational segregation of extractives and the entire labour market

	2013		2015		2017	
Segregation index	Extractive	All sectors	Extractive	All sectors	Extractive	All sectors
ID	0.313	0.293	0.581	0.283	0.350	0.238
KM	0.499	0.300	0.497	0.259	0.499	0.325
Da	0.450	0.255	0.664	0.365	0.598	0.335

Source(s): Computed from GLSS VI of 2012/13, GLSS VII of 2016/17 and 2015 Labour Force Survey to minimise potential influence or intimidation from participants from the opposite gender group. The approach was however varied in the case of the gold mining sector. Thus, separate FGDs for male and female workers were organised in two large- and two small-scale mining firms (i.e. 8 FGDs) and joint male–female FGDs for three large- and three small-scale gold mining companies (i.e. 6 FGDs) were organised to compare with the results of the separate FGDs. We observed no difference in the demeanour and responses of participants of the joint FGD was not different from the separate ones as participants freely expressed themselves at the interaction. Participants were selected from departments and professions in the company. The interaction at the FGDs was audio recording machine and transcribed and analysed with the aid of NVIVO software.

Participants at the FGD gave a number of reasons that account for the limited involvement of women in extractives including cultural barriers, physical nature of the task, intimidating behaviour of male workers and patriarchy practices at the mining or drilling site. Some of the participants posited that extractive activities particularly mining are tedious, physically demanding and dangerous and as a result, most women are not able to withstand the working conditions. As one female participant in one of the mining companies puts it, "*the adage 'barima beko Tarkwa'* [7] *is inscribed in the minds of many women, making some of our female friends wonder whether we have the strength to cope with the tedious and physical nature of the mining work*". Another female participant also submitted that *"extractive activities are tedious and if a woman gathers courage to work in areas where a lot of physical exertion is required, she is mocked by her women colleagues"*. This is clear evidence of masculinity of extractive activities resulting in the under-representation of women in the sector. Essentially, men are preferred in the hiring process to women in extractives particularly in the core areas that require physical effort and longer working hours away from home and thus contributing to under-representation of women in mining and by extension extractives in Ghana.

The patriarchy and intimidating behaviour of some male workers towards their female counterparts also impede women's access to extractive activities. Some women engaged in plant and machine operations complained about intimidation from their male colleagues, accusing them of crossing to their "territory" of occupation. Women who operate excavators and drive tipper trucks are intimidated in the course of their work with the excuse that such activities are preserved for men. A female truck driver shared her experience about the discouraging comments passed by a colleague male driver when she nearly ran her truck into a ditch that *"if a woman forces herself to compete with men in men's occupation, she contends with such bad omen"*. Another woman also recounted how her male working colleague refused to give her a helping hand in addressing a mechanical fault on her machine with a comment like *"a woman sells garden eggs (a vegetable) but does not sell bullet for gun"* meaning a woman engages in woman's work but does not compete on men's platform. Such discouraging comments tend to discourage women from pursuing a career in extractive and thereby contributing to weak participation of women in extractives. As Goldin (2002) recounts, "men's work" is perceived as better than "women's work" and observing a woman doing a man's job signalled that the man's job has been downgraded.

The "isolated" nature of mining sites (mostly out of town) and oil extraction (on the ocean) tends to discourage women in particular from engaging in extractive ventures and that engagement in such activities competes with time for family, which women find it difficult to cope. A woman recounted how staying away from home for three weeks in the mines is having a toll on her marriage and relationship with her kids. According to her, *"I don't know how long I will work in this mining company because I cannot sacrifice my family for this work."*

It also emerged from the field conversation that the few women involved in extractives are confined to areas that do not require exertion of physical force and also for cultural reasons. Some participants also linked occupational segregation in extractives by gender to the fact that women are often not allowed to get closer to the machine or the operating area. According to some men in ASM, *there is cultural belief that, a woman in her menstrual period getting closer to the operation area drives away the gold ore*. As Van Hoecke (2006) noted, in many countries, women are perceived to be bringing bad luck if they enter the mine. Therefore, women are confined to elementary activities such as cooking and washing the rocks and sand after it has been brought from the ground.

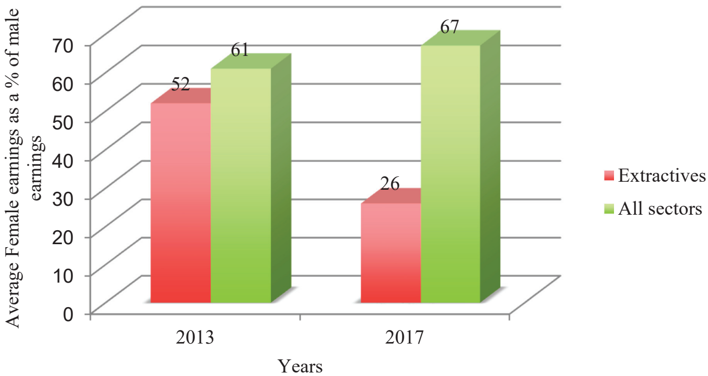
There are other extractive activities that women would find it difficult to get involved due to their biological makeup. For instance, those activities that take workers down the mining pit or closer to fire may not be good for women who are at the age range of 24–45 years where marriage and procreation become very critical in their lives. According to a male participant, *"it is better for women to get involved in underground activities such as drilling and blasting after having family because if they are engaged in such activities before making babies it might affect their procreation responsibilities"*.

Indeed, lower education of women than men and women under-representation in STEM were cited as largely explaining women under-representation in high-skilled occupation in extractive activities in Ghana. According to a male participant, *"it is not that management deliberately employ men in this company but rather, oil exploration and extraction or mining requires expertise in geology, engineering and other science related expertise, which women shy away from"*. A female participant corroborated this observation and submitted that *"right from primary school, girls shy away from mathematics, which is a prerequisite for science and engineering at the higher level. Therefore, it is not surprising that women are underrepresented in activities that require expertise in STEM"*. Others indicated that non-exposure of girls to prospects in mining-related disciplines in school and cultural barriers that tend to perceive women as better in the kitchen are also to be blamed for lower representation at the top of the echelon of the job ladder in extractives. Few women are trained in mining engineering, geology drilling, blasting and plant and machine operation. Thus, for women to access such jobs that pay better, it is important to encourage investment in education and skills development in these areas.

5. Gender earnings differences in extractive activities

5.1 Descriptive overview

Even though average earnings of women are generally lower than their male counterparts in the Ghanaian labour market as a whole, the difference is wider in the extractive sector. As depicted in Figure 3, the average female-to-male monthly earnings ratio is lower in the



Source(s): Computed from the 6th and 7th Rounds of the Ghana Living Standards Survey of 2013 and 2017

Figure 3.
Average female monthly earnings as a % of that of males in 2013 and 2017

extractives than average for all sectors. In 2013, female monthly earnings in extractives were estimated at 52% of the monthly earnings of males as against 61% for all sectors. Gender earnings differentials in extractives relative to all sectors worsened subsequently with average monthly earnings of women in extractives estimated at 26% of that of men compared to 67% for the entire labour market in 2017. Clearly, women are not only under-represented in the extractive sector but they also receive less returns for their labour than males and thus undermining the economic empowerment of women in Ghana considering the importance of extractive activities in the Ghanaian economy particularly in terms of higher earnings.

5.2 Sources of gender earning differences: a quantitative analysis

5.2.1 Model specification. Wage or earnings differentials between two demographic groups have often been attributed to differences in human capital accumulation, labour market experience and the type of jobs engaged by the group. Empirical analyses in the past have adopted the human capital model as the theoretical basis for estimating earnings function (Mincer, 1974; Becker, 1983). Essentially, the level of education and work experience are used as proxies for measuring human capital of workers. In assessing sources of gender earnings differentials, the paper adopts earnings decomposition model to investigate the proportion of earning differences explained by differences in the covariates or observable characteristics (endowment) and the part attributable to discrimination. Using Oaxaca–Blinder decomposition approach (Oaxaca, 1973; Blinder, 1973), we specify gender earnings decomposition as follows:

$$ln\overline{E}_i^m - ln\overline{E}_i^w = \left(\overline{X}_i^m - \overline{X}_i^w\right)\widehat{\beta}_j^m + \left(\widehat{\beta}_j^m - \widehat{\beta}_j^w\right)\overline{X}_i^w \tag{4}$$

where x_i is a vector of covariates, β_i denotes a vector of coefficients of (or returns to) these covariates. The superscripts m and w represent men and women, respectively, and subscript i represents observations of individual workers. The first term of Equation (4) reflects the differences in mean wage due to differences in observable or explained characteristics between men and women. It is based on estimates of what a woman would receive if she faces men's earnings structure. The second term represents the differences in the average wage due to the shift coefficient β i.e. the differential returns to the explained variables or observable characteristics between men and women. This is what is referred to in the literature as "wage remnant" and is used to measure the extent of wage discrimination.

The vector of covariates that captures explained characteristics in the decomposition model are *age, age squared,* categorical education dummies (*basic, secondary* and *tertiary*, with no education as reference dummy), *individual hours of work*, *urban dummy* (urban 1; rural 0), *skill dummy* (high-skill, medium-skill occupations with low-skill occupations as reference dummy), and *formalisation dummy* (formal 1: informal 0). The dependent variable is a log of monthly earnings.

5.2.2 Data, estimation strategy and discussion of results. The main sources of data for the decomposition estimation are two nationally representative cross-sectional household surveys i.e. GLSS VI, 2012/13 and VII, 2016/17 as described in Section 4.2. The estimation made use of information on demographic, education and employment modules. Mindful of possible selectivity bias due to non-random selection of individuals who work in extractives, the study uses Heckman two-stage correction method to correct for potential selectivity bias. Essentially, men and women have different reasons for joining the labour force and different reasons for choosing to work in a particular sector. The Heckman two-stage correction method involves estimation of a model of probability of working in extractives using probit regression on participation to compute inverse mills ratio at the first stage. The inverse mills ratio is introduced into the Oaxaca–Blinder earnings decomposition model in stage two as one of the covariates to correct for potential selectivity bias. We employed STATA 16 software in estimating the Oaxaca–Blinder earnings decomposition model of Equation (4).

Table 5 reports both the decomposition results without selection correction and results corrected for selection correction. The decomposition results with selection correction did not yield statistically significant inverse mills ratios suggesting no potential selectivity bias and thus rendering the decomposition without selection results valid. The Oaxaca–Blinder decomposition without selection shows statistically significant positive earnings gap in favour of men in 2013 with statistically significant 16.6% attributable to differences in observable or explained factors (age, education, location, hours worked, type of occupation and sector of employment). A statistically significant proportion of the earnings gap of 83.4% is attributable to unexplained variation termed "wage remnant" which suggests wage discrimination. Similarly, a statistically significant log of earnings gap in favour of male workers in extractives in 2017 was as a result of differences in observable characteristics of 14.2% and unexplained factors of 85.8%. This suggests that without adjusting for possible sample selection, unexplained factors (wage discrimination) account for over 80% of higher earnings of males over females in extractive sector with differences in observable characteristics explaining less than 20% of the earnings differences between the two groups.

The selection-adjusted version of OB decomposition reduces the discrimination part of the earnings gap from 83.4% to 43.0% in 2013 and from 85.8% to 33.4% in 2017 but not statistically significant (see Table 5). In contrast, differences in endowment or observable characteristics increase to 57.0% in 2013 and 66.5% in 2017 at statistically significant level of 10%. In effect, differences in observable characteristics of male and female workers explain gender differences in earnings with or without correcting for potential selection bias. Potential effect of discrimination cannot be overlooked considering the statistically significant large portion of gender earnings differences attributable to unexplained characteristics based on the results without correcting for selectivity bias.

Clearly, lower education of women and their under-representation in STEM is one major contributor to earnings differences in favour of men in extractives confirming the findings from the econometric analysis. At the FGD, participants argue that some qualitative factors including cultural barriers, intimidating and patriarchy behaviour of men among others that give rise to occupational segregation in the extractive sector largely underscore the gender

Table 5.
Oaxaca–Blinder decomposition results of gender earnings differences

		2013		2017	
Selection approach	Log of earnings	Coeff.	Proportion	Coeff.	Proportion
Without selection correction	Male	6.2829***		7.0547***	
	Female	5.3624***		5.7368***	
	Difference	0.9205***		1.3179***	
	EXPLAINED	*0.1529****	*(16.61%)*	*0.1871***	*(14.20%)*
	UNEXPLAINED	*0.7676****	*(83.39%)*	*1.1308****	*(85.80%)*
With selection correction	Male group	6.2856***		7.0547***	
	Female group	5.3624***		5.7368***	
	Difference	0.9232***		1.3179***	
	EXPLAINED	*0.5263**	*(57.0%)*	*0.8767**	*(66.52%)*
	Inv. mills ratio	0.4673		1.0192	
	Standard error	*0.3560*		*0.7137*	
	UNEXPLAINED	*0.3968*	*(43.0%)*	*0.4412*	*(33.48%)*
	Inv. mills ratio	−4.0237		15.305	
	Standard error	*5.2960*		*11.7599*	

Note(s): ***significant at 1%, **significant at 5% and *significant at 10%
Source(s): Estimated from GLSS VI, 2012/13 and GLSS VII, 2016/17

earnings gap in favour of men that cannot be explained by worker endowment characteristics. Even though some participants at the FGD find men and women to earn the same wages for similar job holdings, they contend that major differences in roles assigned to males and females and differences in education largely explain differences in job status and earnings.

6. Conclusion and policy recommendations

Women's participation in extractive activities is very low and those working in extractives are mostly engaged in elementary occupations and are highly under-represented in professional and managerial jobs where earnings are high. Analysis of occupational segregation in extractives points to some degree of segregation along gender lines. These observations are linked to a number of factors such as cultural beliefs that prevent women from certain extractive activities, the physical nature of the extractive jobs, intimidating behaviour of male workers on the job and patriarchy practices at the mining site. Limited education of women relative to their male counterparts and under-representation of women in STEM also contribute to lower representation of women in extractives particularly in low paying activities. The gender earnings differences attributable to discrimination against female extractive workers may be accounted for by factors such as cultural barriers that prevent women from engaging in core mining activities, which are associated with higher earnings, intimidating and patriarchy behaviour of men among others that give rise to occupational segregation in the extractive sector.

These observations call for policy effort to remove the barriers that impede women's participation in extractives particularly mining and promote their access to core extractive activities associated with higher earnings. The commitment of government to pursuing policies that bridge the gender education gap particularly in STEM is likely to reduce gender earnings gap in extractives attributable to education. Ghana has made considerable progress in addressing gender parity in enrolment, particularly at the pre-tertiary education level but female enrolment in STEM continues to lag behind that of males. The promotion of science education for females at the secondary school level would get more girls into STEM including geology and mining engineering and contribute to improving their access to core activities in extractives. Few women who pursued programs in STEM and managed to break into male-dominated core extractive activities could serve as role models for young females in schools to address the negative perception that STEM education is the preserve of boys while humanities belong to girls. These measures, coupled with public education against cultural beliefs that tend to keep female extractive workers away from core mining activities could reverse the confinement of women in elementary occupations. The harassment and intimidation of female mining workers by their male counterpart could be addressed through enforcement of regulation and code of ethics instituted at the workplace.

Notes

1. Computed from Quarterly Digest of Statistics of the Bank of Ghana; www.bog.gov.gh
2. Computed from the seventh round of the Ghana Living Standards Survey (GLSS VII, 2016/17).
3. Computed from the sixth round of the Ghana Living Standards Survey (GLSS VI, 2012/13).
4. See Gunderson (1985), Reskin and Padavic (1994).
5. See Senyonov and Scott (1983), Charles and Grusky (1995).
6. The only diamond company – the Great Consolidated Diamond in Akwatia, eastern region of Ghana – was not in active operation and was therefore left out in the sampling.
7. Literary translates, as “a man would go to Tarkwa a mining town”.

References

Anker, R. (1998), *Gender and Jobs: Sex Segregation of Occupations in the World*, International Labour Office, Geneva.

Baah-Boateng, W. (2014), "Empirical analysis of the changing pattern of sex segregation of occupation in Ghana", *International Journal of Social Economics*, Vol. 41 No. 8, pp. 650-663.

Becker, G.S. (1957), *The Economics of Discrimination*, The Chicago University Press, Chicago, IL.

Becker, G.S. (1983), "A theory of competition among pressure groups for political influence", *Quarterly Journal of Economics*, Vol. 98 No. 3, pp. 371-400.

Bergmann, B.R. (1974), "Occupational segregation, wages and profits when employers discriminate by race or sex", *Eastern Economic Journal*, Vol. 1 No. 2, pp. 103-110.

Blinder, A.S. (1973), "Wage discrimination: reduced form and structural estimates", *The Journal of Human Resources*, Vol. 8, pp. 436-455.

Chaloping-March, M. (2006), "The place of women in mining in the Cordillera region Philippines", in Lahiri-Dutt, K. and Macintyre, M. (Eds), *Women Miners in Developing Countries: Pit Women and Others*, Ashgate Publishing, Aldershot, pp. 185-208.

Charles, M. and Grusky, D.B. (1995), "Models for describing the underlying structure of sex segregation", *American Journal of Sociology*, Vol. 100, pp. 931-971.

Cohn, S. (2000), *Race, Gender and Discrimination at Work*, Foundation of Social Enquiry Westview Press, Boulder, CO.

Doeringer, P.B. and Piore, J.M. (1971), *Internal Labour Market and Manpower Analysis*, Health Lexington Books, Lanham, MD.

Duncan, O. and Duncan, B. (1955), "A methodological analysis of segregation indexes", *American Sociological Review*, Vol. 20, pp. 210-217.

Gibbs, J.P. (1965), "Norms: the problem of definition and classification", *American Journal of Sociology*, Vol. 70 No. 5, pp. 586-594.

Goldin, C. (2002), "A pollution theory of discrimination: male and female differences in occupations and earnings", NBER Working Paper No. 8985, NBER, Cambridge, MA.

Gunderson, M. (1985), "'Discrimination, equal pay and equal opportunities' in the labour market", in Riddell, C. (Ed.), *Work and Pay: The Canadian Labour Market*, University of Toronto Press.

Hakim, C. (1992), "Explaining trends in occupational segregation: the measurement, causes and consequences of the sexual division of labour", *European Sociological Review*, Vol. 8 No. 2, pp. 127-152.

Jahn, J.A., Schmid, C.F. and Schrag, C. (1947), "The measurement of ecological segregation", *American Sociological Review*, Vol. 12 No. 3, pp. 293-303.

Jones, F.L. (1992), "Segregation indices: a historical and conceptual note", *Australian and New Zealand Journal of Sociology*, Vol. 8 No. 1, pp. 105-110.

Jonung, C. (1982), "Patterns of occupational segregation by sex in the labour market", in Palz, S. and Bandirma, B.U. (Eds), *Determining the Presence and Extent of Ooccupational Gender Segregation in the Turkish Labour Market, A Paper Presented at METU International Conference in Economics*, 8-11 September, Ankara.

Karmel, T. and Maclachlan, M. (1988), "Occupational sex segregation – increasing or decreasing?", *Economic Record*, Vol. 64 No. 3, pp. 187-195.

Kotsadam, A. and Tolonen, A. (2016), "African mining, gender, and local employment", *World Development*, Vol. 83, pp. 325-339.

Lahiri-Dutt, K. (2010), "The megaproject of mining: a feminist critique", in Brunn, S. (Ed.), *Engineering Earth*, Springer.

Lahiri-Dutt, K. and Macintyre, M. (Eds) (2006) *Women Miners in Developing Countries: Pit Women and Others*, Ashgate, Aldershot.

Mincer, J.A. (1974), *Schooling, Experience and Earnings*, National Bureau of Economic Research, New York.

Oaxaca, R.L. (1973), “Male-female wage differentials in urban labour markets”, *International Economic Review*, Vol. 14, pp. 693-709.

Reskin, B. and Padavic, I. (1994), “Women and men at work”, in Anker, R. (Ed.), *Gender and Jobs: Sex Segregation of Occupations in the World*, International Labour Office, Geneva.

Robinson, J. (1934), “The economics of imperfect competition”, in Cain, G.G. (Ed.), *The Economic Analysis of Labour Market Discrimination: Hanbook of Labour Economics*, Vol. 1.

Semyonov, M. and Scott, R.I. (1983), “Industrial shifts, female employment and occupational differentiation: the dynamic models of American Cities 1960-1970”, in Oliveira, A.M. (Ed.), *Occupational Gender Segregation in and Effects on Wages in Brazil XXIV General Population Conference*, IUSPP.

Tuma, E.H. (1995), *The Persistence of Economic Discrimination: Race, Ethnicity and Gender, A Comparative Analysis*, Pacific Books Publishers, California.

Van Hoecke, E. (2006), “The invisible work of women in the small mines of Bolivia”, in Lahiri-Dutt, K. and Macintyre, M. (Eds), *Women Miners in Developing Countries: Pit Women and Others*, Ashgate Publishing, Aldershot, pp. 265-288.

Ward, B. and Strongman, J. (2011), *Gender-Sensitive Approaches for the Extractive Industry in Peru: Improving the Impact on Women in Poverty and Their Families*, The World Bank, Washington, DC.

Watts, M.J. (1994), “A critique of marginal matching”, *Work, Employment and Society*, Vol. 8 No. 3, pp. 421-431.

Watts, M.J. and Rich, J. (1992), “Labour market segmentation and the persistence of occupational sex segregation in Australia”, *australian economic papers*, Vol. 31 No. 58, pp. 58-76.

Further reading

Eftimie, A., Heller, K. and Strongman, J. (Eds) (2009), in , *Gender Dimensions of the Extractive Industries: Mining for Equity*, The World Bank, Washington, DC.

Ghana Statistical Service (2012), “2010 population and housing census: summary report of final results”, available at: https://www.statsghana.gov.gh/gssmain/storage/img/marqueeupdater/Census2010_Summary_report_of_final_results.pdf.

Ghana Statistical Service (2014a), “2015 Ghana labour force survey dataset”, available at: https://www2.statsghana.gov.gh/docfiles/publications/Labour_Force/LFS%_microdata.

Ghana Statistical Service (2014b), “Sixth round of the Ghana living standards survey (GLSS VII) of 2012/2013 datasets”, available at: https://www2.statsghana.gov.gh/nada/index.php/auth/login/?destination=catalog/72/get_microdata.

Ghana Statistical Service (2019), “Seventh round of the Ghana living standards survey (GLSS VII) of 2016/2017 datasets”, available at: https://open.africa/dataset/ghana-living-standards-survey-glss-7-2017.

Hinton, J.J., Veiga, M.M. and Beinhoff, C. (2003), “Women and artisanal mining: gender roles and the road ahead”, in Hilson, G. (Ed.), *The Socio-Economic Impacts of Artisanal and Small-Scale Mining in Developing Countries*, Swets Publishers, pp. 149-188.

Corresponding author
William Baah-Boateng can be contacted at: wbboateng@ug.edu.gh