The gender wage gap in Bangladesh: an application of Olsen and Walby simulation method

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Abstract

This article examines the gender wage gap in the formal public and private sectors in Bangladesh. The traditional Oaxaca method focuses on the explained and unexplained part of the wage gap; in this paper we use the Olsen and Walby (2004) simulation method which emphasises only the explained part of the wage gap. Using the Bangladesh Labour Force Survey 2005-2006, Bangladesh Bureau of Statistics data show formal-sector female employees earned about 32.1 per cent less than their male counterparts (2008). Using the Olsen and Walby (2004) simulation method for the first time in the Bangladeshi context, the results reported here show that age and educational differences and industrial and occupational segregation played important roles in explaining the gender pay gap in Bangladesh. However, 'being female' was also an important determinant of lower female earnings. These results show the importance of policies to boost female education and training in Bangladesh. They also indicate the need for policies to promote female participation in the formal-sector workforce, including improvements in childcare and transport availability.

JEL Codes: J310, J450, J710
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1. Introduction

There have been significant improvements in the Human Development Index of Bangladesh since the 1990s, with life expectancy at birth rising from 58.4 years in 1990 to 72.8 years in 2017. Mean years of schooling increased over the same period from 2.8 years to 5.8 years, and Gross National Income more than doubled from $1,320 to $2,641 (2011 PPP$) (United Nations Development Programme 2018). Bangladeshi women have participated in these improvements, including increased educational achievement and labour force participation (Hossain and Tisdell, 2005). However, these achievements have not ensured equality in earnings and employment or female participation in decision-making in the economic and political sectors.

The aim of this paper is to investigate the causes of the gender wage gap in the private and public sector formal economy in Bangladesh. The formal sector covers a relatively small part of female labour force participation in Bangladesh (see Table 1). Nevertheless, it might be expected to play a significant role in promoting economic opportunities among Bangladeshi women. One reason is the affirmative action policies of the Bangladeshi government in favour of women. Since 1976, the Government of Bangladesh has reserved a 10 per cent quota for female employees in the public sector. However, it took about 25 years to meet this quota target in 2002 (Asian Development Bank (ADB), 2004). In addition, there are several programs to promote the participation of girls in education. Compulsory primary education was supported by the Cash for Education program which encouraged parents to send their children to school, and stipends for girls promoted participation in secondary education (Government of Bangladesh, 1999).

Table 1: Percentage of labour force participation in the formal and informal sector during 1995-96 to 2005-06

	Year 1995-96			*Year 2005-06*		
	Total	*Male*	*Female*	*Total*	*Male*	*Female*
Total ('000)	49,071	30,419	18,651	47,357	36,080	11,277
Formal sector (%)	13.0	17.2	6.2	13.9	14.7	11.5
Public (%)	4.2	5.7	1.7	4.5	4.9	3.2
Private (%)	8.8	11.5	4.5	9.4	9.8	8.3
Informal sector (%)	87.0	82.8	93.8	78.4	76.2	85.7
Others (%)	-	-	-	7.6	9.2	2.8

There are few studies that have examined the sources of the gender pay gap in Bangladesh. Specifically, there is no known study on the gender wage gap of Bangladesh using the Olsen and Walby (2004) simulation method. This method focuses on differences between males and females in their human capital and other endowments, and their contribution to the wage gap. It enables the identification of the individual endowment differences which can form the focus of policy aimed at reducing the gap; for example, levels of education and hours of work. The method has been

promoted as a means of overcoming the difficulties in identifying the contribution of individual factors to the gap using the standard decomposition methods as developed by Oaxaca (1973), Blinder (1973) and others (to be further discussed below).

This study is divided into five sections. Following this introductory section, Section 2 provides the background. Section 3 describes the methodology and dataset that is used in the wage equation estimations and the decomposition method to analyse the gender wage gap in Bangladesh. Section 4 describes the empirical results. Finally, Section 5 presents the conclusion and summarises the results for the gender wage gap in Bangladesh for formal private and public-sector employees.

2. Background

Why do females earn less than males? For more than five decades economists have tried to answer this question. According to human capital theory developed by Becker, earnings differentials between individuals occur because of productivity differences (1964). Even with the same level of human capital, female employees may earn less than their male counterparts because of different rewards for these endowments arising for a range of reasons, including direct and indirect discrimination (Olsen and Walby, 2004). The literature shows that the major factors which directly or indirectly account for the raw wage gap are: the stock of human capital including education, work experience, general and firm specific on-the-job training and career interruption; institutional factors such as working in the public or private sector; and occupational and industrial segregation, cultural factors and discrimination in the labour market (Ashraf and Ashraf, 1993; Altonji and Blank, 1999; Beblo et al., 2003; Blau et al., 2006; Al-Samarrai, 2007; Kapsos, 2008; Watson, 2010; Blau and Kahn, 2010; Cassells et al., 2010; Olsen et al., 2010). These factors individually and collectively account for substantial portions of the explained part of the wage gap.

There are different methodologies for comparing the wage differences between two groups, such as between males and females. A common and basic approach is to include a dummy variable in the pooled wage equation (Gregory and Borland, 1999). For example, sex (1 for male and 0 for female or vice-versa) is generally included as a dummy variable in the wage equation for pooled data (e.g. Walby and Olsen, 2002; Olsen and Walby, 2004; Kapsos, 2008; Watson, 2010; Cassells et al., 2010). This dummy variable approach estimates the effects on the raw wage gap between males and females as an intercept effect. It allows no differences in the coefficients on other variables in the model.

There are other methodologies described in the literature that use a separate wage equation for males and females to measure and to decompose the observed wage gap depending on race, gender and ethnicity. A method for the decomposition of the overall gender wage gap due to human capital and other work-related variables or endowment differences (the explained part of the gender wage gap) and differences due to returns to those factors (the unexplained part of the gender wage gap, sometimes known as discrimination) and its decomposition was independently developed by Oaxaca (1973) and Blinder (1973).

This Oaxaca (1973) decomposition method is based on mean differences

between two groups (e.g. race, gender). It is assumed that in the absence of discrimination, males and females would receive the same returns for the same endowments. It is necessary to choose a non-discriminatory wage structure to evaluate the effect of endowment differences between males and females, and the choice of this structure has significant implications for the results. Oaxaca used the male wage structure as the non-discriminatory wage that would prevail in the absence of labour market discrimination (1973). He decomposed the wage gap into two parts. The first is the difference in human capital endowments and job-related characteristics or an individual's personal characteristics or other endowment difference (characteristics effect) which is the explained part of the gender wage gap that is also known as the 'endowment effect'. The second part is the difference in estimated coefficients, sometimes represented as discrimination (Blinder, 1973; Oaxaca, 1973) or the 'unexplained part' of the wage gap. This is also named the 'treatment effect' (Fortin et al., 2010), 'remuneration effects' (Beblo et al., 2003), 'coefficient effect' (Yun, 2008) or 'returns to endowment' (Cassells et al., 2010). This unexplained part of the gender wage gap may also reflect the impact of model misspecification, mismeasurement or error of calculation (Reiman, 2000; Oaxaca, 1973; Blinder, 1973).

The Oaxaca–Blinder method uses a specific wage equation as the non-discriminatory wage, which leads to an index number problem (Oaxaca and Ransom, 1994; Yun, 2005). Researchers have argued that using a specific wage equation (male or female) leads to undervaluation of one group and overvaluation of the other group. A number of alternative methodologies have been introduced to overcome this problem (Cotton, 1988; Neumark, 1988; Oaxaca and Ransom, 1994; Olsen and Walby, 2004). Oaxaca and Ransom (1994) summarised other methods and provided a matrix of combinations of both male and female wages in the wage decomposition method. The Olsen and Walby (2004) method used here will be explained further below.

Studies covering the gender wage gap in Bangladesh are limited, but there are a few examples (Al-Samarrai, 2007; Kapsos, 2008; Ahmed and Maitra, 2011; Anjum, 2016). Al-Samarrai (2007), using the unit record information for salaried workers from the Household Income and Expenditure Survey (HIES), conducted by the Bangladesh Bureau of Statistics (BBS) in 2000 and 2005, estimated the gender wage gap as well as major factors that contribute to reducing the wage gap in Bangladesh. In this research, the Oaxaca decomposition method was applied, with the male wage used as the non-discriminatory wage structure. The variables used were age, years of education, working in the public sector, marital status and residential location. During this period, according to this study, the gender wage gap in Bangladesh decreased from 73.4 per cent in 2000 to 45.2 per cent in 2005, and between 0 per cent and 31 per cent of the earning gap between males and females was explained by identifiable human capital and other job-related endowments. The remaining 69 per cent to 100 per cent of the total wage gap was the result of the unexplained, or discrimination, (coefficient) component.

Using the BBS Occupational Wage Survey 2007, Kapsos (2008) estimated the gender wage gap for the non-agricultural workforce in Bangladesh by using the Oaxaca–Blinder methodology and used Cotton's (1988) method for the non-discriminatory wage structure, which is a weighted average of the male and female

coefficients. Variables used in this study were age, education level, occupation and industry dummies, and geographic location. The results found that females earned 22.5 per cent less than males. Female employees in this study had higher human capital endowments than males and, on this basis, should have been better paid than males by 18.8 per cent. This result may be due to omitted variables, measurement errors and other factors.

Another study conducted by Ahmed and Maitra (2011) used the unit record information of paid employees from the Bangladesh Labour Force Survey 2005-2006 (BLFS 2005-2006) conducted by the BBS during 1999 and 2005. Ahmed and Maitra estimated the gender wage gap across different quantiles as well as major factors that contributed to the increase in the wage gap in Bangladesh during this period. In this research, the Oaxaca decomposition method and the Wellington (1993) extended method for two periods were used. Male and female wage structures were used separately as the non-discriminatory wage, and the variables used were dummy variables for the age groups, education, marital status, industry and occupation of employment and residential location. The results showed that the gender wage gap increased during this period from 45.4 per cent in 1999 to 64.9 per cent in 2005, and the adjusted wage gap decreased from 93 per cent to 81 per cent. After the selection correction[1] for male and female employees, the major part of the wage gap was attributed to the selection effect and the unexplained, or coefficient, part of the wage gap. Female employees received lower wages than males over the entire distribution, but the wage gap was lower and the discrimination effect was larger for the high wage earners than for the low wage earners.

Anjum (2016) used data from the BLFS 2005-2006 to compare results for the decomposition of the gender wage gap using the different methods outlined above. She found that, in the absence of a selection correction for labour force participation, the part attributed to measured endowment effects varied substantially according to the chosen method – between 21 and 46 per cent of the total wage gap. Over half of the gap was attributed to unexplained factors, including coefficient differences – between 54 and 79 per cent. Differences in age, education, industrial segregation and family-related variables were important components of the explained wage gap. A double selection correction in an additional set of regressions, firstly for participation in the labour force and secondly for employment in the public sector, played an important part in explaining the gender pay gap in Bangladesh.

In summary, the literature on the gender wage gap in Bangladesh shows that only a small portion of the total wage gap is explained by productivity-related characteristics and a larger portion is the 'rewards' to those endowments (the unexplained part). These results could be due to discrimination and unobserved effects. Other reasons which have been argued to account for low female wages in Bangladesh are the rapid growth in female labour force participation, a high female unemployment rate and female under-employment, a high poverty rate among female wage workers, low bargaining power and job segregation (Rahman and Islam, 2003).

1 If samples are not selected randomly for Ordinary Least Square estimation, then the sample selection problem arises and this problem can be solved by including the Heckman correction (1979).

In Bangladesh, different datasets have been used to decompose the gender wage gap including the BLFS 2005-2006 (Ahmed and Maitra, 2011), the Household Income and Expenditure Survey (Al-Samarrai, 2007) and the Occupational Wage Survey (Kapsos, 2008). This study uses the same data source as Ahmed and Maitra (2011) and the Olsen and Walby (2004) methodology to address the following questions for public and private sector employees in the Bangladeshi context:

- Are there any wage differences between males and females in the formal sector?
- If there are, how much do employees lose in monetary terms?
- What are the important individual endowment differences between males and females in generating the gender pay gap?

3. Research methodology and data

Methodology

The Olsen and Walby (2004) method, based on the original Oaxaca method, was used to investigate the gender wage gap in the UK. It used a single equation to identify the portion of the gender wage gap associated with different factors. The most interesting point of this method is that it allows visualisation of the gender wage gap in monetary terms for each factor that affects the wage gap. In addition, it identifies the effect of being female and enables policy formulation to reduce the wage gap. The focus on possible policy responses to the gender wage gap means that Olsen and Walby emphasise those endowments where women fall behind men.

This method allows decomposition of the total endowment effect and it does not consider the unexplained part of the wage gap measured in the Oaxaca–Blinder methodology. Olsen and Walby used the pooled wage equation with a female dummy variable in the wage equation to capture the direct effect of being female. The equation used as the simulation effect is:

$$R = (\bar{X}^m - \bar{X}^f)\beta^* \qquad \text{----------1}$$

where R equals the raw wage gap between males and females, $\bar{X}^m$ and $\bar{X}^f$ are the mean values of endowments for males and females, and β^* are the coefficients of the pooled wage equation that includes a female dummy to capture any direct discrimination. The simulation effect is distributed among different factors according to their weight. $(\bar{X}^m - \bar{X}^f) = \Delta X$ which indicates the characteristic differences between males and females. This 'change factor' (Watson, 2010) is multiplied by the pooled β to get the simulation effect ($\Delta X^*\beta$), which is expressed in terms of the percentage of the wage gap. Each factor's simulation effect is used to generate the individual factor's contribution to the total monetary value of the wage gap.

The Olsen and Walby (2004) simulation method measures the total wage gap justified by the overall male and female endowment differences. In addition, this method allows us to estimate how much women's endowments need to change to equalise men's endowments, and how much the wage gap may be reduced if female

endowment levels equalled that of males. For example, one can examine the percentage of the pay gap accounted for by a particular endowment difference (e.g. the years of education) and the monetary value of any differences. Olsen and Walby (2004) modelled the gender wage gap for the UK and found that education accounted for eight per cent of the gross wages gap of 0.23. This variable can then be given a monetary value; 18 pence per hour (eight per cent of the £2.28 wages gap). These results can then be used for policy formulation to reduce wage inequality. The method excludes the effects of factors which are 'female-advantaging' or reduce the wage gap, as they are not relevant for policy formulation to reduce the gap (Cassells et al., 2010) . One of the most interesting aspects of this method is that it can be applied to all of the variables in the regression, or to just a subset that is relevant to a particular policy (Watson, 2010). Cassells et al. (2010) provide a detailed review of the Olsen and Walby decomposition method and they summarised the advantage of this method as follows (p. 12):

> The gender component is visible enabling the effect of direct discrimination or other aspects related to being a woman to be measured.
>
> There is the option to bring all of the 'policy relevant' variables into the forefront, and to treat all other variables as controls or irrelevant.
>
> Offsetting 'female advantaging' aspects are removed.
>
> The tug-of-war about what component is due to 'rewards' and what is due to 'endowments' is removed.
>
> Feedback effects (pre-labour market discrimination) are to some extent addressed by giving women the 'best average situation among men'.

The Olsen and Walby (2004) simulation method is not widely used. This method has been used to estimate the gender wage gap in the UK and in Australia (Walby and Olsen, 2002; Olsen and Walby, 2004; Watson, 2010; Cassells et al., 2010; Olsen et al., 2010). Olsen and Walby (2004) used a British Household Panel Survey sample consisting of 10,000 adults to explore how much of the gender gap is related to different factors. The findings of the research showed that the gender wage gap was £2.28 per hour in 2002 and that this can be segregated into the following main factors: lifetime working patterns (consisting of years of full-time employment, years of part-time work and work interruption due to family care) accounted for 36 per cent of the pay difference; rigidities in the labour market (such as occupational segregation, size of firm) accounted for 18 per cent of the pay gap; eight per cent was due to the lower education attainment of females; and 38 per cent was accounted for by 'being female'. This 'being female' measures any direct discrimination because of different labour market preferences of females compared with males. Olsen and Walby estimated the selection correction term as another single factor but did not include it in the simulation procedure.

Two other studies using this method were conducted by Cassells and her colleagues (2010) and Watson (2010) to estimate the gender wage gap for Australia.

Watson (2010) estimated the gender wage gap for managerial employees using seven waves of the Household, Income and Labour Dynamics in Australia (HILDA) Survey data. As a selection effect was not statistically significant, Watson did not include it in the wage equation. Cassells et al. (2010) used Wave 7 of HILDA data and their sample consisted of wage earners aged between 21 and 65 years. Those who were still in school or self-employed were excluded from the sample. This means their sample suffers from a sample selection problem, but Cassells et al. argued against adjusting the non-random sampling error in their gender wage gap estimation. Following this study, the present study did not correct for sample selection.

Data

In this study, the BLFS 2005-2006 by the BBS dataset covering all of Bangladesh has been used to provide individual-level information on labour force status, demographic variables, working status (full-time or part-time) and employment characteristics. It estimated the wages for the formal sector employees, which includes the public and private sectors, but excludes the non-formal sector, which is mostly agricultural and subsistence-level jobs and the self-employed. This decision was made because in the non-formal sector, no formal wage structure exists and workers are mostly unpaid family helpers. Those who worked in the army were also excluded. If the wage gap had been calculated for all employees, it might be much higher. The sample was restricted to those who were aged between 15 and 65 years. In the formal sector, employees receive a monthly income in Bangladesh so employed persons who worked on a full-time or part-time basis and received a monthly income are in the sample. The total sample size was 6,351, where 80.6 per cent were male and 19.4 per cent were female employees.

The main intention of this study was to investigate the gender wage gap in Bangladesh, and so the most important variable of this study is the income variable. In the BLFS 2005-2006 dataset, income information is provided in three ways: i) income in cash, ii) income in kind, and iii) total income in cash and kind. In this analysis, total income is calculated by adding income in cash (i) and income in kind (ii). In some cases, separate information on cash and kind income was not provided, but total income was provided;

The choice of explanatory variables was based on human capital theory but limited by data availability. In this analysis, instead of the preferred variable of actual labour market experience, age and age-squared variables were used to capture all the effects of age on income. The educational achievement is given as a categorical variable, and four dummy variables were generated to capture educational achievement (Appendix Table A1 provides a detailed list of variables).

The work-related variables are crucial to estimate the gender wage gap. Working hours, working full-time or part-time, and working in either the private

or public sector were included in the earning equation. Occupation[2] and industry[3] dummies were included to cover gender-based segregation in the workplace.

Job interruption has also been shown to affect wages and career progression. Family and childcare responsibilities, marital status, number of children less than five years of age, number of children between 6 and 14 years in the household and number of household members aged between 19 and 24 years were therefore also included in the wage equation.

To cover regional local price differences, Reimers (1983) made an adjustment for the local price level. He also argued this could be accounted for by including regional dummy variables in the regression model, which also capture any differences in how the labour market operates in different regions. In this present study, it was not possible to collect regional price differences or a regional cost of living index, so the regional dummy variables control for regional differences. To capture locational effects for employed persons, an urban dummy (1 for that group, otherwise 0 for rural areas) was included, and regional location was captured by introducing six divisional dummy variables.

4. Results and discussion

Average characteristics difference between male and female employees

Descriptive statistics on different characteristics between males and females are presented in Table 2. In this sample, the average hourly wage rate for male employees was 22.12 Taka (Tk) compared to 16.2 Tk for female employees. This indicates that the average male employees earn 6.07 Tk more per hour than female employees, which means females earned, on average, 73 per cent of male earnings.

Gender differences exist in human capital acquisition. In this sample, age is used as a proxy for work experience and, on average, male employees were six years older than female employees (37.9 years and 31.9 years for the male and female employees respectively).

2 BLFS 2005-2006 used International Standard Classification of Occupation (ISCO-88) for occupational category. However, this present study used the restricted sample, so representative data were not available for each group. Regrouping generated five occupational groups for this study.

3 BLFS 2005-2006 used Bangladesh Standard Industrial Classification (BSIC, Rev-3) for industrial category consisting of 15 categories. Due to the lack of a reliable representative sample size, this study regrouped them and generated seven industrial categories.

Table 2: Descriptive statistics for public and private sector employees

	Male		*Female*		*Mean difference (male-female)*
	Mean	*Sd*	*Mean*	*Sd*	
WAGE (Tk†)	22.12	0.22	16.05	0.38	6.07
LNWAGE‡ (ln)	3.096	0.01	2.776	0.02	0.321
AGE	37.87	0.16	31.9	0.29	6.0
AGE2	1568.67	12.58	1121.33	20.15	447.3
Primary*	11.85	0.01	14.73	0.01	-2.9
Secondary*	52.87	0.01	45.08	0.01	7.8
Tertiary*	28.74	0.01	26.20	0.01	2.5
PUBLIC*	42.03	0.01	40.28	0.01	1.8
TOTHOURS	50.66	0.17	47.35	0.37	3.3
Full_time*	98.50	0.00	94.96	0.01	3.5
Professional_Tech*	30.89	0.01	44.43	0.01	-13.5
Clerical*	17.49	0.01	14.48	0.01	3.0
Agricul_trans*	20.30	0.01	21.72	0.01	-1.4
Others_Occ*	14.39	0.01	14.40	0.01	0.0
Manufacturing*	24.25	0.01	27.10	0.01	-2.8
Electricity_gas*	9.41	0.00	2.20	0.00	7.2
Financial_Business*	9.18	0.00	9.03	0.01	0.1
Public_Defence*	19.72	0.01	12.86	0.01	6.9
Educations*	22.06	0.01	34.58	0.01	-12.5
Others_Indus*	11.93	0.01	3.99	0.01	7.9
URBAN*	61.25	0.01	72.74	0.01	-11.5
Chittagong*	18.49	0.01	16.35	0.01	2.1
Dhaka*	34.56	0.01	42.47	0.01	-7.9
Khulna*	14.49	0.01	11.23	0.01	3.3
Rajshahi*	18.39	0.01	16.19	0.01	2.2
Sylhet*	4.26	0.00	4.96	0.01	-0.7
MARRIED*	79.62	0.01	71.44	0.01	8.2
PREMARRIED*	0.41	0.00	10.09	0.01	-9.7
CHILD005	0.35	0.01	0.29	0.02	0.1
CHILD0614	0.89	0.01	0.72	0.03	0.2
TERAGE1924	0.71	0.01	0.55	0.02	0.2

† Taka (Tk) means Bangladeshi local currency. The exchange rate for US$1 = 67.08 Tk for year 2005-06. Source: Bangladesh Bank, http://www.bangladesh-bank.org/econdata/index.php downloaded on 01.05.2012.

‡ Raw wage gap = $\ln\bar{Y}^m - \ln\bar{Y}^f$ where $\ln\bar{Y}^m$ is the logarithm mean hourly wage for male employees and $\ln\bar{Y}^f$ for females. The raw wage gap interpreted as [exp (Raw wage gap)-1]*100 in percentage terms as per hour wage provided in log form (Oaxaca, R.L. and Ransom, M.R. (1994), but most of the study of the gender wage gap used just equivalent to percentage, which slightly differs with from previous one, Reimers (1983).

Notes:

a) *provided in percentage terms, as they are dummy variables. Education group: others, Occupation: Sales and service worker, Industries: Health and social worker, Division: Barishal and Marital status: Single used as base category.

b) Taka (Tk) means Bangladeshi local currency. The exchange rate US$1 = 67.08 Tk for year 2005-06. *Source:* Bangladesh Bank, http://www.bangladesh-bank.org/econdata/index.php downloaded on 01.05.2012.

A large proportion of males were in the more highly educated category: 11.8 per cent of male employees have primary education compared to 14.7 per cent of females; 52.9 per cent of males had secondary and higher-secondary education and 28.7 per cent had tertiary qualifications compared to 45.1 per cent and 26.2 per cent of the female employees for the corresponding category. The 'Others' educational level,[4] used as the base category, is higher for females (it accounts for 14.0 per cent of female employees compared to 6.5 per cent of males).

Among the job-related factors, the gender difference in public sector employment was not large in this sample. According to this sample, 42.0 per cent of male employees worked in the public sector compared to 40.1 per cent of female employees.

Gender differences were also found in working status. Working status captures working either full-time or part-time. On average, male employees work 3.3 hours more than females per week, (males work on average 50.7 hours per week compared to 47.4 hours for females). Both male and female employees in the formal sector worked more than the weekly full-time requirement (37.5 hours). Almost 99 per cent of the male employees worked on a full-time basis. However, part-time employment was higher for female employees (five per cent of female employment). This could be because the societal norm of the country is for the male to be the main 'breadwinner' of the family.

Other work-related variables such as occupation segregation affect wages. Due to occupational segregation, females tend to work in low-paid jobs and males in the high-paid jobs. So, gender differences in occupation are one of the critical factors in explaining the gender wage gap (Baron and Cobb-Clark, 2010). The gender difference in occupation was also present in this sample. Female employment was more highly concentrated in administration, managerial, professional and technical jobs (44.4 per cent compared to 30.9 per cent for males). There were no large differences in the distribution of employment across other occupational categories.

Another important variable is employment in different industries. Male employees were more concentrated in manufacturing (24.3 per cent of total male employees), public administration and defence (19.7 per cent), electricity, gas, water supply, construction and transport storage (9.4 per cent) and the education sector (22.1 per cent). On the other hand, females were mostly concentrated in the manufacturing (27.1 per cent of total female employment) and education industries (34.6 per cent). Employment in education was relatively more important for females. There is no significant difference in the remaining industries.

4 In this sample, 'Others' education category considers 'technical and others education' levels based on BLFS 2005-2006 questionnaire.

Male and female employment varied with regional location. The percentage of total male employees located in the urban area was 61.3 per cent compared with 72.7 per cent for female employees. To address the regional variation in detail, geographic location dummies for six divisions were included in the wage equation. The share of female employment was higher in Dhaka compared to males, but in all other divisions, males had a higher representation. This may reflect different social norms in the major urban centres compared with other areas and to differences in industry mix. For example, the practice of purdah which prevents women from interacting with men who are not part of their immediate family, is more important outside the major urban areas.

In this sample, more males were married (79.6 per cent of male employees) than females (71.4 per cent of female employees). However, the percentage of previously married women, which includes widows, divorced and separated, was higher than for males.

Research results

This section presents decomposition results using the Olsen and Walby (2004) decomposition approach to quantify the key determinants of the gender wage gap and to quantify the wage gap in monetary terms. The regression results used for the decomposition are presented in Appendix Table A2. Full detailed decomposition results are provided in Appendix tables A3 and A4. The emphasis is given to simulated change and those factors positively contributing to the gender wage gap which may be amenable to policy interventions.

The unadjusted wage gap shows males earn, on average, 6.07 Tk more per hour than females, with males earning 22.12 Tk per hour on average and females 16.05 Tk per hour – 73 per cent of the male wage. Table 3 demonstrates the simulation effect for formal-sector employees in Bangladesh to bring female endowment levels equal to the average male situation. A graphical representation is provided in Figure 1. The largest effect found is for work experience measured by age, followed by being female, education, occupation and industry segregation, work-related variables and family-related variables.

Age differences were responsible for 48 per cent of the total wage gap. If females had the same level of the proxy of work experience (age) as males, this would increase their average age by six years. The gender wage gap would then fall by 32 per cent, other things remaining equal. From another point of view, females could increase their weekly income by 108 Tk weekly or 5,621.5 Tk yearly. The proxy for work experience (age) may overestimate actual experience for females where their actual work experience was below their potential experience, and so the part of the wage gap explained by differences in working experience might be even larger.

Table 3: The gender wage gap for the Olsen and Walby (2004) method

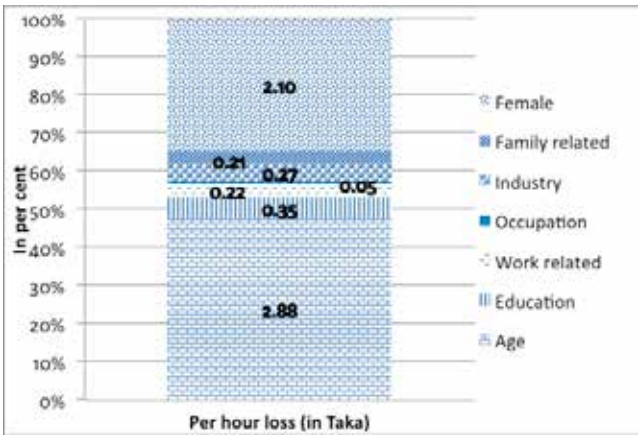
	Simulation effect ($\beta^*\Delta X$)	*Simulation as % of the wage gap*	*Wage lost in monetary value (in Tk)*		
			Per hour	*Weekly*[a]	*Yearly*
Age	0.32	0.48	2.88	108.11	5621.49
Education	0.04	0.06	0.35	13.00	676.26
Work-related	0.02	0.04	0.22	8.08	420.16
Occupation	0.01	0.01	0.05	1.71	88.68
Industry	0.03	0.04	0.27	10.10	525.39
Family-related	0.02	0.03	0.21	7.79	405.10
Female	0.23	0.35	2.10	78.75	4095.26
Total	0.67	1.00	6.07	227.55	11832.35

Note: Only positive values are considered. [a] Weekly hours 37.5 hours is considered.

This method allows quantification of the direct discriminatory effect of being female. If the negative effects of being female were removed, then the gender wage gap would decrease by 23 per cent – the equivalent of 2.10 Tk per hour. If a woman worked an average of 37.5 hours per week, then she would lose 78.8 Tk per week and 4,095.2 Tk yearly, just by being female, keeping all other variables constant. Figure 1 also shows that the effects of work experience and being a woman clearly dominate the gender wage gap.

If the female education level rose to male levels, there would be a four per cent reduction in the gender wage gap, and in the formal-sector female employees could earn an extra 13 Tk per week, where male and female working hours are 37.5 hours per week. The final important factor that affects the gender wage gap is the work-related variables, which include dummy variables for employment in the public sector and working full-time. If the representation of females in the public sector and full-time employment increased to the same proportion as males, the gender wage gap would decline by two per cent.

Figure 1: Per hour wage loss in monetary terms (in Taka)



Occupation and industrial segregation contribute to the wage gap. If females and males were represented equally within occupations and industries, the gender wage gap would reduce by four per cent and could increase the female wage to an extra 11.8 Tk per week.

Female employees earn less due to labour market interruptions associated with childcare and family care responsibility. This is not the general case for males. The female hourly wage would increase by 0.21 Tk per hour (three per cent of the wage gap), if their level of labour market interruption was equivalent to that of males. Here, labour market interruption is measured by marital status, number of children in different age groups, and household members aged less than five years and between 6 years and 14 years and account for three per cent of the total wage gap.

A summary of results is provided below, using Olsen and Walby's (2004) simulation method:

- The unadjusted wage gap shows males earn, on average 6.07 Tk more per hour than females; males earn 22.12 Tk per hour on average and females 16.05 Tk; and formal-sector female employees earn about 32.1 per cent less than their male counterparts.
- Age differences between male and female formal-sector employees accounted for 48 per cent of the total gap.
- Direct discrimination is significant: 'being female' reduced wages by 23.0 per cent compared to males, which is equal to 35 per cent of the total wage gap. If a woman worked an average of 37.5 hours per week, then she would lose 78.8 Tk per week and 4,095.2 Tk yearly, all other variables remaining constant.
- Another type of discrimination is measured by occupation and industry segregation, which contributes only five per cent to the total wage gap.

The results using the Olsen and Walby method showing that age, education and occupational and industry segregation were important determinants of the gender pay gap confirm the results of other studies for Bangladesh using the Oaxaca–Blinder decomposition. The effect of 'being female', measured by the intercept term in the Olsen and Walby method and the unexplained component of the Oaxaca–Blinder decomposition, was also an important element in all these results.

The main feature of the Olsen and Walby (2004) simulation method is that it allows quantification of the gender wage gap in monetary terms and enables direct policy targeting. However, this method is not beyond criticism, as problems such as omitted variable bias and other unobserved effects remain. Accepting the limitation, this method provides useful results for policy formulation to reduce the gender wage gap (Cassells et al., 2010).

5. Conclusion

Bangladeshi women have made noticeable progress in the labour market and the gender gap in educational achievement has narrowed (Anjum, 2016). Despite this progress, a significant wage gap remains and females are disadvantaged compared to males. The Constitution of Bangladesh grants equal rights to males and females in all spheres of public life; however, discrimination against women exists (ADB, 2004). Social norms such as 'purdah', limit active labour force participation of females and their participation in politics and other forms of decision-making. The social norms affect their lives and leave many of them living in poverty. There are other factors that might constrain female labour force participation including lack of suitable transport to the workplace, lack of appropriate housing and lack of childcare facilities (Rahman, 2005).

The existing literature and this present study have identified several factors that contribute to the gender wage gap in Bangladesh. These factors are the level of human capital stock (e.g. the level of education and proxy working experience), working in the public sector, industry and occupational segregation, regional location, and career interruption due to motherhood or family-related responsibilities. Direct and indirect public policy intervention can help to reduce the gender difference in human capital and occupational segregation, and to remove direct and indirect discrimination in society. Pre-labour market discriminatory behaviour is affected by societal norms as families invest less in their daughters, which leads to less-educated, and fewer skilled workers for the job market compared to males (Altonji and Blank, 1999). In addition, due to direct or indirect discrimination in the labour market, female employees earn less.

There needs to be broader change and more opportunities for women in the formal sector. The government should introduce more positive initiatives leading towards gender development; i.e. more childcare facilities close to workplaces, training and improved flexible working hours. Stronger anti-discrimination policies may assist female labour force participation. In addition, social awareness policies should be adopted to increase labour force participation and to change social attitudes towards women working outside the home and family. Based on the results reported

here, policies such as these directed at promoting longer-term attachment to the formal labour market for women could be expected to reduce the gender pay gap in Bangladesh.

'When mothers live in poverty, so do their children' (Olsen and Walby, 2004; p. 34). Policies to promote female employment outside the home are likely to improve the position of women in the workforce. Any reduction of the gender wage gap will not only increase national income, but also reduce child poverty and lead to improvements for future generations. Improving the level of education for women may increase competition for formal-sector jobs in the short term and lead to a reduction in wages; however, in the long term, more educated workers could be expected to make the economy more competitive and to reduce poverty.

The results presented here have focused on the small formal sector in Bangladesh where workers are relatively highly educated. They provide a basis for further research on changes in the gender pay gap over time, using more recent data. Outcomes in the informal sector are relevant and have important implications for the welfare of women in Bangladesh and therefore should be subject to further research.

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Appendix

Table A1: Variables used in this study

Variables	*Description*
LNWAGE	Natural log of per hour wage
AGE	Age
AGE2	Age square
Primary	Education dummy for Primary schooling which is equivalent to year 1 to year 5, 1 for this category otherwise 0
Secondary	Secondary and Higher schooling education which is equivalent to year 6 to year 12, 1 for this category otherwise 0
Tertiary	Tertiary education such as Bachelor, Masters, Medical and Engineering, 1 for this category otherwise 0
Others*	Other, 1 for this category otherwise 0 (working as a base category)
FEMALE	Dummy Variable for female, 1 for female and 0 for male
PUBLIC	Public sector dummy, 1 for this category otherwise 0
TOTHOURS	How many hours work per week for the main job
Full_time	Dummy variable for Working status full-time, 1 for this category otherwise 0 for part-time
Professional_Tech	Dummy variable for occupation Administrative and Managerial and Professional and Technical category, 1 for this category otherwise 0
Clerical	Occupation Clerical Workers, 1 for this category otherwise 0
Sales_Service*	Occupation Service and Sales workers, 1 for this category otherwise 0 (working as a base category)
Agricul_trans	Occupation Agriculture, forestry, fisheries and Production and Transport labours, 1 for this category otherwise 0
Others_Occ	Occupation Others, 1 for this category otherwise 0
Manufacturing	Dummy variable for Industry Manufacturing, 1 for this category otherwise 0
Electricity_gas	Electricity gas Water supply, construction and Transport storage, 1 for this category otherwise 0
Financial_Business	Financial Intermediation and Real estate and renting business, 1 for this category otherwise 0
Public_Defence	Public Administration and defence, 1 for this category otherwise 0
Educations	Education, 1 for this category otherwise 0
Health_social*	Health and social worker, 1 for this category otherwise 0 (This one working as a base category)
Others_Indus	Others Industry, 1 for this category otherwise 0
Urban	Dummy variable for location, 1 for urban area and 0 for rural
Chittagong	Dummy variable for the District Chittagong, 1 for this category otherwise 0
Dhaka	Dhaka, 1 for this category otherwise 0
Khulna	Khulna District, 1 for this category otherwise 0
Rajshahi	Rajshahi District, 1 for this category otherwise 0
Barishazila*	Barishazila, 1 for this category otherwise 0 (working as a base category)
Sylhet	Sylhet District, 1 for this category otherwise 0
SINGLE*	Marital status dummy, not married, 1 for this category otherwise 0
MARRIED	Married dummy, 1 for this category otherwise 0
PREMARRIED	Previously married dummy, 1 for this category otherwise 0
CHILD005	No. of children aged between 0 and 5 years
CHILD0614	No. of children aged between 6 and 14 years
TERAGE1924	No. of household member tertiary age group where age between 19 and 24 years

Note: * dummy variables omitted from the regression equation.

Table A2: Regression results for the pooled wage equation

LNWAGE	*Coef.*	*Std. Err.*
FEMALE	-0.23	0.02**
AGE	0.05	0.00**
AGE2	0.00	0.00**
Primary	0.09	0.03*
Secondary	0.28	0.03**
Tertiary	0.65	0.03**
PUBLIC	0.29	0.02**
TOTHOURS	-0.01	0.00**
Full_time	0.53	0.05**
Professional_Tech	0.20	0.03**
Clerical	0.15	0.03**
Agricul_trans	-0.03	0.03
Others_Occ	-0.09	0.03**
Manufacturing	0.05	0.04
Electricity_gas	0.13	0.04**
Financial_Business	0.13	0.04**
Public_Defence	0.01	0.04
Educations	-0.15	0.03**
Others_Indus	-0.04	0.04
URBAN	0.13	0.01**
Chittagong	0.04	0.03
Dhaka	0.10	0.02**
Khulna	-0.10	0.03**
Rajshahi	-0.11	0.03**
Sylhet	0.16	0.04**
MARRIED	0.03	0.02
PREMARRIED	-0.17	0.05**
CHILD005	0.01	0.01
CHILD0614	0.00	0.01
TERAGE1924	0.02	0.01*
_cons	1.44	0.11**

*indicates significant at the 5% level and ** at the 1% level.

Table A3: The gender wage gap based on the Olsen and Walby simulation method

LNWAGE	*Male*	*Female*	*Change Xs*	*Pooled β*	β*ΔX	*Simulation*	*Simulation effect in Tk**
AGE	37.87	31.90	5.97	0.05	0.32	0.99	6.02
AGE2	1568.67	1121.33	447.34	0.00	-0.24	-0.75	-4.54
Primary	0.12	0.15	-0.03	0.09	0.00	-0.01	-0.05
Secondary	0.53	0.45	0.08	0.28	0.02	0.07	0.41
Tertiary	0.29	0.26	0.03	0.65	0.02	0.05	0.31
PUBLIC	0.42	0.40	0.02	0.29	0.01	0.02	0.10
TOTHOURS	50.66	47.35	3.30	-0.01	-0.05	-0.14	-0.88
Full_time	0.98	0.95	0.04	0.53	0.02	0.06	0.35
Professional_Tech	0.31	0.44	-0.14	0.20	-0.03	-0.08	-0.50
Clerical	0.17	0.14	0.03	0.15	0.00	0.01	0.09
Agricul_trans	0.20	0.22	-0.01	-0.03	0.00	0.00	0.01
Others_Occ	0.14	0.14	0.00	-0.09	0.00	0.00	0.00
Manufacturing	0.24	0.27	-0.03	0.05	0.00	0.00	-0.03
Electricity_gas	0.09	0.02	0.07	0.13	0.01	0.03	0.18
Financial_Business	0.09	0.09	0.00	0.13	0.00	0.00	0.00
Public_Defence	0.20	0.13	0.07	0.01	0.00	0.00	0.01
Educations	0.22	0.35	-0.13	-0.15	0.02	0.06	0.36
Others_Indus	0.12	0.04	0.08	-0.04	0.00	-0.01	-0.06
URBAN	0.61	0.73	-0.12	0.13	-0.01	-0.05	-0.28
Chittagong	0.18	0.16	0.02	0.04	0.00	0.00	0.02
Dhaka	0.35	0.42	-0.08	0.10	-0.01	-0.02	-0.14
Khulna	0.14	0.11	0.03	-0.10	0.00	-0.01	-0.06
Rajshahi	0.18	0.16	0.02	-0.11	0.00	-0.01	-0.04
Sylhet	0.04	0.05	-0.01	0.16	0.00	0.00	-0.02
MARRIED	0.80	0.71	0.08	0.03	0.00	0.01	0.05
PREMARRIED	0.00	0.10	-0.10	-0.17	0.02	0.05	0.31
CHILD005	0.35	0.29	0.07	0.01	0.00	0.00	0.01
CHILD0614	0.89	0.72	0.16	0.00	0.00	0.00	0.00
TERAGE1924	0.71	0.55	0.16	0.02	0.00	0.01	0.06
FEMALE	0.00	1.00	-1.00	-0.23	0.23	0.72	4.38
_cons	1.00	1.00	0.00	1.44	0.00	0.00	0.00
Sum					0.32	1.00	6.07

*indicates significant at the 5% level and ** at the 1% level.

Table A4: The gender wage gap considering only positive values[a]

LNWAGE	*Male (mean)*	*Female (mean)*	*Change factor*	*Pooled coefficient β*	*Simulation effect* (β*ΔX)	*Simulation as % of the wage gap*	*Per hour loss*	*Weekly loss*
Age (Proxy to work experience)								
AGE	37.87	31.90	5.97	0.05	0.32	0.48	2.88	108.11
Education								
Secondary	0.53	0.45	0.08	0.28	0.02	0.03	0.20	7.42
Tertiary	0.29	0.26	0.03	0.65	0.02	0.02	0.15	5.59
Work-related variables								
PUBLIC	0.42	0.40	0.02	0.29	0.01	0.01	0.05	1.73
Full_time	0.98	0.95	0.04	0.53	0.02	0.03	0.17	6.35
Occupation								
Clerical	0.17	0.14	0.03	0.15	0.00	0.01	0.04	1.56
Agricul_trans	0.20	0.22	-0.01	-0.03	0.00	0.00	0.00	0.14
Others_Occ	0.14	0.14	0.00	-0.09	0.00	0.00	0.00	0.00
Industry								
Electricity_gas	0.09	0.02	0.07	0.13	0.01	0.01	0.09	3.30
Financial_Business	0.09	0.09	0.00	0.13	0.00	0.00	0.00	0.06
Public_Defence	0.20	0.13	0.07	0.01	0.00	0.00	0.01	0.23
Educations	0.22	0.35	-0.13	-0.15	0.02	0.03	0.17	6.51
Family-related								
MARRIED	0.80	0.71	0.08	0.03	0.00	0.00	0.02	0.87
PREMARRIED	0.00	0.10	-0.10	-0.17	0.02	0.02	0.15	5.56
CHILD005	0.35	0.29	0.07	0.01	0.00	0.00	0.01	0.25
TERAGE1924	0.71	0.55	0.16	0.02	0.00	0.00	0.03	1.11
Female								
FEMALE	0.00	1.00	-1.00	-0.23	0.23	0.35	2.10	78.75
Sum					0.67	1.00	6.07	227.55

[a]regional dummy excluded.