Gender wage differential in the labour market of Bhutan (2009-2022)

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ABSTRACT

This study investigated striking gender wage differentials trend in Bhutan between 2009 and 2022. In order to decompose the gender wage differentials, we used household level micro-data of Labor Force Survey (LFS), which was conducted by then Ministry of Labor and Human Resources (MoLHR) and National Statistics Bureau (NSB). The methodology estimates the sources of gender wage differentials by segregating gender-specific factors and general wage structure factors. The explanatory variables like women's labor market skills (education, work experience) and women's choice into certain occupational and industrial groups; and treatment towards women employees by employers (i.e., discrimination) are categorized into gender-specific factors. Whereas, the sum of observed prices of labor market skills (education and work experience) and price of women's segregation into certain occupational and industrial groups and unobserved prices were termed wage structure factors. The result shows that gap in education and women's choice into low paying jobs increased gender wage differentials. However, increase in women's work experience narrowed the gender wage differential. Therefore, the widening gender wage differentials resulted from gender-specific factors by huge margin. The findings from this study will help decision and policy makers in developing policies which helps narrowing education and skills gaps between men and women. In addition, it will also help in drafting policies which helps women in getting better paying jobs.

Contribution/ Originality: This study illuminates the current state of gender wage differentials in Bhutan and provide new insights into gender wage differentials in the case of a small developing country. In addition, this paper examines the non-formal sectors in a small country which has not been considered in the earlier research.

1. INTRODUCTION

Despite fast growing economic development globally, gender wage differentials continue to be prominent issues in many parts of the world. Gender wage differential is a problem because it pronounces that women population is earning less throughout their career life. This means that women have less money to put towards their social security, pension and personal savings. This will lead to poverty during their retirement age and affect the entire economy of the country.

The study of gender wage differential in most countries is an intensifying phenomenon. While analyzing the gender wage differential, researchers generally emphasize gender differences in term of labor market skills

(experience and education) and treatment towards women employees by employers (i.e., discrimination), as explanatory variables. Both of these factors were termed as gender-specific factors (Blau & Kahn, 1997), which influence gender wage differential. The impact of gender specific factors on gender wage differential varies from country to country. Scholars in developed countries such as the United States found that gender wage differential declined over the years, which was primarily influenced by gender-specific factors (Blau & Kahn, 1997). Similarly, in the United Kingdom the narrowing of gender differential was triggered by equal pay legislation in the early part of the period in 1970s (Blackaby, Clark, Leslie, & Murphy, 1997). Duflo (2012), in his paper concluded that the increasing labor market opportunities generated by economic growth improves conditions of life for everyone in a country including the women, and helps in narrowing down the gender gaps in education and earning opportunities. However, interestingly, this was not the case in developing countries. For example, China's economic growth has been unparalleled and lifted millions of people out of poverty making China the second largest economy in the world by 2010 (World Bank, 2011). In spite of the economic growth, gender wage differential in China was in fact increasing. Many of the studies carried out in developing countries have focused on the overall labor market rather than specific sectors.

Bhutan's labor market experienced a dramatic change in the last fourteen years, especially in terms of nominal wages. During 2009 and 2022, the mean nominal wage for men have increased steadily in urban Bhutan, whereas, mean nominal wage for women had a slow growth. Due to the gender difference in nominal wage, the ratio of average real wage between men and women began to fall over the years. Subsequently, women's position in men's wage distribution has dropped from 53.60 percent in 2009 to 41.58 percent in 2022.

So far, researchers have not focused on gender wage differentials in Bhutan. Therefore, the primary purpose of the current study is to investigate the gender wage differentials in the country. Hence, this study will illuminate the current state of gender wage differentials in Bhutan and provide new insights into gender wage differentials. This study therefore, aims to explain the striking and widening gender wage differential in Bhutan in 2009 to 2022 by conducting a comprehensive analysis of factors that contribute to differentials in wage between men and women during this period, with a specific focus on the employed persons with wage information.

In order to decompose gender pay gap, we used an analytical model proposed by Juhn, Murphy, and Pierce (1991) and adopted by Blau and Kahn (1997). The advantage of the proposed model is that it can help us in separating the sources of change in gender wage differential that might relate to gender-specific factors and in segregating the change component arising from changes in prices in the labor market. In order to apply this, we used the household-level micro data from LFS conducted by the then MoLHR and NSB.

The remainder of paper consists of six sections. First section provides a brief literature review of key ideas and concepts in gender wage differentials. It also presents results and limitations pertinent to gender wage differentials. The second section presents description on data sources and kinds of variable presents in the micro-data. It also presents the descriptive statistics of the micro-data. The third section looks at the theoretical framework, to which the methodology is adopted. To decompose the change in overall gender pay gap in Bhutan, the same methodology used by Juhn et al. (1991) and Blau and Kahn (1997) is adopted. The fourth section outlines empirical findings on both human capital model and the full model. Section five concludes the paper, highlighting some key results from the paper. Finally, section six provides certain policy recommendations.

2. LITERATURE REVIEW

Gender wage differential in developed countries is declining. In the United States, difference in gender wage started falling since the introduction of anti-discrimination laws. Similar case in the United Kingdom found that gender wage differential is narrowing, which was influenced by equal pay legislation in the early part of the period in 1970s. The increasing labor market opportunities generated by economic growth improves conditions of life for everyone in a country, including the women (Duflo, 2012). This helps in narrowing down the gender gaps in education

and earning opportunities. However, in spite of economic boom in China, gender wage differential in urban China is increasing. The factors, which resulted in changes in gender wage differential in these countries, were discussed in the earlier literature explaining how the factors influenced the recent trend in gender wage differential.

2.1. Gender Wage Differential in Developed Countries

The United States Government initiated antidiscrimination activities in the work place in the 1960s and 1970s rigorously for the past two decades (Blau & Kahn, 1997). The indirect effect of this policy in the US labor market can be seen in the form of the increasing labor force commitment of black women (Collins, 2003). This was clearly shown in his paper, that black women shifted themselves from domestic servants to manufacturing operatives. Thus, because of this we assumed that these women would invest in building their human capital, which would help them in higher relative earning. The gender wage differential between white men and women declined approximately by 4 percent (Wellington, 1993) which job tenure and other observed work history favored white women.

The government's antidiscrimination activity brought intended changes into the labor market when black women were benefited more from the antidiscrimination activity than did for black men (Collins, 2003). Such differences in unobserved labor market qualifications narrowed race differential during 1970s (Blau & Beller, 1991). The greater impact from observed differences were brought to the older women cohort with work experience more than twenty years, which increased earnings ratio, by 11.9 percent. The gender wage differential during 1980s reduced further, which was brought out by unmeasured labor market characteristics (Bound & Johnson, 1992).

The change in skill-based technology may bring in equality or bring rectification into the labour market. The technological revolution contributed to increase in returns to education (Krueger, 1993). He found out that more than one-third of increase was due to the returns to education. He further suggested that, there were more likely, highly educated workers tend to use computers on the job. Bartel and Lichtenberg (1987), found that there was high association of educated workers with the introduction of new technology. This theory of hiring highly qualified workers in the times of computer revolution may have led to increased demand for highly qualified and flexible workers (Krueger, 1993). The enormous supply of university graduates into the labor market during this time may have driven by higher returns to education and increased demand for highly qualified workers. It explicitly showed that college wage premium increased owing to rise in demand for highly qualified workers (Katz & Murphy, 1992). In spite of all these changes in wage structure in the US labor market, the gender wage differential narrowed. On an average, women's average wage increased by 8 percent which resulted in declining gender wage differential (Bound & Johnson, 1992).

The narrowing trend in gender wage differential continued. The larger negative effect of de-unionization on male than female workers contributed to a narrowing of the gap (Blau & Kahn, 2006). The constant decline in occupational segregation also contributed to narrowing gender wage differential, which made it possible for the women to move up the occupational ladder (Blau & Kahn, 1992, 1997, 2006). The labor market characteristics (education and experience) of women workers improved during this period. Especially their increase in experience narrowed gender wage differential (Blau & Kahn, 1997).

In the United Kingdom dispersion of earnings for both men and women widened in the late 1970s. However, gender wage differential started narrowing around 1973. Blackaby et al. (1997), investigated earning distribution of men and women in 1973 to 1991. Their decomposition gender wage showed that gender wage differential declined during this period. In the upper percentile, the decline in gender pay gap was dominated by price of the experience and qualification, which was influenced by equal pay legislation in the early part of the period. Nonetheless, the further significant decline in gender wage differential in later part of the period was driven by change in characteristics (experience and qualification) with slight contribution from price of experience and qualifications.

During the same period in 1973 to 1991, Blackaby et al. (1997), showed that gender wage differential in the lower end of the tail declined even narrower than upper end of the tail. For example, by 1991, unmeasured (residual) effect

and characteristics (experience and qualification) resulted 14 log points fall in gender wage differential in lower end of the tail while their combined effect resulted only two log points in the upper end of the tail (Blackaby et al., 1997). It is these two factors that explained the increased narrowing of the gender wage differential at the lower end of the tail. In the same study, they stated that the gender wage differential declined even further which was 34.5 log points at lower end of tail compared to 27.0 log points at upper end of the tail. It has been speculated that the significant reduction at the lower end of the tail could have been the effect of the more discriminated-against employees being located here. Conversely, a greater contribution came from the price of education and experience.

2.2. Gender Wage Differentials in Developing Countries

In contrast to developed countries, gender wage differentials have shown different trends in developing countries. For example, gender wage differential in urban China is getting widened over the year. Explaining this phenomena, Ying Chu (2006), suggested that in the early stage of economic reforms, gender wage differential in urban China was very small. However, gender wage differential increased rapidly after 1990 and increased at the accelerated pace after 1992. Ying Chu (2006) has attributed this to faster economic development and decentralized wage determination left to market forces, which might have given leeway to employers in setting discriminatory wage rates across gender groups.

In the case of China, the gender wage differential widened significantly at the upper percentile of the earning distribution during 2001-2004 (Zhang, Han, Liu, & Zhao, 2008). They argued the broadeing gender pay gap in Urban China was primarily driven by faster increased in returns to both labour market characteristics and discrimination. Factors like education and experience were in favor of higly qualified men. Gender wage gap worsened at the lower percentile of the earning distribution, which was influenced by rising returns to education where women were renumerate less than their counter part (Su & Heshmati, 2017).

In the same period due to the women suffering from the worsening discrimination at the work place, the low skilled women exited from the labour market. Fang, Eggleston, Rizzo, Rozelle, and Zeckhauser (2012) also found that between 1997-2006, women were paid less than men for each additional years of schooling.

The above review of literature on the gender wage gap in the United States, United Kingdom and China, shows that observed labor market characteristics (experience and education) and unobserved characteristics like discrimination are some of the factors that cause differences in gender wage between men and women. The results, however, point to certain differences between developed and developing countries. In the United States, decline in discrimination and de-unionization contributed to narrowing the gender wage differential. The increased number of highly qualified workforce into the labor market led to increase in wage premium resulting in convergence of gender wage differential. Almost similar to the American women, in the United Kingdom, gender wage differential in highly skilled group declined, which was dominated by price of the experience and qualification, which was influenced by equal pay legislation. In the lower skilled group, gender wage differential narrowed even further, which was due to the improvements in women's labor market endowment such as education and work experience. In contrast, in urban China, in both high and low skilled group, gender wage differential has widened. Chinese women in both of these groups stood more disadvantageous to men, with respect to both observed and unobserved skills. The gender disparity in returns to education, with the returns for each additional year of schooling also favored men than women. In order to understand these different results among countries, further research in needed, particularly in developing countries.

Bhutan, which has recently experienced a significant widening of wage between men and women have seem to provide an optimal context for identifying the determinants of gender wage differentials. Since no study to date has investigated in the case of Bhutan, previous researchers have focused on the overall labor market rather than specific sectors. Hence, this study will illuminate the current state of gender wage differentials in Bhutan and also provide new insights into gender wage differentials. This study therefore, aims to leverage the gap in the literature and

attempts to identify and present a comprehensive analysis between 2009 and 2022. For this analysis, we used model proposed by Juhn et al. (1991) and adopted by Blau and Kahn (1997) to decompose gender pay gap. Since this study is first of its kind in the country, we do not have any basis to compare or predict results. The purpose of the study is to examine what determines the differential in wages earned by men and women in labor market of Bhutan.

3. AN OVERVIEW OF DATA AND RECENT TRENDS IN WAGE STRUCTURE AND GENDER WAGE DIFFERENTIALS

3.1. Data and Descriptive Statistics

3.1.1. Data Descriptions

An investigation on wage structure over the years has been evolving, however obtaining a good quality micro data with comprehensive information on workers' wage, education levels and consistent data across the year has been a paramount importance to a study like this to come to a conclusion that wage structure is not affected by temporary economic shocks.

The data we use were from National LFS of Bhutan from 2009 to 2022, which is conducted by the then MoLHR and NSB. The survey was a household based and conducted annually. Although there was not much modification in sampling design and enumeration of data, however data was collected in varying sample size. This was due to resources and time constraints. The sample size varies from the lowest 6000 households to maximum of 12000 households. In all analyses the weight for each data set calculated by MoLHR and NSB has was adopted. The survey contains detailed household characteristics that were required in analyses of the research.

The survey data, which was drawn from household, consists comprehensive information on education, age, gender, monthly earning and detailed data on occupational and industrial classification. The classification of industries and occupations of the micro data was adopted on International Standard of Industrial Classification (ISIC) and International Standard Classification of Occupation (ISCO) respectively. The data includes classification of industries and occupations for all working persons in an informal[1] and formal[2] sectors.

The consumer price index, which was required to find real wage of the working people, was imputed in the micro data. This new variable was separately collected from Price Section of NSB and generated real wage for all the working age population. Before merging the data sets, we took considerable efforts to make sure that all the variables in the data sets were consistent with each other. This was followed by a process of standardizing the value label of variable in all the time series data. These value labels of the same variable vary for different time series in the micro data set. These data-cleaning procedures are essential because the merging of data sets could lead to discrepancies in merged data, which make them unfeasible for correct use. To remove this inconsistency in merged data, the value label in the variable were regrouped to a fewer number keeping the common value label for all the time series. The value label was regrouped in variables like nature of employment[3]. Regrouping of value label in variables like major occupation[4] and major industry[5] were changed. Minor changes were made in marital status since these variables were frequently used in analysis of the research. For detailed value label it was shown in the footnote.

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[1] Informal sector for this study has been defined as those persons who are not working as regular salaried person. For example, those working as unpaid family workers, own account workers, casual paid workers are categorize into informal sector.

[2] Formal sector in other hand is defined as those persons working as regular paid workers.

[3] The value label in nature of employment is regrouped into four categories. Those person working as regular paid employed under regular paid employee, contract, piece and casual paid under casual paid employee, own account worker agriculture and non-agriculture and employer under own account workers and family workers agriculture and non-agriculture under family worker category.

[4] For construction of wage decomposition for full model, the original major occupation which has ten major groups has been regrouped to only three major groups

[5] Same for major industry, for construction of wage decomposition for full model, twenty-one existing major industry has been regrouped to three major industries

Often in economic data, few large outliers can be either arguably questionable observation or data entry error. The existence of outliers can substantially influence Ordinary Least Square (OLS), therefore, to get rid of large outlier we performed scatter plot technique and removed such large and unusual observations from the sample observations. In our data, gross salary and gross hours variables had outliers. In gross salary, working person who were earning less than Nu. 100 and more than Nu. 300,000 were treated as outliers and not included in the analyses.

Similarly, in case of gross hours, persons who were working more than 105 hours in a week were treated as outliers and also therefore, excluded in the sample. Measure of labor supply was in hours spend by person working. The micro data collected hours spend by working person in reference period of past one week. This total weekly hour spent by working person were generated in total hours spent by working person in a month. To calculate the monthly total hours, standard form of four weeks a month was used. Four weeks a month was multiplied with the weekly total hours to generate monthly total hours.

Throughout the analyses, we focused our analyses to only to those employed person with the wage information. More than 71 percent of employed persons were based in rural areas with long hours of working hours, however, only 48.44 percent of total rural employed had wage information. Since wage information is prior interest to this research, this section of people was excluded from the analyses.

We restricted sample to individuals aged 15-65 years who were working in the survey reference period. We limited the sample to those people who were working 105 hours in a week. We also excluded from the sample those people who were working in an informal sector and do not have wage information. Informal sectors by definition in this paper were those working as un-paid family workers, own account workers, employer and contract, piece and casual workers. Missing wage information despite their working status were excluded from the sample. Those working persons who earns between Nu. 100 and Nu. 300,000 in a month is treated full-time workers and included in the sample. Zero report of wage information was treated as data entry error or field enumeration error and was omitted from the sample. The wage information with 'don't know' category was omitted from the sample.

Since there was high chance of career interruption of women than men in their life cycle, it was difficult to find the working experience in their career. To calculate the working experience of women's career, the standard method was adopted to measure the experience[6]. Individual's years of schooling was subtracted from the completed age. Standard number six was applied to subtract from the difference of individual's age and years of schooling since number 6 is the age for the pre-primary entry age.

3.1.2. Descriptive Statistics

Table 1 illustrates the trend of share of college degree and above in both formal and informal sectors. The first part of the table displays overall share of working men and women with university graduates and above in the country. The Bhutanese labor market was composed of more of informal sector than formal sector. Although composition of informal sectors was fluctuating over the years, overall, it illustrates decreasing trend. Share of informal sector decreased from 79.6 percent in 2009 to 65.4 percent in 2022, which has declined by 14.3 percentage points. Simultaneously, share of formal sector displayed increasing trend. It increased from 20.4 percent in 2009 to 34.6 percent in 2022. The share of college degree and above showed increasing trend in both formal sector and informal sectors. The total share of college degree and above in formal sector increased from 8.8 percent in 2009 to 24.1 percent in 2022 and 0.3 percent in 2009 to 3.1 percent in 2022 in informal sector.

In addition, women's share of college degree and above was much less than men's share in both the sectors. In formal sector, men's share of college degree and above was more than two times higher than women's share of college degree and above across the fourteen years. Men's share of college degree in 2009 was 6.2 percent and increased to 15.2 percent in 2022. However, women's share of college degree and above in 2009 is only 2.6 percent. Even though

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[6] We generated experience variable by using this method. Experience=age-years of schooling-6

women's share of college degree and above increased in 2022, but it has increased to only 8.9 percent which was little more than what men's share in 2009. This predicts that women's education was more than five years behind their men.

Correspondingly, informal sector also shared the same state. Men's share of university graduates and above, which was very less, compared to formal sector but more than two times higher than women's share across all the years. It increased from 0.3 percent in 2009 to 2.0 percent in 2022. Women's share of college degree also demonstrated rising trend which has rose from 0.04 percent in 2009 to 1.1 percent in 2022. Furthermore, overall share of working person in the country against the college degree and above showed increasing trend. Although women's share of university graduate and above has increased from 0.6 percent in 2009 to 3.8 percent in 2022, it was still very low compared to men's share of university graduates. Men's share of university graduates in 2009 is 1.5 percent and 6.6 percent in 2022. Share of college degree and above for both men and women came mostly from the formal sector. From the table, we can say that in all the three categories, share of university graduates getting employed for both men and women was increasing. It also showed that women's share of education in university degree was more than five years behind than their men counterpart across all three categories.

3.2. Trends in Gender Wage Differentials

Table 2 summarizes the overall trend in male and female wages in the last fourteen years in Bhutan. From the table, it was very clear that gender wage differential was widening and position of female within the male wage distribution was getting worse. Between 2009 and 2022, the ratio of average real wage of females deteriorated from 105 percent of average male wage in 2009 to 83 percent of average male wage in 2022. Furthermore, the differential of log real wages amplified -0.027 in 2009 to 0.327 in 2022. In other word, it meant that women earned 2.7 percent in 2009 more than men to men earning 32.7 percent more than women in 2022.

Statistically, the widening of gender wage differential was also revealed by increasing trend of male log real wage and decreasing trend of female log real wage. The result reflected that log real wage for male increased 16.9 (4.623-4.454) percent while log real wage for female fell 18.5 (4.296-4.481) percent. In continuation to support the argument, we have calculated the comparative location of female in the male wage distribution. Mean female percentile in the male wage distribution also declined from 53.60 percent in 2009 to 41.54 percent in 2022. All these indicators indicated that women's position in labor market was falling. The real wage for men and women in 2009 was approximately 108 and 114 respectively. However, in 2022 the real wage increased to 138 for men and 116 for women, which was 30 differences of real wage rise for men and 2 difference of real wage increase for women. Real wage for men increased by more than seventeen folds of what it elevated for women over the years. This estimate indicated that gender wage differential was diverging by huge difference.

Table 1. Trend of share of university graduates in formal and informal sector over the years.

Types of sectors	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Working person	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Men's share of college degree & above	1.5	2.3	2.6	2.8	3.6	4.0	3.8	3.8	4.8	5.0	5.0	5.1	5.3	6.6
Women's share of college degree & above	0.6	1.0	1.0	1.2	1.4	1.8	1.9	1.6	2.5	2.2	2.8	2.9	3.3	3.8
Total share of college degree & above	2.0	3.2	3.6	4.0	5.0	5.8	5.7	5.3	7.3	7.2	7.8	8.0	8.6	10.4
Share of formal sector	20.4	24.6	24.1	23.8	25.7	24.3	23.1	24.0	28.4	26.4	28.4	28.6	28.1	34.6
Men's share of college degree & above	6.2	7.7	9.3	9.9	11.8	13.2	13.0	12.1	13.1	14.3	14.1	14.0	15.1	15.2
Women's share of college degree & above	2.6	3.3	3.4	4.2	4.7	6.1	7.4	5.7	7.3	7.4	8.5	8.3	9.4	8.9
Total share of college degree & above	8.8	11.0	12.7	14.2	16.5	19.3	20.5	17.8	20.4	21.7	22.6	22.3	24.5	24.1
Share of informal sector	79.6	75.4	75.9	76.2	74.3	75.7	76.9	76.0	71.6	73.6	71.6	71.4	71.9	65.4
Men's share of college degree & above	0.3	0.5	0.5	0.5	0.8	1.1	1.0	1.2	1.5	1.6	1.4	1.5	1.5	2.0
Women's share of college degree & above	0.0	0.2	0.2	0.2	0.2	0.4	0.3	0.2	0.6	0.4	0.5	0.8	1.0	1.1
Total share of college degree & above	0.3	0.7	0.7	0.8	1.0	1.5	1.3	1.4	2.1	2.0	1.9	2.2	2.4	3.1

Table 2. Trend of gender wage differential over the years.

Wage differentials	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Log male real wage	4.454	4.455	4.424	4.279	4.222	4.532	4.428	4.528	4.447	4.370	4.516	4.592	4.531	4.623
	0.021	0.010	0.019	0.020	0.025	0.018	0.022	0.024	0.013	0.013	0.014	0.012	0.012	0.012
Log female real wage	4.481	4.482	4.135	3.795	3.811	4.225	4.077	4.313	4.159	3.988	4.168	4.205	4.168	4.296
	0.032	0.013	0.027	0.030	0.033	0.030	0.031	0.037	0.017	0.018	0.019	0.016	0.016	0.018
Differential	-0.027	-0.027	0.290	0.483	0.411	0.307	0.351	0.216	0.288	0.383	0.348	0.388	0.362	0.327
Mean female percentile in the male wage distribution	53.60	55.21	43.39	40.65	41.26	43.08	42.44	46.50	42.70	40.80	41.42	39.37	40.63	41.54
Ratio of average real wages between male and female	1.05	1.00	0.84	0.74	0.75	0.81	0.76	0.87	0.79	0.74	0.79	0.75	0.77	0.83
Male real wage	108.14	102.9	119.23	115.33	110.71	128.48	129.02	141.28	126.96	117.59	134.57	135.53	131.2	138.19
Female real wage	114.15	103.63	100.19	85.55	83.76	105.19	98.97	123.56	100.91	87.63	106.51	102.73	101.21	115.89

We have also observed whether widening of gender wage differential is same across all percentiles in wage distribution. Figure 1 exhibited that in Bhutan, the gender pay gap in log monthly earnings fell in all percentiles in wage distribution. However, women gained advantages in middle percentile than either of the tails in the distribution in 2009 but in 2022, throughout the percentile, men were having advantage of earning more than women. Although men gained in top percentile or in high skilled groups in both years 2009 and 2022, the gender pay gap narrowed even further in top percentiles. In bottom percentile, gender wage gap was very wide and men are favored more than their counterpart.
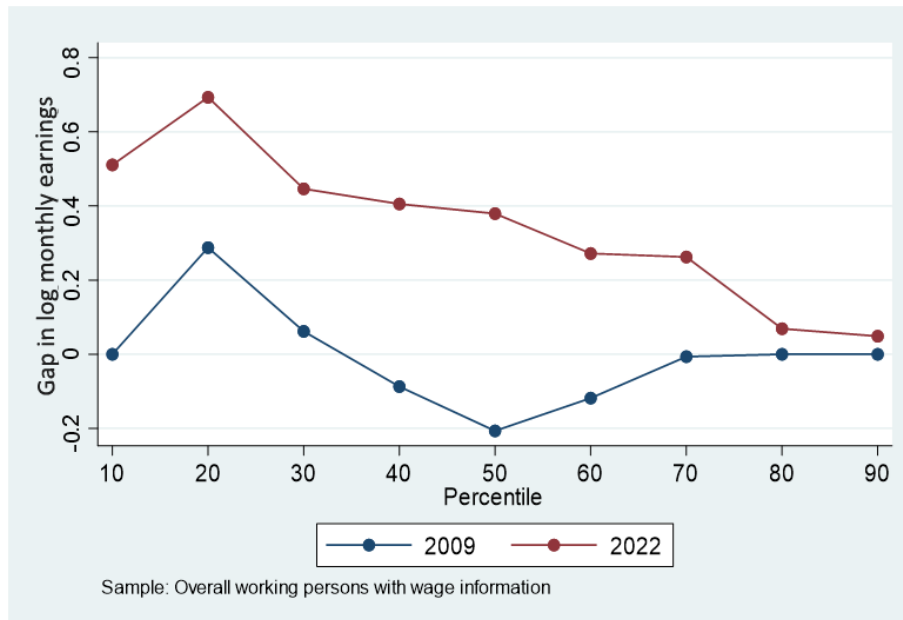

Figure 1. Gender log wage gap in Bhutan.

3.2.1. Labor Force Compositions and Wage Differential

The change in labor force composition of women in labor force affected the gender pay gap. The approximation of wage differential in men and women may occurred differently, if women work force were composed of more educated women. For instance, if the proportion of highly educated women were more likely to remain in labor force over the period of time, gender pay gap was under-estimated. Contradictory, if women labor force was composed of highly qualified women labor force and spread out to less qualified women, the estimated gender pay gap was over-estimated. Thus, we examined the share of women with different level of skill composition. We narrowed down this graph to only for married women.

Figure 2 displays the women labor force participation by different level of skill composition only for married women. Overall, women labor force participation declined over the years and the composition of labor force changed considerably as well. Even though women labor force participation dramatically fell, the percentage of skilled women workforce rose and demand for low skilled workers declined. From the stacked graph, we can assume theoretically two things because women labor force was declining. One may be due to substitution effect where their spouse's income was getting better, which do not require women to work to earn. Secondly, demand for low skilled workers in labor market declined. The tremendous shift in the composition of women labor force in the labor market may have resulted in gender wage gap.

Figure 3 shows the women labor force participation in Bhutan. From the line graph, we can see that labor force participation rate for women increased from roughly 5 percent to 81 percent as the highest. The labour force participation rate in urban peaked from 22 years and 21 years in rural area. The prime age in urban area was between the ages 26 to 29 years which was more than 65 percent. After 29 years of age, the labor force participation in urban area gradually declined. The assumption for declining labor force participation may be women exiting labor market

due to the child birth. However, in rural areas, women during the child bearing age did not exit from the labour market. The high frequency changes in women labor force participation rate will affect the gender wage gap.
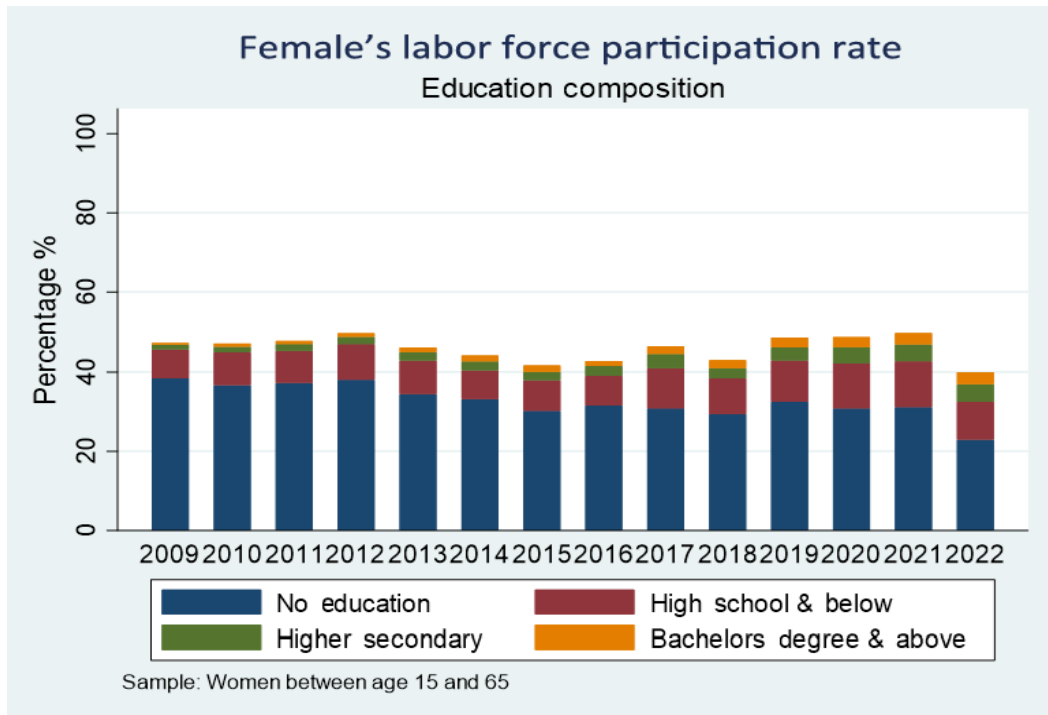

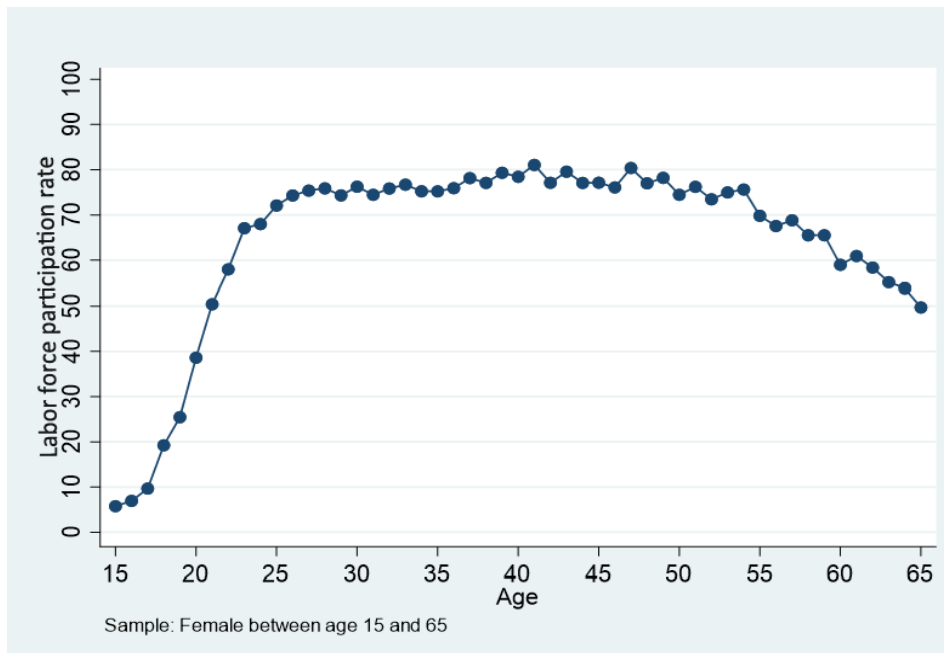**Figure 2.** Distribution of married women labor force participation by skill composition in Bhutan.

Figure 3. Distribution of female labor force participation by age in Bhutan.

3.2.2. Estimates Using Heckman's Two-Step Estimator

The problem of bias in the regression comes from using non-randomly selected sample with missing data. In contrast to standard omitted variables, in which some relevant explanatory variables in a regression equation were omitted. In this situation, a common problem is that the coefficient of regression was unbiased but standard errors, F-test, t-tests and confidence intervals are wrong. However, the problem of sample selection bias results from the

missing data of the dependent variable of the regression model. Although the samples were non-randomly selected, if there was no missing data, regression estimates will not face sample selection bias.

Sample selection bias may occur from self-selection by the individuals, which they want to work on their own preferences (Heckman, 1979). There is a term called reservation wage in economics, which means, the minimum wage at which each individual was prepared to work. If the wage they offered is less than reservation wage, they choose to stay idle at home. Employment happens only when the wage is equivalent or greater than reservation wage.

In this paper, our sample of wage analyses was restricted to full term workers with age between 15 to 65 years. Full term workers here mean those workers who have wage information. Like mentioned earlier in this paper, the wage of monthly earning less than Nu.100 and more than Nu. 300,000 were treated as missing data. Using the women working age of 15 to 65 years in our labor force surveys, we estimated the sample selection bias step by step. Following model shows the first equation:

$$P_t(z) = Prob(L = 1|z, g = 1) = \phi(Z\delta_t) \quad (1)$$

Where $P_t(z)$ specifies likelihood of being in the labor market and g is dummy variables for women. Z shows labour market characteristics (education and experience), which is correlated to the person's labor productivity in labor market. The set of instrumental variables were used as number of children aged between 0 and 6, and number of children aged 0 to 18 years and marital status.

Then in the second stage of the regression model, we included inverse mills ratio. The inverse mill's ratio is the ratio of probability density function divided by the cumulative distribution function. The addition of inverse mill's ratio in the regression models helps to control selection into the labor market.

$$W_{it} = X_{it}\beta_t + g_i r_t + g_i P_t \lambda(Z_{it}\delta_t) + U_{it} \quad (2)$$

Where W_{it} states log wage and X_{it} denotes observed variables like years of education and years of experience. From the above equation, $g_i r_t$ captures the selection corrected gender pay gap and $\lambda(Z_{it}\delta_t)$ denotes inverse mill's ratio, $g_i P_t$ captures the selection corrected gender pay gap with inverse mill's ratio and finally, U_{it} predicts error term.

To interpret the result from the above two models, Table 3 illustrates the estimates of the equations. It demonstrates both estimates of OLS gender pay gap and two-stage estimated gender pay gap. Since it was dummy variable for female, the figures shown in the table are coefficient for women. The third column, OLS is coefficient for women when labor market skills like education and experience being constant. The fourth column, Two-Stage is coefficient for women when inverse mill's ratio is included in the equation and simultaneously experience and education is also conditioned.

The third column which captures the selection corrected gender pay gap illustrates that gender pay gap worsened from 3.252 in 2009 to 4.040 in 2022. In other word, other things like experience and education being constant, women were earning 3.252 times less than men in 2009 to 4.040 times less than men in 2022. Two-Step column captures the selection corrected gender pay gap with inverse mill's ratio which also shows the same trend with widened degree of gender pay gap. Women are earning on an average 3.192 times less than men in 2009 and in 2022, women earn on average 4.199 times less than men with same level of experience and education.

However, from the first column, it shows that bias was declining. The bias, which is 2.250 in 2009, has declined to 0.979 in 2022. This also means that although women's position in men's wage distribution was fluctuating over the years, overall, it was getting better. In summary, estimates shows that gender pay gap was decreasing after labor force selection correction.

3.2.3. Correction for Selectivity of Working Women: Alternative Specifications

As we have seen in earlier discussion that change in selection into the workforce can also bring fluctuations in the estimated gender wage gap. To further scrutinize the robustness of the change brought by the various selection of labor force to estimated gender wage gap, we applied different specification and selection rule in the following section.

Table 3. Selectivity corrected gender wage Gap-Heckman's two-stage estimation.

Year	Bias	OLS	Two-step
2009	-2.250	3.252	3.192
2010	-1.447	3.521	3.526
2011	-0.696	3.530	3.521
2012	-0.675	3.641	3.687
2013	-0.236	3.356	3.601
2014	-1.209	3.628	3.739
2015	-0.810	3.702	3.876
2016	-0.795	3.901	4.024
2017	-1.068	3.587	3.649
2018	-1.025	3.658	3.723
2019	-1.238	3.753	3.811
2020	-1.084	3.938	4.050
2021	-1.174	4.090	4.224
2022	-0.979	4.040	4.199

We applied two specifications in total in the following estimated gender wage gap. Firstly, we estimated gender wage gap by restricting to only women work force and estimating probability to work. In this, we also restricted to women work force and estimated by year-wise to see the trend in variation of gender wage gap. Beside controlling, labor endowment like years of schooling and experience, we also eliminated set of women from the regression equation who has the least probability to work.

Finally, to examine the likelihood of potential outcome of marital status on women's labor force participation decision. If more women prefer to delay their marriage to get different treatment in labor market, this will result in change in composition of women labor force and will lead to gender pay gap. Thus, we excluded non-married women from our sample. We also removed those women who have less likely to be working.

Table 4 indicates estimated figure from the above regression analyses. After excluding women from the labor force with low probability to work, the gender wage gap was getting worse. The regression coefficient for women from the estimated table constantly displayed that gender wage differential was getting wider. By excluding the least probability of less than 25 percent being from the work, gender wage differential widened from 3.252 in 2009 to 3.973 in 2022.

The magnitude for gender wage differential was even wider when we included married women in the sample. When we excluded the least probability of married women from the work, like less than 30 to 35 percent, then the gender pay gap widened from 3.227 in 2009 to 4.056 in 2022.

Table 4. Selectivity corrected gender wage gap selection control.

Selection control	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Excluding the least likely to work (Prob<0.2)	3.252	3.461	3.326	3.514	3.106	3.665	3.746	3.880	3.621	3.616	3.670	3.881	3.859	3.973
Excluding the least likely to work for married women (Prob<0.3)	3.227	3.472	3.532	3.683	3.160	3.839	3.872	3.965	3.721	3.710	3.740	4.014	3.922	4.046
Excluding the least likely to work for married women (Prob<0.35)	3.227	3.474	3.544	3.680	3.192	3.842	3.864	3.913	3.729	3.725	3.749	4.015	3.920	4.056

4. DECOMPOSITION OF GENDER WAGE DIFFERENTIALS

4.1. Methodology

4.1.1. Framework

For the design of sampling two stage method was adopted to determine the sample size in the Enumeration Block or Enumeration Area in urban and Chiwog[7] in rural areas. Enumeration Areas in urban and rural areas were taken as Primary Sampling Units (PSUs). The households in the selected PSUs were considered as Secondary Sampling Units (SSUs). To select fixed number of households in the selected PSUs, Circular Systematic Sampling (CSS) method was applied.

The following equation represents the male wage distribution which decompose gender wage gap in terms of gender specific factors and part brought due to change in wage inequality.

$$Y_{it} = X_{it}B_t + \sigma_t P_{it} \tag{3}$$

Where i represents each male worker and t denotes year, Y_{it} indicates log of earnings for male, X_{it} indicates labour market characteristics (education and experience) and B_t designates a vector of coefficient, σ_t is level of male residual wage inequality and P_{it} denotes residual.

The male-female log wage gap for year t is

$$D_t = Y_{mt} - Y_{ft} = \Delta X_t B_t + \sigma_t \Delta P_t \tag{4}$$

Where m and f subscript indicate male and female average respectively, and prefix Δ denotes the average male-female difference for the variable immediately following. The Equation 4 shows that the gender wage gap which can be broken down into part owing to difference in observed labor market characteristics (X_t) weighted by the male returns (B_t) and the part owing to relative variation in the position of residual (P_t) multiplied by overall wage dispersion (σ_t).

The change in gender wage gap between 2 years 0 and 1 can then be broken down using Equation 4 into following notation:

$$D_1 - D_0 = (\Delta X_1 - \Delta X_0)B_1 + \Delta X_0(B_1 - B_0) + (\Delta P_1 - \Delta P_0)\sigma_1 + \Delta P_0(\sigma_1 - \sigma_0) \tag{5}$$

From the Equation 5, the first term reflects the share due to change in male-female differences in labor market skills like education and work experience. For example, the change in job experience is associated with change in gender wage gap. The second term indicates the result of variation in prices of observed labor market skills in males. For example, given that in actual sense women have less work experience than men, due to increasing return to men's job experience, gender wage gap worsened.

The third term, the gap effect measures the outcome of variation in differences in the relative wage positions of men and women after controlling for observed labor market qualifications. In other words, the position of where women lie within the man's residual wage distribution. Finally, the fourth term measures the change in price of unobserved labor market skills.

For example, discrimination or relative lack of unobserved skill would change female workers' position unfavorably in distribution of residual. This change in position would be captured by the gap effect. If fourth term gets greater, being in relatively low position in the residual distribution receives more punishment than before thereby widening gender gap if on average female workers' position is relatively low in residual distribution.

The first and the third term measure portion due to gender-specific factors such as labor market qualification or relative position in the residual distribution, while the second and the fourth term measure portion due to change in overall wage structure.

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[7] Technical definition of chiwog is a group of villages in rural areas and it is taken as a primary sampling unit in this survey.

4.1.2. Model Specification and Implementations

We used two models to investigate wage equation. The following two models are human capital model and full model. The difference between these two models is inclusion of occupational and industrial groups. The human capital model has education and experience variable of each worker, which helps in separating gender wage differential caused by discrimination during the inclusion of occupational and industrial groups in full model. In addition to education and experience variables of the workers, the full model includes one digit occupation and industry code, which would increase the accuracy of the estimation.

To get the change in observed education and experience, we estimated wage regression of men's sample for year 1. Then using the coefficients, we estimated wage regression of female workers in year 1. Similarly, we estimated imputed wage of both men and women workers in year 0. From this estimation, we calculated the first term, which is difference of year 1 and year 0.

The second term measured the effect of change in price of education and experience. After estimating wage regression for men workers in year 0, we calculated predicated wage for both men and women in year 0. Then the second term was measured by difference of imputed and predicted wage of year 0.

To measure the gap effect and change in unobserved labor market qualifications, we estimated wage regression of men in year 0. From this we found the position of women workers in men's workers residual distribution. Using this women's position, we estimated imputed residual of women workers in year 1. The difference between the actual residual and imputed residual of women workers in year 1 measures the gap effect. This captured the change in position of women workers in residual distribution.

Finally, we measured the fourth term. It is the difference between the imputed residual of women workers of year 1 and residual of women workers in year 0. This term captured difference in dispersion of unobserved labor market qualification of women workers where their relative position was unchanged.

5. EMPIRICAL FINDINGS

In this section we discuss the interpretation of findings of wage decomposition method we have applied in this study. Human capital model and full model were discussed separately in the following section.

5.1. Human Capital Model

Table 5 summarizes the human capital model in Bhutan from 2009 to 2022. The mean female residual from wage regression increased more than six times and this residual comprises measure of unobserved labor market qualifications. The mean female residual percentile declined from 46.64 in 2009 to 39.09 in 2022. The residual term signifies effect of possible discrimination and unobserved labor productivity difference of men and women, which cannot be described by explanatory variables. Statistically, the result continuously indicated that unobserved skill gap has widened.

The panel B illustrates how explained and unexplained variables contribute to increasing wage differentials earned by men and women over the last fourteen years. The gender pay differential in log monthly wage widened by 0.354 log points over the fourteen years. Despite improved level of women's labor market skills, gender wage gap did not decline. Instead, women's improved levels of explanatory variables contributed 10.10 percent (0.036/0.354) in divergence of gender pay gap. Although, women's work experience has narrowed the gender wage gap by 23.98 percent (0.085/0.354), their improvement in education endowment contributed 34.08 in widening the wage gap. Due to this, the overall contribution to the observed X's is positive which resulted in widening of gender pay gap.

The decomposition results further showed that observed price contributed in increasing the gender pay gap. The positive in observed price effect specifies that price of labor market qualifications like education and experience have led to increase the gender wage differentials by 19.84 percent (0.070/0.354). While the price of experience has reduced

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gender pay gap, the rising returns to education has contributed 33.75 percent (0.120/0.354) in increasing the gender wage differential.

The third term gap effect is positive. This positive sign in gap effect indicates that women's position in men's residual distribution has worsened than before. The downward movement of women in men's residual distribution increased gender wage differentials by 0.209 log points which contributed 58.96 percent of total gender pay gap. The alteration of women's position in men's residual distribution may be triggered by factors like increased discrimination against women workers or unobserved labor market qualification of women were increasing.

Finally, the fourth term explains the wage inequality based on position of women in men's residual distribution or unexplained variables. The unobserved price result from the decomposition shows that women workers were relatively in unsuitable position in the residual distribution which contributed 11.10 percent (0.039/0.354).

To sum up, our decomposition result illustrates that gender wage differential comes from gender specific factors. Gap in education and experience widened gender wage differential. Furthermore, women workers need training in unobserved skills where they can be prevented from any discrimination in the labor market.

Table 5. Decomposition of changes in the gender pay gap: Human capital model.

A. Descriptive statistics	Human capital model
Mean female residual from male wage regression	
2009	-0.049
2022	-0.297
Mean female residual percentile	
2009	46.64
2022	39.09
B. Decomposition of change	
Change in differential (D2022-D2009)	0.354
Observed X's	0.036
Education	0.121
Experience	-0.085
Observed Prices	0.070
Education	0.110
Experience	-0.049
Gap effect	0.209
Unobserved prices	0.039
Sum gender-specific	0.245
Sum wage structure	0.110

5.2. Full Model

Table 6 summarizes the wage decomposition findings in Bhutan using the full model, which we added industry and occupation code with one digit classification. After controlling industry and occupation in the model, the increase in human capital of women workers were adequate to prove 22.46 (0.080/0.354) percent of the divergence. The increase in women's comparative education level alone contributed 17.15 (0.061/0.354) percent share of rise in gender pay gap.

Similar to human capital model, full specification model also showed that rise in women's experience in labor market has contributed in reducing gender pay gap by 22.06 (-0.078/0.354) percent. In respect of job classification, shift in occupation and industry did not assist in reducing gender wage differential. Industry and Occupation contributed 23.24 (0.082/0.354) percent and 4.12 (0.015/0.354) percent respectively in widening gender pay gap.

The observed price effect is positive, which means price of labor market qualification did not contributed in closing the gender wage gap but rather widened gender pay gap. Returns to women's education did not contribute in closing the gender wage gap. The price of shift in occupation and industry has contributed in narrowing the gender wage differential. The price of experience also contributed in narrowing the gender wage differential by 6.04 percent.

Owing to this, the overall observed price has contributed 19.91 (0.070/0.354) percent in diverging gender wage differential.

There was substantial gap effect while we estimated human capital model. Conversely, the estimate of full model illustrates that the gap effect dramatically narrowed and the gap effect was affected by excluding industry and occupation in the model. After controlling for industry and occupation in the model, the gap effect was however, positive but declined and contributed in closing the gender wage gap. The reduced gap effect in full model was contributed due to women's selection sorting into low paying job, which contributed to increased gender wage differential.

Lastly, in the full model, unobserved prices were also positive which further increased gender differential by 2.87 (0.010/0.354) percent. The gap effect contributed 54.76 (0.194/0.354) percent in rising gender pay gap. In total, it resulted in widening gender wage differential by 0.204 log points (0.194+0.010) within industries and occupations.

In summary in full model, gender wage differential was contributed from gender specific factors. Gap in education widened gender wage differential. Furthermore, women workers need training in unobserved skills where they can be prevented from any discrimination in the labor market. Women's selection into the occupation and industry has also contributed to gender wage differential, therefore, women workforce needs to be sensitized on choosing the better paying jobs.

Table 6. Decomposition of changes in the gender pay gap: Full model.

A. Descriptive statistics	Full model
Mean female residual from male wage regression	
2009	–0.008
2022	–0.212
Mean female residual percentile	
2009	49.30
2022	41.86
B. Decomposition of change	
Change in differential (D2022-D2009)	0.354
Observed X's	0.080
Education variables	0.061
Experience variables	–0.078
Industry variable	0.082
Occupation variable	0.015
Observed prices	0.070
Education variables	0.105
Experience variables	–0.021
Industry variable	–0.007
Occupation variable	–0.006
Gap	0.194
Unobserved prices	0.010
Sum gender-specific	0.273
Sum wage structure	0.081

6. CONCLUSIONS

We investigated the cause of change in gender wage differential in Bhutan between 2009 and 2022. To address the issue, we used micro-data of LFS from MoLHR and NSB. The increasing gender wage differential mostly contributed from gender specific factors. To be more specific, improved in women's work experience narrowed gender wage differential however, gap in education led to increase gender wage differential. The gap effect in full model declined by 4.20 percent. This reduced gap effect in full model comes from women's selection of occupation and industry, where women sort into low paying jobs, which resulted in increased gender wage differential.

Although nominal wage for both men and women were increasing, the real wage was increasing dramatically faster for men than women. From this, it showed that men's nominal wage was increasing higher and faster than

women's nominal wage. It also indicated that mean female percentile in the male wage distribution was also declining. Which means that in spite of women's improved labor market qualifications (education and experience), women's average wage in men's wage distribution was getting worse.

We also investigated whether gender wage differential was due to sample selection bias. We applied Heckman's two-step estimator. From this we found that even after sample selection correction, gender wage differential was getting worse. Finally, we applied correction for selectivity of working women: Alternative specifications. We applied two specifications. First, we estimated gender wage gap by restricting to only women work force and estimating probability to work. Second, we examined the likelihood of potential outcome of marital status on women's labor force participation decision. The empirical result after this method, showed that gender wage differential was rising.

To sum up, gender wage differential in Bhutan was increasing. Even after the application of Heckman selection correction and women's selection into the labor force led to increase the gender wage differential. Gap in observed price of labor market characteristics (education) in both the models acted against women by huge magnitude. The gap effect in human capital model acted against women by huge magnitude but its effect on full model has reduced. This reduced gap effect in full model contributed due to women's selection sorting to low paying job.

7. POLICY IMPLICATIONS

From the above analysis, we have reached the conclusion that the results have significant policy implications. Since the empirical result showed that gender wage differential was increasing, the overall policy objective of Royal Government of Bhutan (RGoB) is to reduce or eliminate gender wage gap existing between men and women through various policy interventions. Some of the key variable's intervention to reduce or eliminate gender wage differential are improving education gap between men and women especially in secondary and tertiary education. This we can do by encouraging women's education. The results from the decomposition clearly illustrate that gap in education between men and women contributed to gender wage differential by 34.08 percent in human capital model.

The analysis showed that gender wage differential narrowed due to women's improvement in working experience. Statistically, it showed that 23.98 percent of reduction in gender wage differential resulted from women's improved job experience. Therefore, another policy suggestion is to provide labor market skills to women labor force in terms of training like internship and on the job training.

Finally, to rectify women's selection sorting into low paying job, which also contributed to rising gender wage differential, RGoB can provide women with better job market information. Government can widen access to job market information, which may help women's barrier into the high paying jobs. Therefore, this program will enable women to take up better paying jobs.

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