

**The employment sector and gender wage gap in Taiwan: 1979-1995**

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## **I. Introduction**

### **1. Background:**

In the past thirty years, Taiwan has experienced one of the highest economic growth rates in the world, and became the world's 14th largest trading area. On average, real GDP grew at an annual rate of over 6%, higher than that in Singapore and Hong Kong during the same period. With this economic development, the sector structure of employment has been changing as well. During the period between 1978 and 1995, the percentage of female in agriculture declined from 26% to 12%, but the ones in industry and service increased, respectively, from 39% to 43% and 35% to 46%<sup>aa</sup>.

Moreover, women's labor force participation has risen. From 1975 to 1996, female labor force participation in Taiwan increased from 38% to 45%, while the rate for men declined from 78% to 71%<sup>a</sup>. During the same period, the percentage of working-aged women with vocational or university-level training jumped from 16% to 37%, but the number for men increased only from 25% to 44%. While the relative years of education of men and women in the workforces did not change between 1979 and 1995, the proportion of women with a technical university or vocational high school degree increased by more than the proportion of men with a technical degree (table 1). In addition, two other types of human capital, years of tenure and experience, also increased more for women than for men between 1979 and 1995.

Table 1 gives the mean values of main variables by gender.

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<sup>a</sup> Statistics, *The Report on Women's Status in Taiwan, 1998*

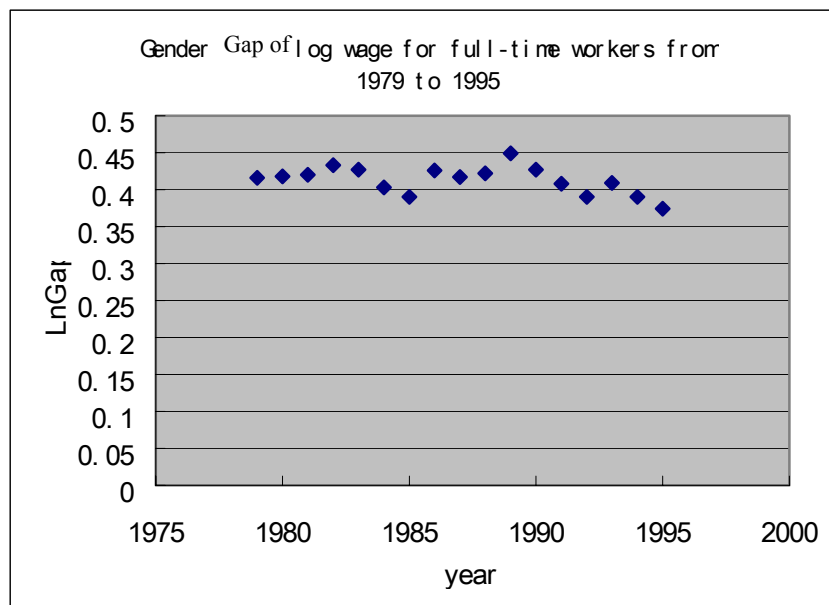
**Table 1: The mean values of main variables by gender**

	1979			1995		
	men	women	w /m	men	women	w/m
weekly earnings	11. 2643	10. 8911	0. 97	12. 7888	12. 4592	0. 97
years of education	7. 7953	8. 0333	1. 03	9. 9559	10. 2885	1. 03
years of tenure	9. 5082	4. 5035	0. 47	9. 0463	5. 4721	0. 60
technical major	0. 1061	0. 0294	0. 28	0. 2828	0. 0927	0. 33
experience	23. 0270	13. 4754	0. 59	23. 4327	17. 9658	0. 77

*(Source: data come from author calculation using the Taiwan Manpower Utilization Surveys)*

These changes seem to be favorable for the women. It would appear that as more and more of Taiwan’s economy includes female employees with high levels of human capital, women should better off. However, the ratio of earning between females and males in Taiwan has been relatively constant, which is of great interests and significance and has been studied extensively by many researchers (see table 1).

**The gender gap of log wag for full-time worker controlling education, experience and major from 1979 to 1995**



*Figure 1*

[data from Jessica L. Baraka “The Gap Remains: Gender and Earnings in Taiwan,” *Research Program in Development Studies Princeton University, July 30, 1999(a)* and Jessica L. Baraka “Does Type of Degree Explain Taiwan’s Gender Gap?” *Research Program in Development Studies Princeton University, July 30, 1999(b)*]

## 2. Literature reviews

The literature has generally measured and analyzed the gender wage gap in Taiwan using the Blinder(1973)-Oaxaca (1973) decomposition. This decomposition of gender wage gap [Blinder-Oaxaca (1973)] is a common method of measuring labor market discrimination against women. The standard Blinder-Oaxaca decomposition explains wage differentials in terms of differences in individual characteristics (characteristic effects) and differences in the coefficients of the earnings equations (coefficients effect).

The first step in the Blinder-Oaxaca decomposition is to estimate a wage equation for men and women of the following form:

$$Y_{in} = \beta_{in} X_{in} + e_{in} \quad (1)$$

where i is Male or Female and n is the individual;  $Y_{in}$  is the natural logarithm wage of individual n;  $X_{in}$  is a vector of the wage-determining characteristics of individual n, while  $\beta_{in}$  are coefficient to be estimated by ordinary least square regression. From this estimated regression, we can estimate the mean wage for each group:

$$\bar{Y}_i = \beta_i \bar{X}_i \quad (2)$$

Adding and subtracting  $\beta_m \bar{X}_f$  to  $\bar{Y}_m - \bar{Y}_f$  gives us the Blinder-Oaxaca decomposition

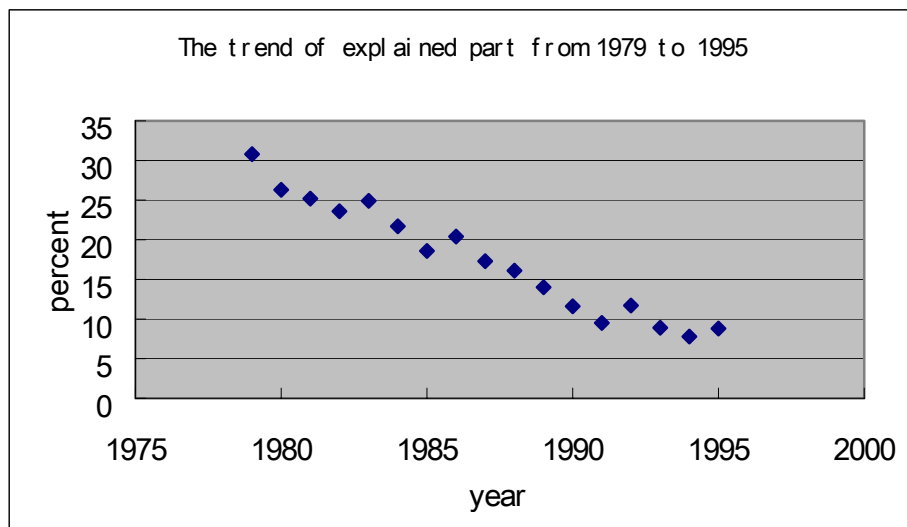
$$\bar{Y}_m - \bar{Y}_f = \beta_m \bar{X}_m - \beta_f \bar{X}_f \pm \beta_m \bar{X}_f = (\bar{X}_m - \bar{X}_f) \beta_m + (\beta_m - \beta_f) \bar{X}_f = E + U$$

Where E is the wage difference that can be explained by differences in wage-determining characteristics between men and women; while the second term (U) is the unexplained share of

the wage difference.  $U$  is the share of the gender wage gap that can not be explained using personal characteristics, and could be considered as a rough measure of wage gap due to labor market discrimination between men and women.

Variable that are included in  $X$  in the literature include education, experience and degree type. Controlling for these variables, the literature has pointed out that the gender wage gap has remained stable in Taiwan during the past two decades, the explained part of gender wage gap has declined, while the unexplainable part has increased.

**The trend of explained part from 1979 to 1995(Controls for education level, age and degree type)**



*Figure 3*

[data from Jessica L. Baraka “ The Gap Remains: Gender and Earnings in Taiwan,” *Research Program in Development Studies Princeton University, July 30, 1999(a)* and Jessica L. Baraka “Does Type of Degree Explain Taiwan’s Gender Gap?” *Research Program in Development Studies Princeton University, July 30, 1999(b)*]

(1) Education and experience. Education and experience are two of the most important factors that affect earnings. Changes in education policy in Taiwan have made it so that more and more

people have the opportunity to receive higher education. Today, women in universities and colleges in Taiwan are almost half of total students. At the same time, women's labor force participation has increased and intermittence in women job period is reduced. Females gained in education and experience more than males did, which will reduce the gender wage gap. But the women suffered a large loss in unmeasured gender-specific factors, which reflected an increase in wage discrimination against women. Since the loss offset the woman's gain, the gender wage gap remained at its previous level (Zveglic 1997, Baraka 1999a).

(2) Degree type. Generally, degree type may be equally important to earnings as education level. Degree type, to some extent, is linked to occupation. Baraka (1999b) used a standard human capital framework to examine the effects of degree type on earnings in Taiwan. She generalized all majors into two categories: technical and non-technical. With implementation of a policy expanding higher education and technical development in Taiwan, the change in Taiwan's education and science & technology policies increased the returns to skill (Helms 1999, Gindling and Sun 2000, James 2001). However, Baraka's analysis found that the impact of degree type on earnings varies by gender, having a more substantial impact on men than women. Degree type can successfully explain a substantial portion of the gap in women and men university graduate's earnings, but does little to explain the overall gender gap in earnings in Taiwan.

Thus, changes in the education and degree type earned by men and women can not fully explain the stable gender wage gap in Taiwan. If only education and degree type were considered, the gender wage gap in Taiwan would have fallen. The part of the gender wage gap

unexplained by education and degree type has increased in Taiwan. Some have interpreted this as an increase in labor market discrimination. But, the increase in the unexplained part of the gender wage gap could be due to a variable omitted from the wage equations in the Oaxaca-Blinder decompositions. One such variable might be sector of employment. As is shown in table 2, the structure of employment by sector has changed considerably in Taiwan between 1979 and 1995. Also, the wage premiums for employment in sectors may have changed. In this paper, we will test whether changes associated with sector of employment can explain part of the increase in the previously "unexplained" part of the gender wage gap, something not explored in previous papers.

**Table 2: worker percent in each sector by gender.**

Sector	1979			1995		
	Total	Men	Women	Total	Men	Women
<b>Employer</b>	4.86	6.14	1.56	5.82	7.50	2.68
<b>Self-employed</b>	23.32	27.82	11.69	18.55	23.16	9.93
<b>Government</b>	14.70	14.97	14.02	11.99	11.31	13.28
<b>Private</b>	57.11	51.08	72.73	63.44	58.03	74.12
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

*(Source: data come from author calculation using the Taiwan Manpower Utilization Surveys)*

Searching for the reasons of the gender wage has important social and economic worth. At first, it would provide the paths for women to get equivalent earning as men, and so as to help realize gender equality. Besides, if the gap comes from discrimination against women, women's human capital could not be fully realized as men do. So eliminating discrimination would improve economic efficiency. So it is worth investigating other factors that might affect

the gender wage gap.

## II. Data and Methodology

### 1. Data and variables

The data for this research come from the 1979 and 1995 annual Taiwan Manpower Utilization Surveys (TMUS). This is a household survey covering the population of Taiwan above age 15. The household samples were created using a two-stage randomization procedure. First, about 500 counties were selected from the over 7000 counties in Taiwan. Second, households were selected within these counties. Estimates obtained from the TMUS include salary, years of school, hours of work, years of tenure, experience, squared experience. The paper also uses several dummy variables: marriage, major (technical and non-technical), and several dummy variables sector. The data for sectors are a set of dummy variables that equal one if they worker is on employer, self-employed, a government worker, a private sector employee and unpaid family worker). During the calculation, the data for unpaid family worker will be dropped because worker in the sector has no wage.

### 2. Methodology:

The paper will use the Oaxaca-Blinder decomposition discussed on page 4 to replicate the results in the relevant literature, to test if gender wage gap in Taiwan is relatively stable from 1979 to 1995. It will also check if the explained share of the wage difference decreased, and if the unexplained share of the wage gap increased. The independent variables in the wage equation include education, experience and major, which have been used in similar studies in the literatures. Tenure is another important variable because it is a measure a type of human

capital-on the job training. This step also include a dummy variable that is one if the worker is married, and the number of hours worked per week as independent variables.

To test if sector of employment is a significant determinant of the change in the gender wage differentia, the second step will include dummy variable for sector (S) in the wage equations, and get

$$Y_{in} = \beta_{in}^1 X_{in} + \beta_{in}^2 S_{in} + e_{in} \quad (3)$$

Then estimating, for each gender, a wage equation of the form:

$$\bar{Y}_i = \beta_i^1 \bar{X}_i + \beta_i^2 \bar{S}_i \quad (4)$$

Adding and subtracting  $\pm(\beta_m^1 \bar{X}_f + \beta_m^2 \bar{S}_f)$  from  $\bar{Y}_m - \bar{Y}_f$  gives the Blinder-Oaxaca decomposition:

$$\begin{aligned} \bar{Y}_m - \bar{Y}_f &= \beta_m^1 \bar{X}_m - \beta_f^1 \bar{X}_f + \beta_m^2 \bar{S}_m - \beta_f^2 \bar{S}_f \pm (\beta_m^1 \bar{X}_f + \beta_m^2 \bar{S}_f) \\ &= (\bar{X}_m - \bar{X}_f) \beta_m^1 + (\beta_m^1 - \beta_f^1) \bar{X}_f + (\bar{S}_m - \bar{S}_f) \beta_m^2 + (\beta_m^2 - \beta_f^2) \bar{S}_f \\ &= E^* + U^* + SE + SU \end{aligned}$$

where  $S_{in}$  is a vector of dummy variables for self-employed, government and private sector employee.

In this equation, SE and SU are separately the part of the gender wage gap explained by differences in the proportion of men and women in each sector (SE) and differences in the wage premiums paid to men and women in each sector (SU).  $E^*$  is the part of the gender wage gap explained by differences in education, experience, major, tenure, work hours, and marriage.  $U^*$  is the part of the gender wage gap not explained by differences the proportion or returns to sector, nor explained by differences in education, experience, major, tenure, work hours, and marriage.

This step will determine if the sectors employment has a significant independent effect on the gender wage gap in Taiwan. Sector dummy variables would be considered as a part of unexplained gender wage gap. The objective is to check if the increased unexplained gender wage gap partly comes from the omitted variable: employment sector. The employer sector would be regard as a reference to the other three sectors to estimate the effects of sector on wage. Also, it will examine whether, after controlling for sector of employment, the unexplained part of the gender wage gap still increased between 1979 and 1995. If so, then it can conclude that changes in sector of employment did not explain the "unexplained" part of the wage gap.

### III. Results

#### 1. First step: Replicating the results

Table 3 presents the results of the Oaxaca-Blinder decomposition where the explanatory variables are education, experience, major, tenure, work hours, and marriage.

**Table 3: Gender wage gap decomposition**

	<b>LnGap</b>	<b>E</b>	<b>U</b>
<b>1979</b>	<b>0.3732</b>	0.1798	0.2025
<b>1995</b>	<b>0.3296</b>	0.0284	0.3030
<b>Change</b>	<b>-0.0436</b>	-0.1515	0.1005

*(Source: data come from author calculation using the Taiwan Manpower Utilization Surveys)*

Table 3 gives at least two conclusions. One is we can see that gender wage gap has decreased about 11% from 1979 to 1995 in Taiwan. This is different from the conclusions of previous research. The previous analysis concluded a relatively stable gender wage gap in Taiwan at this period. The other one is that the explained share (E) declined, while the

unexplained share (U) increased substantially. This result is consistent with the literature review. The following discuss why the explained portion of the gender wag gap decreased.

Why did the explained share of the wage gap fall? The data in Table 1 show that women’s education level increases only slightly higher than men; but experience and tenure have notable increases for women compared with men’s. So, it is not the education level but the tenure and experiences that cause the explained part (E) declined. If women were been compensated the same as men were, the gender wage gap should have decline more.

**Table 4: Earning regression for men and women in Taiwan, 1979 and 1995**

	1979		1995	
	Men coefficient	Women coefficient	Men coefficient	Women coefficient
<b>marriage</b>	0.17543 (0.01131)	<b>0.02853</b> (0.01547)	0.11675 (0.01141)	<b>-0.01762</b> (0.01328)
<b>educaton</b>	-0.05167 (0.00116)	0.05519 (0.00150)	0.053727 (0.00148)	0.06852 (0.00178)
<b>work hour</b>	0.01154 (0.00039)	0.00935 (0.00058)	0.01476 (0.00042)	0.00985 (0.00056)
<b>tenure</b>	-0.00544 (0.00049)	0.01055 (0.00103)	-0.00595 (0.00053)	0.01040 (0.00083)
<b>major</b>	0.12184 (0.01328)	<b>0.03724</b> (0.02800)	-0.01058 (0.00976)	<b>0.07185</b> (0.01612)
<b>experience</b>	0.04685 (0.00122)	0.02700 (0.00175)	0.04658 (0.00123)	0.02830 (0.00144)
<b>experience squared</b>	-0.00077 (0.00022)	-0.00045 (0.00003)	-0.00083 (0.00002)	-0.00049 (0.00003)
<b>constant</b>	9.6771 (0.02609)	9.70989 (0.03696)	11.06370 (0.02936)	10.98599 (0.03854)

*(Boldface coefficients indicate that coefficients are insignificant)  
(Significance level—5%)*

Table 4 presents the results of the wage regressions for men and women for 1979 and 1995. The coefficients on the marriage dummy variable for women are insignificant in both years, indicating that married women do not earn significantly different wages than single women. All other coefficients are significantly different from zero at the 5% level, except for the coefficient on major for women in 1979 and for men in 1995. All coefficients are of the expected signs except for tenure, which is negative for men, indicating that men with more tenure receive lower wages. The coefficients on education for men in both years are similar to the coefficient on education for women. The returns to one more year of education are similar for men and women about 5%-6%. The coefficient on hours worked for men is higher than that for women in both years, and the difference increases between 1979 and 1995. This may help to explain why the unexplained part of the gender wage gap increased. Between 1979 and 1995 the coefficient on major increased for women but decreased for men. Therefore this did not contribute to the increase in the unexplained part of the gender wage gap. The coefficients on experience are higher for men than women in both years, but these coefficients do not change between 1979 and 1995. Therefore, this did not contribute to the increase in the unexplained part of the gender wage gap. The majority of the increase in the unexplained portion of the gender wage gap was due to an increase in the difference between men and women in the constant terms in the wage equations, which increased by 0.1109 (compared to an increase in U of 0.1005). In summary, the increase in the unexplained portion of the gender wage gap was due to changes in the constant term and an increase in the returns to hours worked for men (while returns to hours worked for women remained the same).

Should we regard all increased unexplained gender wage gap as discrimination against women? It may be the result of omitting some other important variables, such as sector. Next we test for this possibility.

## 2. Adding Sector of Employment into Oaxac-Blinder decomposition

Table 5 presents the results of the Oaxaca-Blinder decomposition after controlling the sector of employment where the explanatory variables are education, experience, major, tenure, work hours, marriage, self-employed, government and private sector worker.

**Table 5: Decomposition of gender wage gap after controlling the sector of employment**

	Gap	E*	E(%)*	U*	U(%)*	SE	SE(%)	SU	SU(%)
<b>1979</b>	<b>0.3732</b>	0.1782	48%	0.0199	5%	0.0019	0.5%	0.1732	46%
<b>1995</b>	<b>0.3296</b>	0.0353	11%	0.2475	76%	-0.0228	-6.9%	0.0693	21%
<b>Change</b>	<b>-0.0436</b>	-0.1429	-37%	0.2276	71%	-0.0247	-7.3%	-0.1039	-25%

*(Source: data come from author calculation using the Taiwan Manpower Utilization Surveys)*

Table 5 show that changes in the proportion and wage premiums for different sectors contributed to reduce the gender wage gap. The part of the wage gap explained by differences in the proportion of men and women in each sector (SE) decreased by -0.0247, while the part of the change in gender wage gap due to differences in the wage premiums paid to men and women in each sector (SU) decreased by -0.1039. In fact, adding sector dummy variables to the wage equation increased the contribution of changes in the portion of the gender wage gap not explained by differences in the proportion or returns to sector, nor explained by differences in education, experience, major, tenure, work hours, and marriage (U\*). U\* is the unexplained part of the gender wage differential after controlling for differences related to sector of employment.

Comparing U to U\* from table 3, we see the difference increases from 0.1005 to 0.2276.

**Table 6: Earning regression for men and women in Taiwan after controlling the sector of employment, 1979 and 1995**

	1979		1995	
	Men coefficient	Women coefficient	Men coefficient	Women coefficient
<b>marriage</b>	0.14969 (0.01092)	<b>-0.00648</b> (0.01591)	0.12354 (0.01178)	<b>-0.02036</b> (0.01355)
<b>educaton</b>	0.04235 (0.00121)	0.04529 (0.00161)	0.04085 (0.00159)	0.05517 (0.00186)
<b>work hour</b>	0.01105 (0.00037)	0.00975 (0.00058)	0.01620 (0.00043)	0.01061 (0.00056)
<b>tenure</b>	-0.00209 (0.00048)	0.00884 (0.00102)	-0.00383 (0.00053)	0.00758 (0.00082)
<b>major</b>	0.13069 (0.01294)	<b>0.04730</b> (0.02835)	<b>-0.00446</b> (0.01015)	0.07438 (0.01606)
<b>experience</b>	0.04390 (0.00115)	0.02420 (0.00172)	0.04230 (0.00124)	0.02519 (0.00141)
<b>experience squared</b>	-0.00073 (0.00002)	-0.00041 (0.00003)	-0.00076 (0.00002)	-0.00046 (0.00003)
<b>self-employed</b>	-0.74912 (0.01647)	-0.82436 (0.04107)	-0.60781 (0.01680)	-0.52116 (0.03234)
<b>government</b>	-0.54459 (0.01768)	-0.66222 (0.04109)	-0.24336 (0.01857)	-0.23364 (0.03198)
<b>private</b>	-0.60568 (0.01584)	-0.80878 (0.03973)	-0.34746 (0.01581)	-0.45758 (0.02994)
<b>cons</b>	10.39694 (0.03089)	10.59906 (0.05700)	11.51363 (0.03563)	11.55728 (0.05125)

*(Boldface coefficients indicate that coefficients are insignificant)*

*(Significance level—5%)*

The coefficients on self-employed, government and private sector for women and men in both years are all negative, which is expected sign because employer sector has highest wage

both for women and men. The difference of coefficient on sectors between men and women decreased in 1995. Therefore, this did contribute to the decrease in the unexplained part of the gender wage gap. Moreover, the coefficient on education, marriage, work hour, tenure, major and experience almost have the same change for men and women. So the meaning and effects of their coefficient on gender wage gap are the same with before controlling sector of employment. Among them, the coefficient on hours worked for men is higher than that for women in both years, and the difference increases between 1979 and 1995. Only this may help to explain why the unexplained part of the gender wage gap ( $U^*$ ) increased. Thus, as before controlling dummy variables, the coefficient for the majority of the increase in the unexplained portion of the gender wage gap ( $U^*+SU$ ) was due to an increase in the difference between men and women in the constant terms in the wage equations, which increased by 0.1575 [compared to an increase in ( $U^*+SU$ ) of 0.1237]. The increase in  $U^*$  is mainly because of the increase in difference in constant terms. In summary, the increase in the unexplained portion of the gender wage gap was due to changes in the constant term and an increase in the returns to hours worked for men (while returns to hours worked for women remained the same). Therefore, we can conclude that changes related to sector of employment cannot explain the "unexplained" part of the change in the gender wage gap.

## **Conclusions**

Based on Blinder-Oaxaca (1973) decomposition, the paper analysed the gender wage gap, E and U of gender wage gap in Taiwan from 1979 to 1995. The replicating results show

that gender wage gap was not constant as concluded by previous literatures but slightly decline. Consistent with the literature's conclusion, E declined and U still increased from 1979 to 1995. The decrease in E is because of women's gains in tenure and experience. Through analyzing the regression results, the paper find that the majority of increase in U is because of the increase in difference between men and women in constant term. Thus, the original Blinder-Oaxaca decomposition might omit some important independent variables. To test if the increase in U is the result of omitting the significant variables, the paper adds the sector of employment as dummy variables into the Blinder-Oaxaca equation. But the paper found that, after controlling sector of employment, the explained part of gender wage gap ( $E^*+SE$ ) declined and the unexplained part ( $U^*+SU$ ) not only still increased, but also more than that before. By separately decomposing the effects of dummy variables (SU) and all other variables ( $U^*$ ) (marriage, education, tenure, major, work hour and experience), it found that sector of employment (SU) would contribute to decrease the unexplained part of gender wage gap ( $U^*+SU$ ). Comparing U to  $U^*$ , it found that difference increased from 0.1005 to 0.2276. Since difference of coefficient on marriage, education, work hour, tenure, major and experience is similar to those before controlling sector of employment, we can conclude that the majority of increase in the unexplained part of tender wage gape ( $U^*+SU$ ) is also because of the increase in difference between men and women in constant term. The difference in constant term increased by 0.1575 [compared to increase in ( $U^*+SU$ ) of 0.1237]. So the paper concludes that the sector of employment can not explain the increase in the unexplained part of gender wage gap.

Some interpret the increase in U as indicating that the labor market discrimination

against women in Taiwan increased. However,  $U$  may not be a good measure of labor market discrimination. Because the analysis in this paper may omit some important variables; experience ( $=\text{age}-6-\text{the year of education}$ ) is not a good measure for all worker; wages in big cities are much higher in Taiwan than that in some counties, so there might exist selectivity bias; since labor force of women increase more than men's, women's reservation wage should be lower than men's. Then gender wage gap may come from compensation differentials.

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