The Gap Remains: Gender and Earnings in Taiwan

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ABSTRACT

The female-male gender gap in earnings in Taiwan has remained nearly constant over the past two decades, despite rapid change in the structure of the labor market. Using data from a series of 17 cross-sectional household surveys, I discuss the shifts that have taken place in the composition of the workforce in Taiwan. I then analyze the gender gap by performing a traditional decomposition of the gap into "explained" and "unexplained" portions, and find that the unexplained portion of the gap has increased substantially over time. I also examine how changes in the overall level of inequality in the economy have contributed to the stability of the gap. Finally, I look at whether the increased relative supply of female workers in Taiwan over time can account for their unchanged relative earnings in the face of increasing relative skills. I find little evidence that women are not treated as substitutes for men in production, but suggestive evidence that discrimination depresses women's earnings in Taiwan.

PART I: INTRODUCTION

Over the past three decades, Taiwan has experienced tremendous economic growth. Heralded as part of the "Asian Economic Miracle," Taiwan saw double digit rises

in GDP through much of the 1980's. On average, from 1979 to 1990, real GDP grew at an annual rate of over 6% in dollar terms. In comparison, Singapore experienced growth of 5.3%, Hong Kong growth of 5.8%, and Korea growth of 6.6% annually over the same time period (Summers and Heston 1991).

With economic growth has come a change in the composition of GDP. Taiwan has moved away from a focus on light manufacturing toward a focus on the service sector and commercial areas. The percentage of GDP originating from manufacturing reached a peak at 39% in 1986, then declined to around 28% by 1996. Concurrently, the percentage of GDP originating from commerce, finance, and business services rose from 26% to 38% (Huang 1998).

Along with these changes in output composition have come changes in the composition of the labor force. Table 1 gives the percentage of workers in various broadly defined industry groups by sex and year. We can see that there has been a rapid decline in the percentage of workers in the manufacturing industry in the latter part of the period under study, a decline that is especially precipitous for women. In fact women's movement out of light manufacturing exceeds men's by nearly ten percentage points. We can also see that the percentage of workers in the agricultural sector has declined rapidly over the years, with the sharpest decline in the early- to mid-1980's. Large differentials in changes between men and women

appear in commerce and the social and personal services industries; women's entry into these industries has been more rapid than men's.

At the same time, the average educational attainment of workers in Taiwan's population has risen dramatically. While in 1979 the median Taiwanese worker had only a primary school education, by 1995, 50% of the potential labor force had at least a high school diploma (see Table 2). For women, the increase has been even more dramatic. In 1979, fully 70% of women ages 20-69 had only a primary school education or less. By 1995, that number had dropped to 39%. Over the same period, the percentage of working-aged women with vocational or university-level training jumped from 16% to 37%, an increase of 231%. The analogous increase for men was 176% (see Table 2 for details). In fact, in recent years, nearly equal numbers of men and women have enrolled in universities in Taiwan (Ministry of Education 1996).

Women's labor force participation has also been on the rise. Between 1975 and 1996, female labor force participation in Taiwan increased from 38% to 45%, while the rate for men declined from 78% to 71% (Directorate-General of Budget ; Kao, Polacheck et al. 1994).

These types of changes should be favorable for women in the work force. A shift away from manufacturing, where women may experience a relative disadvantage owing to physical strength, toward the service sector, as well as an increasingly

well-educated female work force, should lead to a decline in the gender gap in earnings. We would expect this decline for two major reasons. First, because the jobs now available are ones where women can be at least as productive as men. Second because a larger, better-educated, more attached female labor force should lead to a decline in any discriminatory wage setting practices as "female" becomes less of a proxy for "low skill."

However, concurrent with these beneficial (for women) changes in the labor market, the measured male-female earnings gap has declined only slightly. Table 3 shows several measures of the gender gap in Taiwan over time. The "unadjusted" estimates in Panel A include estimates for all workers who report positive earnings. While the unadjusted difference in average monthly earnings between men and women has increased substantially (Gap column), this largely reflects trend growth in real earnings, as the ratio of female to male earnings has increased only from around 62% in 1979 to 67% in 1995 (Ratio column). This ratio changes very little when we examine only the subset of workers who work full-time.[1] Interestingly, however, when we limit our examination to those persons who are categorized as *private-sector employees* (that is, we exclude employers, the self-employed, and government workers), the ratio becomes nearly constant over time, hovering around 66% for most of the last two decades. In fact, controlling for education level, marital status, and a quadratic in age, the earnings gap actually appears to increase over the period in question (see Regression column which shows the

coefficient on a female indicator variable in a log-earnings regression; and see Appendix A for complete regression results).

Panel B of Table 3 shows the gap at different percentiles of the earnings distribution. That is, the 90th percentile gap is the difference between the log earnings of a woman at the 90th percentile of the female earnings distribution, and a man at the 90th percentile of the male earnings distribution. Figure 1 graphs these percentile gaps. While there is variation in the measured gap by percentile, the trends seem to be remarkably similar and steady. Why, despite the observed structural changes in the labor market, has the gender gap in earnings remained so stable for employees, and decreased only slightly overall?

In this paper, I use data from Taiwan's Manpower Utilization Survey (TMUS) to examine the gender gap in earnings. I proceed with a standard decomposition analysis of the gap into components that are explained by various worker characteristics. I examine whether differing levels of education, differing levels of labor force experience, or industrial or occupational segregation by gender might be responsible for the observed gap. I then examine changes in the gender gap over time, and look for the impact of changing overall residual earnings inequality on the gap. Finally, I use a structural model of the labor market to test the hypothesis that men and women with similar measured attributes are perfectly substitutable. If this hypothesis is true, then the increase over time in the relative supply of women in the work force should have the same effect on men's earnings as it does on

[1] Full-time is defined as at least 35 hours per week.

women's. If not, it is possible that the increased relative supply of female labor (increased female labor force participation) has exerted downward pressure on women's earnings which has counterbalanced the effects of increasing relative skills in women workers.

In Part II, I describe the data used for this analysis. In Part III, I describe in more detail the changing composition of the workforce in Taiwan. In Part IV, I give a brief review of the standard methodology used for decomposing the gender gap and discuss the results of this analysis. I further discuss the impact of residual earnings inequality on changes in the gender gap over time. Part V describes the model and gives results for an analysis of the substitutability of labor by sex. I conclude in Part VI.

PART II: DATA

The primary source of data for this paper is the 1979-1995 annual Taiwan Manpower Utilization Surveys (TMUS). The TMUS is a household survey covering the non-institutionalized population of Taiwan. It includes approximately 17 thousand households and 55 thousand individuals each year.[2] The households were sampled following a two-stage randomization procedure. First approximately 400 townships were selected from the over 7000 townships in Taiwan. Then

[2] The (unweighted) number of households ranges from 14,117 in 1979 to 19,736 in 1995. The (unweighted) number of individuals ranges from 49,683 in 1979 to 61,091 in 1995.

households were randomly selected within these townships. The analyses in this paper account for this clustering effect in calculating standard errors.

In these data, education is measured as a series of levels, from no education through university level. Only in years 1988 and later is graduate school indicated separately from undergraduate, and only in 1995 are Ph.D.'s indicated separately. For consistency across years, I use a single indicator variable for "university and higher" education.[3] The income variable is average monthly earnings in the primary job in New Taiwan Dollars. I use this variable (or its natural log) as my earnings measure. To adjust for topcoding in this earnings variable (which affects approximately 0.04% of the sample), I assume that earnings are log-normally distributed, then replace the topcoded values with the estimated mean of the censored part of the distribution, estimated separately in each year. This adjustment does not make a noticeable difference to the analysis.

For the purposes of this analysis, I use two main subsamples of the data. For descriptions of the "potential workforce," I use everyone in the data ages 15-64. For measurements of the gender gap, I limit this sample (by necessity) to those with positive real earnings.

[3] The number of graduate degrees granted each year is very small in relation to the number of Bachelor's Degrees awarded. Hence, the measurement error induced by grouping graduate and undergraduate degrees together is likely to be small.

In addition to the TMUS data, I use macroeconomic data from DataStream International and the 1996 Statistical Yearbook for the Republic of China (DataStream International ; Taiwan Government Information Office 1997). All earning figures are adjusted to reflect real 1991 Taiwan Dollars.[4]

PART III: CHANGES IN LABOR FORCE COMPOSITION

Before proceeding further with this analysis, let us look more closely at labor force composition in Taiwan. In the introduction, I discussed gender differentials in shifts between industrial sectors. I stated that a shift out of the manufacturing industry should be beneficial for women (where beneficial means increasing the overall measured ratio of female to male earnings). In fact, this is only true if women earn relatively less in manufacturing than in other industries.

Looking more closely at the earnings gap, we note that there is some significant variation in the gap across industrial sectors (Table 4). In fact the ratio of female to male real monthly earnings by industry ranges from 45 to 69 percent in 1979, and from 54 to 80 percent in 1995. The manufacturing industry (both "heavy" and "light") has among the lowest female-male earnings ratios of any industry throughout the period in question. Hence, we would expect that a shift away from the manufacturing sector would be beneficial for women at the aggregate level.

[4] The Taiwanese currency is the New Taiwan Dollar (NT$). As of November 1997, there were approximately 32 NT$ per US$.

In addition to shifts in industrial classification, there have been major shifts in class of worker over the past couple of decades in Taiwan. One anecdotal change that has occurred in Taiwan has been the movement away from home-based "cottage industry" into formal labor market activity. Typically, men who worked in home industry are classified as self-employed or employers, while their wives, sisters, and daughters are classified as unpaid home workers. We see these trends reflected in Table 5. As the table shows, in 1979 over 20% of female workers were classified as unpaid home labor. By 1995, that number had fallen to around 16%, with most of the difference made up by an increase in private sector employment among women. Unpaid home workers make up a much smaller fraction of men in all years. However, there have been other shifts in classification for male workers. The most noticeable are the decrease in self-employed men, and the increase in private sector male workers, consistent with the idea that men are leaving home industries to work in the private sector.

The gender gap varies by class of worker, as well. Women who are private-sector employees are consistently paid less relative to their male counterparts than are women who work in government or work as employers or self-employed (see Figure 2).

Since unpaid home workers are (tautologically) unpaid, they do not enter into calculations of the gender gap in earnings. As women leave home industries to join

the formal labor force in large numbers, it is possible that the influx of new workers has caused the average true skill level of female workers in the labor force to decline. That is, if *formal* labor market experience is an important component of skill, these new labor market entrants will be "low-skill" by their nature. Therefore, one question that must be examined before proceeding is the issue of labor market experience.

In addition to the issue of transitions from home industry into the formal labor force, women in Taiwan, as elsewhere, have traditionally left the labor market after marriage, or after the birth of their children, though this is less common in recent years. Hence age, for women, has not been as good a proxy for labor market experience as it is for men. Multivariate regression results suggest that additional years of age (or potential experience) are rewarded at a much lower rate for women than for men (Baraka 1999a). This is consistent with the idea that there is an abundance of female workers at various ages with very little actual labor market experience.

The TMUS data give us some insight into this question by recording tenure on the current job, for those currently working, and, if that tenure is less than two years, asking whether or not the person has previous full-time experience.[5] Table 6 shows tenure in months, by gender, for each year. Men's average tenure is significantly

[5] After 1993, the cutoff for asking about previous experience was lowered to 1-1/2 years of tenure. Also, this variable is not available for the years 1991-93.

higher than women's in each year. In fact, men's average tenure is more than double that of women's in 1979. This proportion shrinks over time, with women's tenure being 64% of men's by 1995.

These differences in average tenure by gender could be explained if women are, on average, newer entrants to the workforce; those who have spent less time working have had less opportunity to build up tenure at the current job. However, this is not the only possibility. Women may have lower average tenure because working women switch jobs more frequently than working men. These different explanations have different economic implications. If women simply switch jobs more often, then the differences in tenure would not be systematically related to true labor market experience differentials, and might be unrelated to earnings.[6] However, if tenure differences reflect differences in labor market experience, we might expect lower tenure to "explain" lower earnings for women. Given what we know of the time-series pattern of women's labor force participation, this second explanation seems plausible. If women who were previously outside the paid labor force are rapidly entering the labor force, the average experience level among women could be declining even as labor force participation increases.

To examine this issue further, I create a variable measuring recent entrance into the labor force. I include as a new entrant anyone with less than one year of tenure at

[6] There has also been a lively literature in the U.S. concerning the effects of tenure on earnings. See, for example, (Abraham and Farber 1987; Brown 1989).

his or her current job, who does not state that he or she has had prior full-time experience.[7] This measure of recent labor force entrance is fairly noisy. The question on prior full-time experience was not asked in 1991-93, and hence everyone reporting less than one full year of tenure in those years is considered a new labor-force entrant, a number that clearly overstates the true fraction. Because of this problem, I omit (biased) information on those years from my data tables.

With these caveats in mind, however, Table 7 provides some interesting results. The table shows the percentage of paid workers who are recent labor force entrants, by age and sex, in each year. Looking across age categories for the "prime working years" of ages 20-50, we notice that, up through the mid-1980's, the percentage of female workers who are new entrants to the labor force does not decline much with age. That is, new female workers join the labor force in approximately equal proportions in each age category. Women in their thirties and forties are nearly equally as likely as women in their twenties to be just starting out in the paid labor force. However, by the late 1980's, this trend has changed. In later years, older women workers are significantly less likely to be new entrants to the labor force than are their younger counterparts. By the 1990's, women are apparently joining the labor force young, and continuing to work as they age.[8] The pattern for men is quite different. Throughout the period under study, men have apparently joined the

[7] My results are not sensitive to the one-year choice of cutoff. Rerunning the same analyses using a two-year cutoff leads to substantively identical conclusions.

labor force at young ages, with only a very few male workers being new to the labor force after age 25. Table 7 also indicates that "new" women workers make up a much higher percentage of all women workers at each age after the mid-twenties than "new" male workers do of all male workers. These results are consistent with a pattern of increased labor force participation and increased labor force attachment for women over time.

PART IV: DECOMPOSING THE GENDER GAP

Standard Decomposition of Gender Gap

Zveglich, et. al. provide a concise description of the standard methodology for decomposing log-earnings differentials into a portion due to differences in measured productive characteristics, and a portion due to differences in rates of compensation or other factors (Zveglich, Rodgers et al. 1997). Following their notation, we write a standard log-earnings function as:

$$y_{it} = X_{it} b_{it} + s_{it} e_{it} \quad (1)$$

where i=male or female. The left-hand-side is the natural logarithm of real monthly earnings, ε_{it} is distributed as a standard normal, and σ_{it} is the "non-standardized" portion of the residual, reflecting such things as overall earnings dispersion in the economy at time t. Allowing y_{mt} and y_{ft} to represent average male

[8] If women join the labor force young, but exit the labor force permanently after marriage or childbearing, we might see a similar patter in recent labor force entrance. However, the concurrent increase in women's labor force participation indicates that this is not what is happening.

and female log-earnings, respectively, and $\overline{X}_{mt}$ and $\overline{X}_{ft}$ to represent average characteristics by gender, we can write the gender gap as:

$$G_t \equiv y_{mt} - y_{ft} = \left(\overline{X}_{mt}\beta_{mt} - \overline{X}_{ft}\beta_{ft}\right) + \left(\sigma_{mt}\varepsilon_{mt} - \sigma_{ft}\varepsilon_{ft}\right). \tag{2}$$

Note that the last term is zero when the regressions are evaluated at the means of the log-earnings distributions. We can rearrange the above equation to get worker attributes in terms of "male prices."

$$\begin{aligned} G_t = &\left(\overline{X}_{mt} - \overline{X}_{ft}\right)\beta_{mt} + \overline{X}_{ft}\left(\beta_{mt} - \beta_{ft}\right) \\ &+ \sigma_{mt}\left(\varepsilon_{mt} - \varepsilon_{ft}\right) + \left(\sigma_{mt} - \sigma_{ft}\right)\varepsilon_{ft} \end{aligned} \tag{3}$$

The first term on the right hand side of this equation is the portion of the total log-earnings differential that is explained by differences in measured productive characteristics, such as education and experience. I will call this the "explained gap." The second term, usually called the "residual gap," represents the portion of the gap that is explained by different rates of compensation for measured characteristics across gender groups. When the decomposition is done at the means, the last two terms will equal zero, and hence are generally ignored; otherwise, the sum of the last three terms is considered the residual gap. The residual gap may be due to unmeasured productive characteristics that differ systematically between the sexes, or it may be due to discrimination in which persons of one sex are systematically paid less than persons of the other sex for equal work.[9]

[9] Discrimination may have more far reaching effects than simply lowering wages for the affected group. If women, for example, expect to experience workplace discrimination, this may affect their

Table 8 shows the cross-sectional decomposition of the gender gap for each available year of data. The estimates in Panel A of the table show the decomposition including only human capital variables as covariates (education levels and a quadratic in age). Panel B shows the decomposition including additional variables for tenure and recent labor force entrance. Finally, Panel C includes all of the preceding variables, plus 12 industry and 89 occupation indicator variables.

As previously discussed, the gender gap, measured as the difference in logs, has remained quite steady, with only a slight decline in the most recent years, and no decline if we limit our sample to private-sector employees. However, the portion of the gap that can be explained by differences in measured characteristics has declined precipitously, from nearly 32% in 1979, to only around 10% by the end of the time period under study (Panel A). This result appears quite robust to the specification of the underlying regression equation, as the numbers hardly change when adding other covariates (Panels B and C). As time goes by, a greater and greater proportion of the gender gap is due to differential returns to measured characteristics, and this result does not change, even when we add a large number of measured characteristics into the equation.

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decisions about how much they want to invest in their own human capital. Hence, lower (on average) human capital among women may also be due to discrimination.

Panel A also breaks down the explained portion of the gender gap into the portion explained by education level differentials, and the portion explained by age differentials. In all years except 1979, the portion of the gap explained by education is actually negative. In other words, those women who have positive real earnings are actually better educated, on average, than are men with positive earnings. Hence, given a positive return to education, we might expect the gap to go the other way, since women's education level exceeds men's. The entire explained gender gap in this formulation is attributable to higher average age (and presumably labor market experience) among male workers.

Possible reasons for the increase in the unexplained gap include an increase in gender differences in unmeasured characteristics, increases in labor market discrimination, and changes in the overall wage structure (residual inequality) which affect the gender gap. Is it plausible that unmeasured productive characteristics have become more unequal over time in Taiwan? Certainly, measured productive characteristics such as education and labor force attachment (tenure, new labor force entrance) appear to be equalizing between the sexes, hence it is difficult to think of plausible examples of unmeasured characteristics which could be driving this result. While the evidence presented so far may be indicative of labor market discrimination against women, it does not constitute proof. I address the effects of the overall wage structure on the gap in the next section.

Whether or not these effects should properly be labeled “gender-specific” effects is also discussed.

Decomposition of Changes in Gender Gap

The existence of multiple years of cross-sectional data allows me to examine components of the gender gap over time. It is important to keep in mind that changes in the gender gap might be due not only to changes in worker characteristics or changes in discrimination, but may also reflect changes in the overall earnings distribution. When the average woman lies below the median in the male wage distribution, a decrease in overall inequality should increase women’s relative wages. In other words, changes in the overall level of earnings inequality in Taiwan may affect the relative position of women (for a more thorough discussion in the U.S. context, see Blau & Kahn, 1994). While recent work on Taiwan has found that overall earnings inequality has been low and steady, this appears to be because of several factors which have offsetting effects on inequality trends (Fields and O'Hara 1996). These factors may differentially impact men and women.

In order to allow for the effects of changes in residual male earnings inequality on the gender gap, we will slightly reformulate the above equations. Following the description in Blau and Kahn (1994), suppose that we start with a wage equation in

year t as above, but this time we estimate the equation for males only.[10] Then the gender gap becomes:

$$G_t = \Delta X_t b_t + s_t \Delta e_t , \tag{4}$$

where a Δ before a variable indicates the difference in average male and average female values for that variable. Note that the average value of the male residual, ε_t, will be zero, so that that male-female difference will just equal the average female residual when predicted with male prices, β_t. The change in this gap between years 1 and 2 may be written as:

$$\begin{aligned} G_2 - G_1 = (\Delta X_2 - \Delta X_1) b_2 + \Delta X_1 (b_2 - b_1) \\ + (\Delta e_2 - \Delta e_1) s_2 + \Delta e_1 (s_2 - s_1) . \end{aligned} \tag{5}$$

The first term on the right-hand side again represents the contribution of changes in observed characteristics. That is, it shows how changes in male-female differences in observed productive characteristics have influenced changes in the gender gap. The second term reflects the contribution of changing prices for labor market qualifications. The third term gives the contribution to the gender gap that would result if the percentile ranking of women in the male distribution were allowed to change, but the overall level of residual male earnings inequality stayed constant. In other words, holding overall inequality constant, what has been the effect of changing differences in the relative earnings positions of men and women after controlling for observed characteristics? The final term measures the contribution

[10] Alternatively, we could start with the equation for females only, and proceed from there. However, it is common in the literature to take male rates of return as proxies for "non-discriminatory" rates of return. Of course, if labor market discrimination does exist, it likely affects

that would result if the mean female percentile ranking in the male distribution stayed the same, but the overall level of male residual earnings inequality were allowed to change. In other words, what effect has the overall slight narrowing of earnings inequality had on the gender gap?

I calculate the decomposition of changes in the gender gap over two time periods: 1979-87 and 1987-95. Estimates of the first two terms on the right-hand side are straightforward constructions of the data. To estimate the third term, I follow a multi-stage procedure. For changes between 1979 and 1987, I first estimate a standard log-earnings regression model using only male data in 1979, and predict female log-earnings residuals from this model. I then assign to each woman in 1979 her percentile rank in the male residual earnings distribution. Next, I find the distribution of male wage residuals in 1987, and assign to each woman from 1979 the residual from the 1987 male residual distribution which would give her the same percentile rank she had in 1979. I then take the difference between the average true female residual from 1987 (using parameters from the 1987 male earnings equation) and the average "imputed" 1987 female residual. This difference gives me my estimate of the third term. Remember that the average male residual is zero, hence the difference in average residuals in the equation above is equal to the average female residual. The final term of the equation is

men's wages (raising them) at the expense of women's wages (lowering them). However, the male wage is likely *less* affected by discrimination than the female wage.

estimated in a directly analogous manner (Juhn, Murphy et al. 1991; Blau and Kahn 1994).

Table 9 shows the decomposition of the change in the log-earnings gap for 1979-87 and for 1987-95. Because the cross-sectional decomposition showed little sensitivity to changes in specification of the underlying regression equation, I have chosen to focus on the most parsimonious specification, namely that which includes only measured education level and a quadratic in age.[11] As the table shows, the gap declines somewhat in both of these periods, with a larger decline in the second period. The columns are labeled to be consistent with the order of the terms in the decomposition equation above. The column labeled "1st Term" refers to the change in the gap that is explained by changing worker characteristics. Interestingly, during 1979-87, the change in the gap due to changing characteristics is actually larger than the observed change in the gap. In other words, if all else had remained equal, the gains in women's measured characteristics over this time period would have caused the earnings gap to shrink instead of remain steady. During 1987-95, changes in measured characteristics again helped to decrease the gender gap, though this effect did not outweigh the overall change in the gap in this period.

[11] The substantive results are unchanged if I include other covariates.

The column labeled "2nd Term" shows the effect of changing rates of return to measured characteristics. In both time periods, changes in measured prices tended to expand the gender gap.

The "3rd Term" column measures the contribution of changes in the percentile rank of the mean female residual in the male log-earnings residual distribution, holding constant overall residual inequality. This is the only effect for which the sign differs across the two periods. In 1979-87, changes in the mean female percentile rank tended to increase the gender gap, while they tended to substantially decrease the gap in the second period. We can get some further insight into these changes by looking at Figure 3, which graphs the position of the mean female residual in the percentile ranking of male residuals in each year. The figure shows that the mean female residual declined smoothly from 1979 to around 1988, then evened out for the rest of the period, increasing slightly in 1995. In other words, controlling for measured characteristics, women earned less in 1987 than they had in 1979 (lower percentile rank of residual), but slightly more in 1995 than they had in 1987. This fits well with the results from Table 3, which show the explained portion of the gender gap decreasing over time, with a bump up in 1995.

Finally, the "4th Term" of Table 9 measures the contribution of changes in overall male residual earnings inequality to changes in the gender gap. In both periods, overall inequality tended to increase the gender gap, with the contribution being

twice as large in the first period. Since the average woman is well below the median in the earnings distribution, even small changes in inequality tend to exacerbate the gender gap in earnings. In fact, the change in overall inequality was the largest contributor toward *increasing* the gender gap across both periods. Without the effects of overall inequality, the gender gap in log-earnings in Taiwan would have declined to 0.396 in 1987 and 0.312 in 1995 (compared to the true values of 0.430 and 0.363, respectively).

The results of this analysis indicate that changing residual inequality did play a part in maintaining the gender gap in earnings from 1979-95. In fact, the effect from the increase in male residual earnings inequality in the first period was larger in magnitude than the effect of changing prices and the effect of changing female percentile rankings combined.

However, it is difficult to know how to interpret these results. If the "unexplained" gender gap is due to discriminatory remuneration practices, do increases in the gap due to increases in overall residual earnings inequality count as discriminatory in nature? Examining the third term, it seems clear that this effect should be considered gender specific, in that in reflects losses or gains for women at the same level of earnings as men. However, the fourth term is more difficult to interpret. If the overall earnings gap between men and women reflects both true skill differentials and discriminatory pricing, then this term will embody both gender-

specific and overall skill-pricing effects (see Juhn, Murphy, et. al. for a more thorough discussion in the context of black/white wage differentials in the U.S.).

The magnitude of the 3rd Term contribution to the change in the gender gap between 1987 and 1995 indicates that gender-specific factors were a large part of the change in the gap over this time. This is consistent with the cross-sectional increase in the unexplained portion of the gap.

PART V: EFFECTS OF CHANGING RELATIVE SUPPLY

Simple supply and demand theory tells us that if the relative supply of a commodity increases while demand remains fixed, the price for that commodity should drop. The rapid increase in female labor force participation in Taiwan leads us to wonder whether the persistence of the gender gap in the face of increased measured relative skills for women might be partly an effect of supply shifts. If women and men who share the same measured productive characteristics are viewed as substitutes by employers, then the influx of female workers into the Taiwanese labor market should have affected men's and women's wages in the same way, and should not have changed the gender gap. If, however, women and men are not viewed as perfect substitutes, then the relative increase of the supply of women in the labor market should differentially depress women's wages.[12] This supply shift for

[12] Note that a deviation from perfect substitutability could also be interpreted as a differential demand shock in favor of one sex over the other.

women could then explain why the gender gap remained constant or declined only a little in the face of increased relative skills for women.

In order to address this question, we model output as a constant elasticity of substitution function of capital and labor, where labor is categorized by education level. We have:

$$Y_t = \left[\left(1 - \sum a_e\right) K_t^{\Theta} + \sum_{e=1}^{i} a_e L_{et}^{\Theta} \right]^{1/\Theta} \tag{6}$$

where K measures capital, and L_{et} stands for effective labor in education group e, where e is one of the eight education levels measured in the TMUS data. Each effective labor group can be written as a composite of male and female labor.

$$L_{et} = \left[\left(e^{X_{et}^{m} b} L_{et}^{m} \right)^{r_e} + \left(g_e e^{X_{et}^{f} b} L_{et}^{f} \right)^{r_e} \right]^{1/r_e} \quad \text{for each e=1,…,8} \tag{7}$$

where L_{et}^{m} is the number of male workers of education level e at time t, L_{et}^{f} is the analogous number for females, X_{et}^{m} represents a vector of average characteristics for men in education group e at time t, and X_{et}^{f} represents the analogous vector for women.

In this model, the term γ represents the difference in productivity between male and female labor. If female workers of a given education level are, on average, less productive than males of the same education level (due to differences in

unmeasured skills), then γ will be less than 1. The elasticity of substitution between male and female labor will be constant and equal to $1/(1-\rho)$. A more general model would allow both ρ and γ to vary with time, as well as education level, but is unidentified in the data.

This formulation allows us to test two different aspects of how women are treated in the labor market relative to men. First, estimation of γ tells us, in a productivity sense, the percentage of a male worker to which each female worker is equivalent. Second, estimation of ρ tells us how substitutable men and women of similar productivities are.

In order to estimate this model, I proceed by setting wages equal to marginal product. Solving for the ratio of female to male earnings, and taking the natural logarithm of this ratio, we get:

$$\ln\left[\frac{w_{et}^{f}}{w_{et}^{m}}\right] = r_e \ln g_e + r_e b_t\left(X_{et}^{f} - X_{et}^{m}\right) + \left(r_e - 1\right)\ln\left(\frac{L_{et}^{f}}{L_{et}^{m}}\right). \tag{8}$$

Hence relative wages for women depend on gender differences in measured characteristics, and on relative supplies of labor by gender.

I estimate this equation separately for each of the eight education groups, both with and without other covariates. When I do include covariates, they are differences between women and men in average age, differences in average tenure, and

differences in the average percent new entrant to the labor force within each education category. Panel A of Table 10 gives the resulting estimates of ρ. Of the sixteen separate estimates (eight with covariates and eight without), only two are significantly different from 1. However, these estimates are based in each case on only 17 observations. In order to get more power, I assume that ρ is constant across education groups, and re-estimate my model by pooling the data and adding indicator variables for each education level to the right hand side. This assumption seems reasonable, as pairwise tests of the ρ's fail to reject the hypothesis of equality in 26 out of 28 cases. Panel B of the table provides the estimate of ρ from this pooled model, as well as estimates of γ for each of the eight education groups. My estimate of ρ is once again statistically indistinguishable from 1 (ρ=1.05 with a standard error of 0.028 without covariates, or ρ=1.00 with a standard error of 0.033 with covariates). My estimates of γ range from 0.625 to 0.763 by education level. Even when controlling for differences in average characteristics, a woman in the labor force in Taiwan is treated as only about two-thirds of a man.

Based on these results, I cannot reject the hypothesis that women and men are perfect substitutes in production (that ρ=1.00). However, I do find that across all education groups a women is treated as only "part of" a man. This difference could be due to differences in unmeasured factors, or to discriminatory behavior.

This analysis should be viewed cautiously. Not only is it based on a small number of observations, but the structure of the model does not allow for changes over time in either women's relative productivity due to unmeasured factors or the substitutability of male and female labor. However, this analysis does indicate that the changing relative supply of women in the workforce had little, if any, effect on the gender gap in Taiwan. To explain why that gap remained so steady, we must look elsewhere than increased female labor force participation.

PART VI: CONCLUSION

Using data from 1979-1995 in Taiwan, I have found that the measured gap in earnings between men and women has remained remarkably constant over time. In fact, while the overall gender gap has decreased slightly, the gap has actually *increased* when we control for human capital variables (age and education). A standard cross-sectional decomposition of the gender gap into explained and residual portions shows that the percentage of the gap that can be explained by measured labor force characteristics has actually declined over time. Possible explanations for the increase in the unexplained portion include increasing gender differences in unmeasured productive characteristics, such as innate ability or true labor market experience, and increases in differential compensation for men and women of equal productivity (that is, discrimination). Examination of tenure on the current job and recent labor force entrance indicate that women's labor force attachment in Taiwan is actually increasing over time. Hence, it is unlikely that the

male-female differential in true labor market experience by age is actually increasing. While we have no data on "ability," it seems plausible to assume that it is evenly distributed between men and women. Given the convergence in measured characteristics between men and women, it seems unlikely that unmeasured characteristics have become more dissimilar.

Another possibility for explaining the increasing portion of the gap not due to measured characteristics is that the gender gap has been affected by changes in the overall level of earnings inequality in Taiwan. If women at a given percentile of the male residual earnings distribution are treated equally to men at that percentile, then changes in male residual inequality may affect the gender gap, as the "average" (in a residual sense) female lies below the median of the male residual earnings distribution. A decomposition of changes in the gender gap into portions due to overall inequality changes and portions due to changes in characteristics or differential treatment indicates that this explanation holds some promise for explaining the residual gender gap. Specifically, an increase in male residual inequality over the 1979-87 period appears to have substantially widened the gender gap.

However, while changes in the overall wage structure may be the mechanism by which the gap has widened, they do not provide an explanation or justification for it. Changes in the position of the mean female residual in the male residual log-

earnings distribution are clearly due to "gender-specific" factors, hence may be attributable to discrimination. If *any* discrimination against women in the workforce exists, then women will actually be more qualified than men at the same percentile of the log-earnings distribution. Hence increases in inequality that cause the gap to widen would be, at least partly, attributable to discrimination.

Given the rapid increase in women's labor force participation over the time period under study, one explanation for the stability of women's relative earnings in the face of women's increasing levels of productive characteristics (i.e., education and experience) is that the relative increase in the number of women has differentially depressed women's earnings. This can only be the case if women and men with similar measured characteristics are not viewed as perfect substitutes by employers. My analysis finds little support for this hypothesis.

The results of this analysis are somewhat surprising. While other countries have seen a decline in the gender gap concurrent with increased female labor force participation and increased levels of productive skills for females, Taiwan has seen a very steady earnings differential. Moreover, the portion of the differential that can be explained by differences in measured productive characteristics has declined. It is difficult, in light of the above analysis, to avoid the suspicion that discrimination plays a large part in maintaining this gender gap.

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Table 1
Industry of Worker, by Sex and Year
Male

	Agriculture	Mining	Lt Manuf	Hvy Manuf	Utilities	Construction	Commerce	Transport/ Comm.	Finance	Business Services	Social/Pers. Services	Pulic/ Internat'l
1979	19.60%	1.21%	10.88%	18.97%	0.85%	11.47%	13.90%	7.76%	1.14%	0.75%	8.55%	4.94%
1980	17.56%	0.97%	10.66%	20.19%	0.66%	11.71%	14.62%	8.15%	1.26%	0.85%	8.91%	4.47%
1981	17.19%	1.02%	9.83%	20.25%	0.58%	12.78%	15.30%	7.63%	1.32%	1.11%	8.77%	4.23%
1982	17.28%	1.36%	9.72%	19.26%	0.65%	12.46%	16.10%	7.85%	1.36%	1.09%	8.61%	4.27%
1983	16.98%	1.56%	9.98%	19.53%	0.69%	11.13%	16.13%	7.68%	1.40%	1.06%	9.18%	4.70%
1984	16.40%	0.78%	10.42%	21.08%	0.68%	10.43%	16.13%	7.69%	1.34%	0.98%	9.58%	4.50%
1985	16.66%	0.76%	10.37%	21.70%	0.77%	10.42%	15.31%	7.57%	1.35%	0.88%	9.83%	4.38%
1986	15.68%	0.57%	10.29%	21.99%	0.68%	10.58%	16.09%	7.87%	1.42%	0.96%	9.36%	4.50%
1987	14.75%	0.54%	10.03%	22.95%	0.66%	10.24%	16.53%	8.13%	1.40%	1.19%	9.50%	4.08%
1988	13.14%	0.52%	10.07%	22.83%	0.65%	10.93%	17.27%	7.63%	1.51%	1.43%	10.04%	4.00%
1989	12.23%	0.44%	9.47%	23.45%	0.62%	11.22%	17.73%	7.59%	1.61%	1.50%	9.93%	4.22%
1990	12.14%	0.35%	9.05%	22.09%	0.64%	12.96%	17.42%	7.61%	1.66%	1.86%	9.98%	4.24%
1991	12.37%	0.30%	8.96%	21.48%	0.65%	12.64%	18.65%	7.51%	1.87%	1.66%	10.26%	3.64%
1992	11.67%	0.30%	8.73%	21.31%	0.62%	13.57%	18.31%	7.34%	1.92%	2.21%	10.38%	3.65%
1993	10.74%	0.28%	7.96%	20.39%	0.60%	15.19%	17.87%	7.38%	2.71%	2.05%	11.02%	3.81%
1994	10.28%	0.26%	7.73%	20.14%	0.60%	16.23%	18.08%	7.30%	2.68%	2.09%	10.81%	3.81%
1995	9.75%	0.22%	7.41%	20.04%	0.59%	16.77%	18.19%	7.22%	2.81%	2.02%	11.12%	3.86%
Change (1979-95)	-9.85%	-0.98%	-3.47%	1.07%	-0.26%	5.30%	4.29%	-0.54%	1.67%	1.28%	2.57%	-1.07%

Continued on Next Page

Table 1 (continued)
Industry of Worker, by Sex and Year
Female

	Agriculture	Mining	Lt Manuf	Hvy Manuf	Utilities	Construction	Commerce	Transport/ Comm.	Finance	Business Services	Social/Pers. Services	Pulic/ Internat'l
1979	8.75%	0.43%	24.87%	24.44%	0.13%	2.47%	12.96%	2.80%	1.63%	1.03%	17.23%	3.26%
1980	8.28%	0.50%	23.49%	24.74%	0.15%	2.60%	13.92%	2.74%	1.81%	1.35%	16.99%	3.45%
1981	7.50%	0.21%	24.70%	23.81%	0.14%	2.65%	14.75%	2.61%	1.92%	1.27%	16.92%	3.52%
1982	6.33%	0.38%	23.32%	24.85%	0.22%	2.46%	14.66%	2.84%	2.31%	1.14%	17.54%	3.94%
1983	6.19%	0.68%	23.75%	24.06%	0.20%	1.95%	15.33%	2.68%	2.27%	1.13%	17.86%	3.90%
1984	6.58%	0.20%	23.40%	25.19%	0.20%	1.88%	14.87%	2.46%	2.08%	1.08%	18.05%	4.02%
1985	6.03%	0.20%	21.91%	26.83%	0.23%	1.75%	15.71%	2.26%	2.46%	1.36%	17.63%	3.62%
1986	5.88%	0.26%	22.30%	25.86%	0.18%	1.93%	16.45%	2.54%	2.76%	1.23%	17.12%	3.50%
1987	4.98%	0.19%	20.22%	27.77%	0.17%	2.02%	15.69%	2.55%	2.51%	1.86%	18.44%	3.60%
1988	4.59%	0.16%	18.59%	26.86%	0.17%	2.11%	17.78%	2.41%	2.69%	1.73%	19.23%	3.69%
1989	4.68%	0.14%	17.55%	26.38%	0.16%	2.40%	18.13%	2.14%	3.15%	2.19%	19.10%	3.99%
1990	4.16%	0.12%	16.21%	24.61%	0.18%	2.65%	18.92%	2.55%	3.56%	2.38%	20.51%	4.15%
1991	3.98%	0.12%	15.30%	24.02%	0.19%	2.53%	19.99%	2.50%	4.29%	2.46%	20.94%	3.68%
1992	3.87%	0.12%	13.96%	22.89%	0.18%	2.86%	20.46%	2.88%	4.27%	2.73%	22.06%	3.72%
1993	3.24%	0.12%	13.65%	21.23%	0.18%	3.89%	20.33%	2.76%	4.75%	3.18%	22.62%	4.04%
1994	2.98%	0.10%	12.79%	19.85%	0.17%	4.15%	21.61%	2.61%	5.03%	3.13%	23.57%	4.01%
1995	2.95%	0.11%	11.80%	19.39%	0.18%	3.99%	22.19%	2.63%	5.51%	3.35%	23.94%	3.96%
Change (1979-95)	-5.80%	-0.32%	-13.08%	-5.05%	0.05%	1.52%	9.23%	-0.17%	3.89%	2.32%	6.70%	0.70%

Table 2

Percentage of Potential Workforce in Education Categories, by Year

Non-Institutionalized Population of Taiwan, Ages 20-69

Female	No School	Self-Taught	Primary	Middle School	Acad. HS	Voc. HS	Junior College	Univ+
1979	0.231	0.035	0.431	0.095	0.048	0.088	0.035	0.038
1980	0.213	0.034	0.426	0.099	0.053	0.096	0.040	0.039
1981	0.207	0.031	0.422	0.108	0.051	0.101	0.040	0.040
1982	0.196	0.030	0.415	0.114	0.054	0.108	0.045	0.039
1983	0.197	0.026	0.392	0.122	0.054	0.125	0.046	0.040
1984	0.181	0.027	0.383	0.128	0.055	0.135	0.049	0.042
1985	0.173	0.030	0.389	0.133	0.052	0.135	0.050	0.037
1986	0.167	0.031	0.369	0.139	0.055	0.144	0.052	0.044
1987	0.150	0.027	0.361	0.141	0.059	0.153	0.061	0.049
1988	0.133	0.025	0.358	0.144	0.062	0.166	0.063	0.050
1989	0.123	0.025	0.346	0.150	0.064	0.174	0.065	0.053
1990	0.116	0.023	0.339	0.156	0.071	0.172	0.069	0.054
1991	0.106	0.019	0.342	0.158	0.072	0.176	0.073	0.054
1992	0.096	0.019	0.329	0.161	0.071	0.185	0.080	0.060
1993	0.092	0.017	0.311	0.162	0.070	0.198	0.086	0.064
1994	0.089	0.017	0.301	0.164	0.074	0.200	0.088	0.068
1995	0.086	0.015	0.288	0.166	0.072	0.206	0.095	0.073

Male	No School	Self-Taught	Primary	Middle School	Acad. HS	Voc. HS	Junior College	Univ+
1979	0.069	0.034	0.423	0.146	0.081	0.104	0.063	0.081
1980	0.059	0.034	0.408	0.153	0.082	0.110	0.069	0.084
1981	0.057	0.032	0.405	0.157	0.081	0.116	0.067	0.084
1982	0.055	0.028	0.392	0.166	0.085	0.123	0.071	0.081
1983	0.051	0.027	0.370	0.173	0.083	0.139	0.075	0.082
1984	0.046	0.026	0.359	0.179	0.084	0.144	0.079	0.082
1985	0.045	0.027	0.358	0.185	0.079	0.148	0.079	0.078
1986	0.043	0.029	0.343	0.192	0.077	0.149	0.083	0.083
1987	0.036	0.024	0.324	0.193	0.081	0.162	0.091	0.088
1988	0.030	0.020	0.311	0.190	0.089	0.173	0.096	0.092
1989	0.031	0.018	0.301	0.191	0.089	0.180	0.096	0.093
1990	0.028	0.016	0.293	0.198	0.088	0.182	0.100	0.095
1991	0.025	0.016	0.283	0.204	0.094	0.183	0.102	0.092
1992	0.022	0.014	0.270	0.203	0.095	0.190	0.109	0.096
1993	0.021	0.013	0.259	0.206	0.090	0.197	0.112	0.102
1994	0.021	0.011	0.247	0.212	0.091	0.196	0.119	0.102
1995	0.020	0.011	0.233	0.209	0.091	0.203	0.124	0.111

Table 3
Measures of the Gender Gap in Earnings in Taiwan, 1979-95

	Panel A									Panel B				
	Unadjusted				Full-time only			Employees only						
	Gap(NT$)	LnGap	Ratio	Regression	LnGap	Ratio	Regression	LnGap	Ratio	gap90	gap75	gap50	gap25	gap10
1979	-5026	-0.448	0.616	-0.271	-0.416	0.627	-0.271	-0.400	0.655	-0.470	-0.474	-0.442	-0.357	-0.336
1980	-5038	-0.437	0.623	-0.302	-0.418	0.631	-0.302	-0.404	0.652	-0.511	-0.481	-0.450	-0.405	-0.288
1981	-5108	-0.437	0.635	-0.308	-0.420	0.638	-0.308	-0.403	0.661	-0.405	-0.560	-0.431	-0.445	-0.223
1982	-5444	-0.438	0.630	-0.327	-0.433	0.628	-0.327	-0.413	0.651	-0.431	-0.511	-0.539	-0.357	-0.318
1983	-5746	-0.447	0.627	-0.311	-0.427	0.632	-0.311	-0.415	0.652	-0.405	-0.470	-0.470	-0.348	-0.405
1984	-5832	-0.418	0.637	-0.311	-0.403	0.641	-0.311	-0.393	0.672	-0.383	-0.531	-0.405	-0.405	-0.288
1985	-5723	-0.404	0.650	-0.315	-0.390	0.653	-0.315	-0.390	0.673	-0.383	-0.511	-0.486	-0.325	-0.182
1986	-6478	-0.436	0.633	-0.330	-0.426	0.637	-0.330	-0.411	0.663	-0.446	-0.547	-0.499	-0.357	-0.278
1987	-6865	-0.430	0.634	-0.336	-0.417	0.640	-0.336	-0.416	0.659	-0.396	-0.511	-0.511	-0.288	-0.405
1988	-7676	-0.435	0.630	-0.344	-0.422	0.635	-0.344	-0.428	0.655	-0.405	-0.452	-0.470	-0.405	-0.288
1989	-8581	-0.462	0.627	-0.382	-0.449	0.632	-0.382	-0.437	0.652	-0.452	-0.446	-0.511	-0.511	-0.371
1990	-8812	-0.435	0.642	-0.369	-0.427	0.646	-0.369	-0.425	0.662	-0.365	-0.511	-0.452	-0.470	-0.318
1991	-9503	-0.420	0.646	-0.356	-0.408	0.651	-0.356	-0.422	0.669	-0.308	-0.470	-0.511	-0.405	-0.345
1992	-9796	-0.401	0.656	-0.340	-0.390	0.660	-0.340	-0.402	0.681	-0.373	-0.377	-0.442	-0.431	-0.405
1993	-11184	-0.420	0.639	-0.366	-0.409	0.643	-0.366	-0.416	0.669	-0.357	-0.470	-0.511	-0.383	-0.405
1994	-10977	-0.396	0.654	-0.353	-0.390	0.657	-0.353	-0.402	0.678	-0.340	-0.357	-0.470	-0.493	-0.405
1995	-10517	-0.363	0.670	-0.335	-0.374	0.667	-0.335	-0.381	0.685	-0.318	-0.360	-0.405	-0.329	-0.251

Notes:
Unadjusted measures include all persons ages 20-69 with positive real earnings in the given year.
Full-time only includes only workers with 35 hours per week or more of work.
Employees only refers to private sector employees.
LnGap = ln(mean female earnings) - ln(mean male earnings)
Ratio = (mean female earnings)/(mean male earnings)

Table 4
Ratio of Female/Male Earnings by Industry
(All Persons with Positive Real Earnings in Given Year)

	Agriculture	Mining	Lt Manuf	Hvy Manuf	Utilities	Construction	Commerce	Transport/ Comm.	Finance	Business Services	Social/Pers. Services	Public/ Internat'l
1979	0.671	0.605	0.573	0.521	0.683	0.688	0.617	0.650	0.635	0.454	0.660	0.645
1980	0.637	0.488	0.556	0.536	0.598	0.643	0.646	0.745	0.585	0.464	0.672	0.666
1981	0.645	0.505	0.559	0.552	0.659	0.665	0.630	0.660	0.612	0.448	0.709	0.725
1982	0.650	0.488	0.571	0.546	0.721	0.687	0.632	0.650	0.621	0.591	0.634	0.714
1983	0.585	0.431	0.548	0.536	0.794	0.698	0.616	0.706	0.697	0.507	0.672	0.738
1984	0.607	0.608	0.560	0.552	0.737	0.648	0.606	0.762	0.723	0.569	0.702	0.746
1985	0.629	0.523	0.580	0.556	0.755	0.707	0.633	0.763	0.699	0.467	0.676	0.734
1986	0.630	0.524	0.530	0.540	0.728	0.631	0.619	0.790	0.687	0.531	0.677	0.735
1987	0.726	0.462	0.547	0.532	0.648	0.677	0.609	0.783	0.709	0.551	0.671	0.700
1988	0.641	0.509	0.552	0.521	0.827	0.688	0.621	0.758	0.673	0.481	0.661	0.717
1989	0.605	0.424	0.557	0.521	0.832	0.671	0.633	0.721	0.628	0.547	0.679	0.710
1990	0.635	0.467	0.554	0.547	0.898	0.648	0.643	0.754	0.687	0.581	0.654	0.713
1991	0.675	0.598	0.556	0.529	0.610	0.685	0.622	0.752	0.730	0.560	0.694	0.721
1992	0.604	0.655	0.539	0.536	0.657	0.727	0.637	0.782	0.689	0.566	0.711	0.716
1993	0.608	0.532	0.520	0.520	0.745	0.659	0.629	0.774	0.694	0.575	0.685	0.705
1994	0.691	0.382	0.529	0.517	0.712	0.704	0.652	0.751	0.706	0.600	0.684	0.724
1995	0.708	0.707	0.541	0.558	0.798	0.678	0.631	0.769	0.721	0.633	0.715	0.713

Table 5
Class of Worker by Sex and Year

Male

	Employer	Self-Emp'd	Gov't Worker	Private Worker	Unpaid Home Worker
1979	5.74%	26.12%	14.00%	48.53%	5.62%
1980	5.96%	25.77%	13.85%	49.24%	5.17%
1981	5.91%	25.65%	13.00%	50.66%	4.77%
1982	6.09%	26.03%	12.73%	50.51%	4.64%
1983	5.93%	26.93%	13.40%	48.80%	4.94%
1984	5.51%	27.25%	12.87%	49.77%	4.60%
1985	5.83%	27.11%	11.55%	51.13%	4.38%
1986	6.06%	26.16%	12.29%	50.42%	5.07%
1987	6.21%	25.68%	12.01%	51.93%	4.17%
1988	6.47%	25.52%	12.17%	51.89%	3.94%
1989	6.67%	24.40%	12.04%	53.40%	3.49%
1990	6.94%	23.93%	11.80%	54.14%	3.20%
1991	7.18%	24.94%	11.08%	52.92%	3.88%
1992	7.28%	24.01%	11.35%	53.58%	3.78%
1993	7.40%	22.85%	11.58%	54.57%	3.60%
1994	7.43%	22.74%	10.99%	55.31%	3.53%
1995	7.22%	22.13%	10.71%	56.35%	3.59%

Female

	Employer	Self-Emp'd	Gov't Worker	Private Worker	Unpaid Home Worker
1979	1.15%	10.26%	10.35%	57.64%	20.60%
1980	1.39%	10.72%	10.74%	56.14%	21.02%
1981	1.13%	10.71%	10.96%	57.94%	19.27%
1982	1.30%	9.91%	11.01%	58.34%	19.45%
1983	1.20%	10.02%	10.50%	57.73%	20.55%
1984	1.19%	10.20%	10.44%	57.71%	20.46%
1985	1.26%	10.28%	9.64%	57.98%	20.84%
1986	1.09%	9.91%	9.62%	58.85%	20.52%
1987	1.09%	8.83%	10.12%	61.68%	18.28%
1988	1.17%	9.23%	10.48%	60.50%	18.63%
1989	1.19%	9.56%	9.72%	62.20%	17.33%
1990	1.43%	9.42%	10.37%	61.96%	16.83%
1991	1.51%	8.29%	10.16%	61.65%	18.40%
1992	1.47%	8.98%	10.95%	61.49%	17.12%
1993	1.58%	8.96%	11.50%	61.14%	16.83%
1994	1.73%	8.38%	11.04%	62.04%	16.81%
1995	2.15%	8.51%	10.68%	62.39%	16.27%

Table 6
Average Tenure (in Months)

	Male	Female	Total
1979	904	447	770
1980	812	435	700
1981	814	415	696
1982	816	424	699
1983	846	448	722
1984	862	447	727
1985	871	460	738
1986	855	456	721
1987	829	452	698
1988	836	470	711
1989	812	491	702
1990	803	467	688
1991	797	462	681
1992	803	483	693
1993	806	493	697
1994	802	489	692
1995	809	516	705

Table 7
Percent of Paid Workers who are New Labor Force Entrants by Sex and Age Category

Male	Age Catetory									
	15-19	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**
1979	29.68%	13.00%	2.24%	0.11%	0.22%	0.03%	0.11%	0.25%	0.00%	0.30%
1980	26.80%	18.25%	2.25%	0.35%	0.15%	0.04%	0.49%	0.47%	0.78%	0.37%
1981	23.94%	15.19%	2.56%	0.32%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1982	26.12%	16.64%	1.50%	0.13%	0.36%	0.00%	0.03%	0.00%	0.09%	0.00%
1983	28.61%	17.31%	2.51%	0.26%	0.03%	0.20%	0.08%	0.09%	0.29%	0.57%
1984	27.01%	19.63%	3.20%	0.32%	0.04%	0.08%	0.00%	0.00%	0.12%	0.12%
1985	32.18%	17.56%	2.85%	0.09%	0.09%	0.10%	0.00%	0.07%	0.00%	0.68%
1986	29.01%	16.89%	2.80%	0.56%	0.27%	0.16%	0.10%	0.29%	0.60%	0.98%
1987	29.29%	18.23%	2.60%	0.34%	0.15%	0.04%	0.05%	0.08%	0.05%	0.22%
1988	25.05%	17.29%	3.56%	0.52%	0.06%	0.12%	0.00%	0.42%	0.17%	0.15%
1989	29.10%	21.38%	2.85%	0.45%	0.02%	0.22%	0.13%	0.00%	0.08%	0.17%
1990	33.91%	19.18%	2.79%	0.50%	0.21%	0.23%	0.03%	0.08%	0.14%	0.44%
1994	34.89%	20.68%	2.80%	0.91%	0.32%	0.33%	0.22%	0.32%	0.11%	0.15%
1995	38.15%	18.01%	3.53%	0.82%	0.47%	0.29%	0.42%	0.36%	0.25%	0.19%

Female										
	15-19	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**60-64**
1979	26.04%	9.37%	5.28%	6.72%	7.00%	6.07%	7.02%	2.78%	3.49%	0.00%
1980	25.19%	8.04%	6.85%	8.44%	6.04%	5.35%	3.99%	2.47%	2.84%	2.37%
1981	23.87%	8.44%	4.82%	4.99%	4.78%	4.36%	2.79%	3.87%	3.60%	4.29%
1982	24.89%	8.57%	4.87%	6.26%	5.04%	5.28%	5.71%	4.94%	3.80%	7.49%
1983	24.91%	8.95%	5.59%	6.96%	3.67%	6.51%	2.80%	3.92%	4.86%	0.00%
1984	25.15%	10.88%	7.71%	6.93%	7.40%	6.42%	5.17%	3.53%	7.78%	3.32%
1985	28.22%	8.98%	6.59%	7.06%	5.37%	3.13%	3.58%	1.90%	4.99%	4.98%
1986	26.87%	8.96%	6.38%	4.77%	5.65%	4.46%	4.08%	5.12%	3.71%	9.09%
1987	31.35%	9.50%	6.37%	5.75%	4.39%	5.09%	3.37%	6.10%	4.46%	2.43%
1988	26.89%	9.39%	4.92%	5.13%	3.65%	2.54%	3.69%	3.80%	2.78%	5.79%
1989	28.51%	7.27%	3.75%	4.46%	2.99%	2.58%	3.04%	5.00%	5.31%	2.48%
1990	30.15%	9.28%	3.90%	3.64%	2.72%	2.85%	2.11%	2.16%	1.48%	0.00%
1994	31.85%	9.66%	4.35%	4.85%	2.93%	3.25%	2.36%	3.93%	0.99%	2.84%
1995	37.02%	10.13%	4.32%	2.69%	4.09%	2.58%	1.69%	1.45%	2.24%	0.39%

Table 8
Cross-Sectional Decomposition of Gender Gap

		Panel A Human Capital Variables Only Explained					Panel B Also Controls for Tenure and Recent Entrance into LF			Panel C Also controls for Industry and Occupation		
Year	**LnGap**	**Education**	**Age**	**Total**	**Residual**	**Pct Expl.**	**Explained**	**Residual**	**Pct Expl.**	**Explained**	**Residual**	**Pct Expl.**
1979	0.448	0.000	0.143	0.143	0.306	31.8%	0.138	0.310	30.8%	0.146	0.302	32.6%
1980	0.437	-0.002	0.122	0.120	0.317	27.5%	0.115	0.322	26.3%	0.126	0.311	28.9%
1981	0.437	-0.006	0.125	0.119	0.317	27.3%	0.117	0.320	26.7%	0.134	0.303	30.7%
1982	0.438	-0.010	0.125	0.114	0.323	26.1%	0.113	0.325	25.8%	0.125	0.313	28.5%
1983	0.447	-0.003	0.126	0.123	0.324	27.6%	0.119	0.328	26.6%	0.122	0.325	27.3%
1984	0.418	-0.003	0.103	0.100	0.319	23.8%	0.094	0.324	22.5%	0.091	0.328	21.7%
1985	0.404	-0.004	0.092	0.088	0.316	21.9%	0.081	0.323	20.0%	0.075	0.329	18.6%
1986	0.436	-0.004	0.102	0.098	0.338	22.5%	0.095	0.342	21.7%	0.102	0.334	23.5%
1987	0.430	-0.004	0.086	0.082	0.348	19.2%	0.078	0.352	18.2%	0.075	0.355	17.5%
1988	0.435	-0.005	0.083	0.079	0.356	18.1%	0.072	0.363	16.5%	0.075	0.360	17.3%
1989	0.462	0.002	0.068	0.070	0.391	15.2%	0.062	0.400	13.4%	0.075	0.387	16.2%
1990	0.435	-0.007	0.069	0.063	0.372	14.4%	0.056	0.379	12.9%	0.080	0.355	18.4%
1991	0.420	-0.008	0.064	0.056	0.364	13.3%	0.048	0.372	11.4%	0.075	0.345	17.9%
1992	0.401	-0.004	0.059	0.055	0.346	13.7%	0.047	0.355	11.6%	0.068	0.333	16.9%
1993	0.420	-0.008	0.058	0.050	0.370	11.9%	0.042	0.377	10.1%	0.064	0.356	15.2%
1994	0.396	-0.010	0.046	0.036	0.360	9.1%	0.031	0.365	7.8%	0.042	0.354	10.6%
1995	0.363	-0.012	0.051	0.039	0.324	10.9%	0.033	0.330	9.2%	0.051	0.312	14.1%

Table 9
Decomposition of Change in Gender Gap

	Chg in Gap	1st Term Chg X's	2nd Term Chg Prices	3rd Term	4th Term
1979-87	-0.0179	-0.0724	0.0123	0.0082	0.0340
1987-95	-0.0670	-0.0440	0.0010	-0.0415	0.0173

"Chg in Gap" is the difference over time in the male-female log earnings difference. A negative value indicates that male and female earnings have converged.

See text for explanation of column labels.

Table 10
Estimates of Substitutability Between Female and Male Labor
CES Model - see text for details

Panel A: Estimates of rho from models estimated separately by education level. N=17 in all cases. Covariates are differences by sex in average age, average tenure, and percent new to labor force within each education category.

	No Covariates	S.E.	w/Cov	S.E.
No School	1.053	(0.089)	0.880	(0.083)
Self-Taught	1.009	(0.103)	0.962	(0.118)
Primary	1.052	(0.034)	0.797	(0.111)
Middle	1.199	(0.094)	1.081	(0.152)
Acad. HS	1.059	(0.055)	0.864	(0.059)
Voc HS	1.126	(0.126)	0.884	(0.146)
Jr. College	0.922	(0.058)	1.090	(0.123)
Univ+	1.120	(0.046)	1.128	(0.170)

Panel B: Estimates of Rho and Gamma from Model with All Education Levels. N=136. Covariates same as in Panel A.

rho=	1.051	(0.028)	1.001	(0.033)
gamma=				
No School	0.718	(0.000)	0.627	(0.001)
Self-Taught	0.741	(0.000)	0.628	(0.001)
Primary	0.648	(0.000)	0.574	(0.001)
Middle School	0.668	(0.000)	0.630	(0.000)
Acad. HS	0.661	(0.000)	0.635	(0.000)
Voc HS	0.642	(0.000)	0.625	(0.000)
Jr. College	0.763	(0.000)	0.748	(0.000)
Univ+	0.718	(0.000)	0.695	(0.000)
Adj. R-sq	0.987		0.988	

Figure 1:
Gender Gap at Different Percentiles of the Earnings Distribution
All Persons with Positive Real Earnings
Taiwan, 1979-95

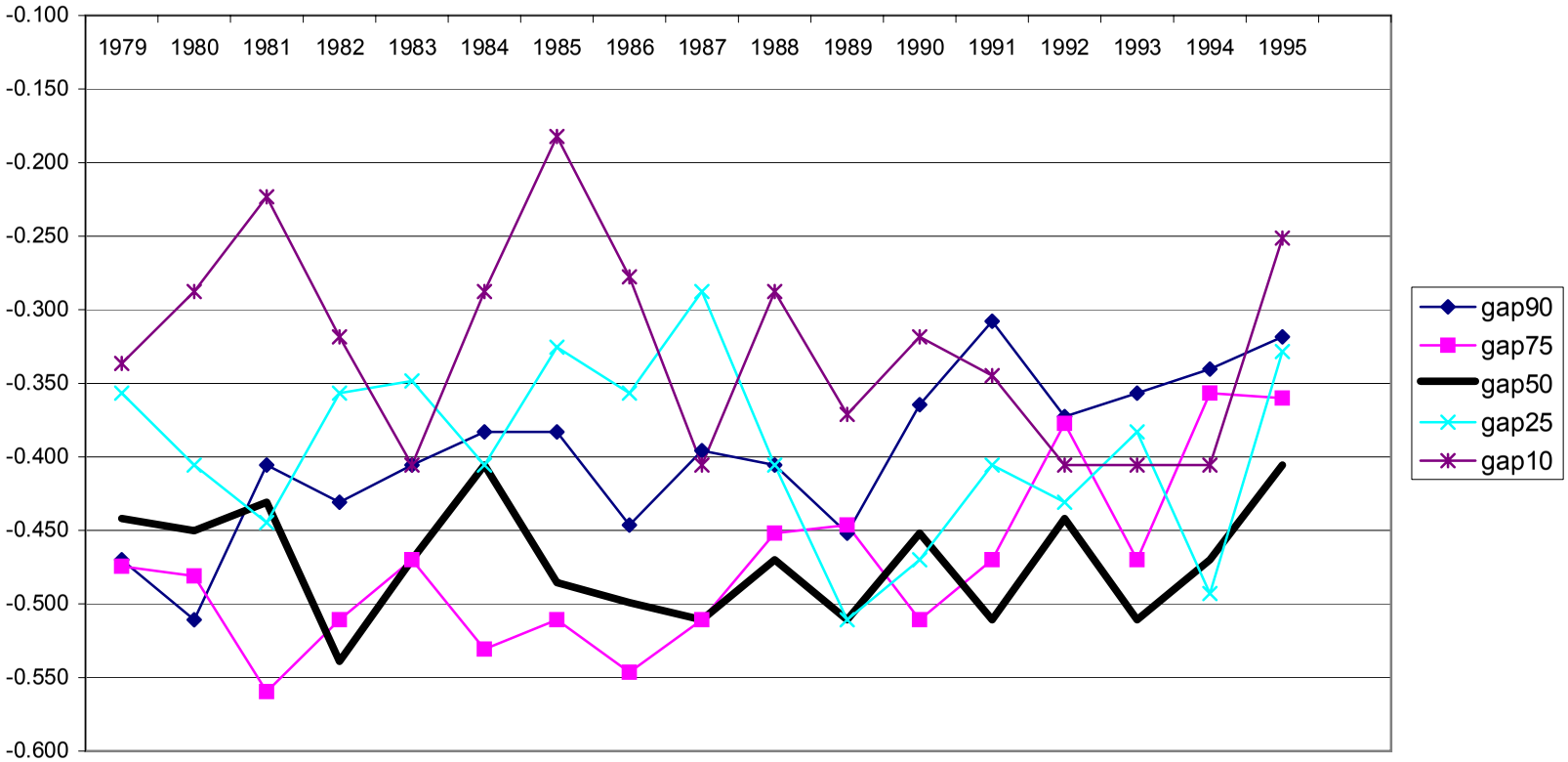


Figure 2:
Ratio of Female to Male Earnings by Class of Worker

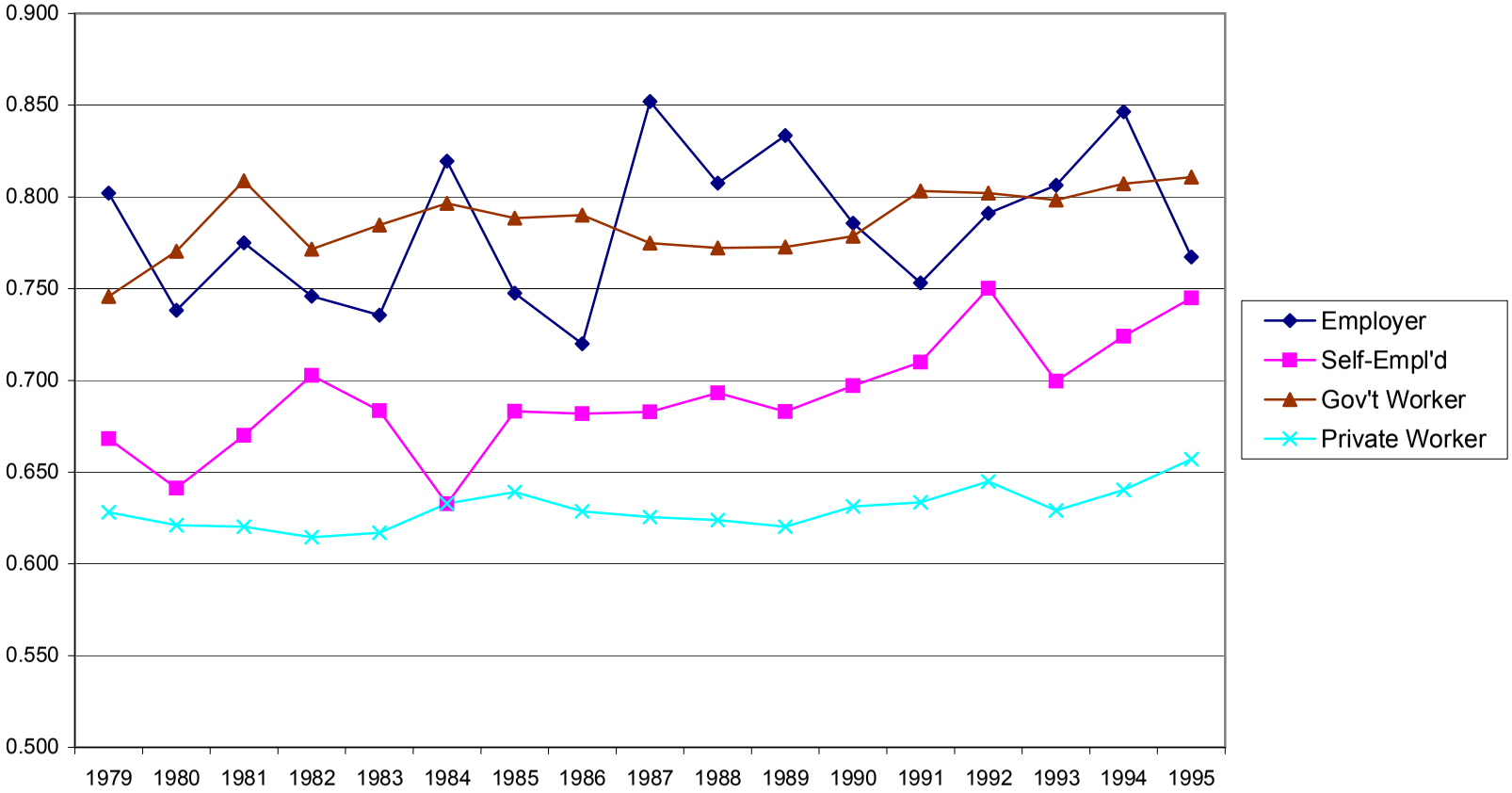
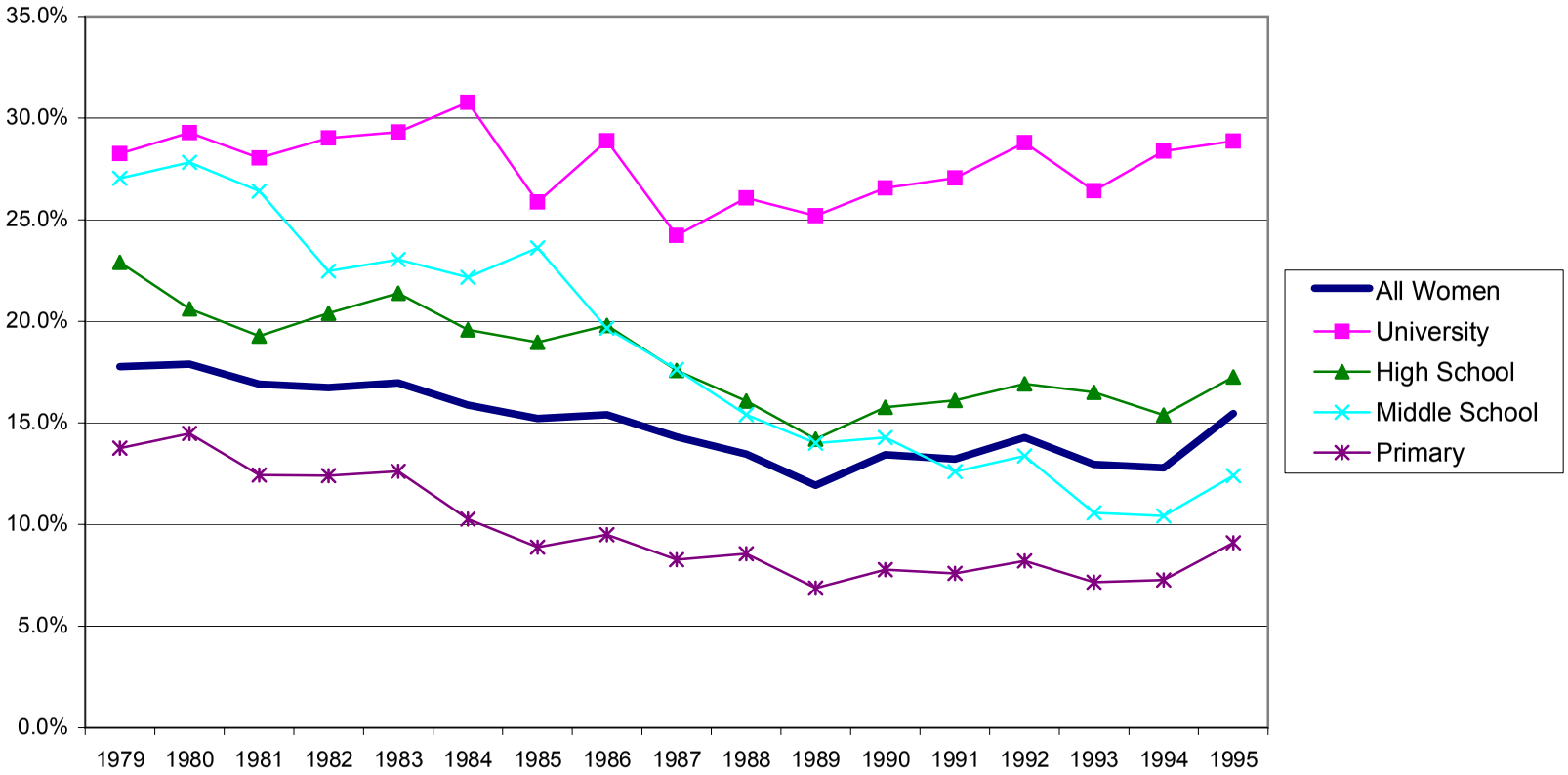


Figure 3:
Position of Mean Female Residual in Percentiles of Males Residual Log Earnings Distribution



Appendix A
Log-Earnings Regressions for Taiwan, 1979-95
(robust standard errors in parentheses with p<0.05 = ~, p<0.01 = *)

Year:	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
# obs :	22291	23200	23995	23921	24309	25641	25653	25583	27882	27924	27580	26808	26357	26135	28208	28512	28241
Intercept	7.873*	7.863*	7.978*	7.998*	7.920*	8.038*	8.024*	8.022*	8.090*	8.210*	8.295*	8.371*	8.412*	8.516*	8.531*	8.560*	8.616*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Age	0.073*	0.075*	0.077*	0.075*	0.081*	0.078*	0.078*	0.083*	0.083*	0.080*	0.082*	0.081*	0.083*	0.077*	0.081*	0.083*	0.076*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age-sq	-0.001*	-0.001*	-0.001*	-0.001*	-0.001*	-0.001*	-0.001*	-0.001*	-0.001*	-0.001*	-0.001*	-0.001*	-0.001*	-0.001*	-0.001*	-0.001*	-0.001*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Female	-0.271*	-0.302*	-0.308*	-0.327*	-0.311*	-0.311*	-0.315*	-0.330*	-0.336*	-0.344*	-0.382*	-0.369*	-0.356*	-0.340*	-0.366*	-0.353*	-0.335*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Married	0.04	0.066*	(0.02)	0.04	0.03	0.02	0.064*	0.02	0.01	0.03	0.03	0.031*	0.02	0.049*	0.03	0.02	0.050*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
No School	-0.346*	-0.378*	-0.382*	-0.338*	-0.382*	-0.415*	-0.418*	-0.433*	-0.379*	-0.438*	-0.417*	-0.350*	-0.418*	-0.466*	-0.326*	-0.363*	-0.357*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)
Self-Taught	-0.339*	-0.366*	-0.354*	-0.365*	-0.326*	-0.368*	-0.423*	-0.445*	-0.426*	-0.493*	-0.416*	-0.454*	-0.459*	-0.360*	-0.326*	-0.305*	-0.380*
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)	(0.05)	(0.04)	(0.05)	(0.05)	(0.05)
Primary	-0.068*	-0.105*	-0.102*	-0.098*	-0.142*	-0.168*	-0.172*	-0.185*	-0.179*	-0.198*	-0.179*	-0.174*	-0.188*	-0.197*	-0.188*	-0.189*	-0.179*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Acad. HS	0.143*	0.157*	0.137*	0.163*	0.146*	0.111*	0.129*	0.121*	0.101*	0.114*	0.112*	0.095*	0.099*	0.094*	0.101*	0.087*	0.095*
	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Voc. HS	0.138*	0.114*	0.110*	0.122*	0.101*	0.099*	0.113*	0.113*	0.090*	0.091*	0.088*	0.089*	0.089*	0.083*	0.086*	0.085*	0.093*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Jr. College	0.296*	0.280*	0.284*	0.305*	0.294*	0.279*	0.280*	0.299*	0.272*	0.282*	0.257*	0.259*	0.277*	0.248*	0.247*	0.227*	0.257*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Univ+	0.486*	0.481*	0.434*	0.461*	0.466*	0.466*	0.485*	0.507*	0.491*	0.464*	0.446*	0.446*	0.441*	0.443*	0.460*	0.427*	0.437*
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
R-sq	0.30	0.28	0.26	0.29	0.33	0.26	0.30	0.33	0.26	0.27	0.33	0.31	0.26	0.269	0.245	0.226	0.267