NBER WORKING PAPER SERIES

THE EARNINGS GAP BETWEEN MALE AND FEMALE WORKERS: AN HISTORICAL PERSPECTIVE

Claudia Goldin

Working Paper No. 1888

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
April 1986

Earlier and substantially longer versions of this paper have been presented to the United States Commission on Civil Rights Consultation on Comparable Worth, June 1984 and the Conference to honor Stanley Lebergott, Wesleyan University, March 1985. The research reported here is part of the NBER's research program in Development of the American Economy. Any opinions expressed are those of the author and not those of the National Bureau of Economic Research.

NBER Working Paper #1888
April 1986

The Earnings Gap Between Male and Female Workers: An Historical Perspective

ABSTRACT

Has economic progress increased the relative earnings of females to males over the long run? Evidence on trends in the earnings gap for the last four decades appears to run counter to this hypothesis. Numerous data sources are used in this paper to piece together a 170-year history of the earnings of females relative to those of males and the variables that determine earnings in the market place. In brief, the constancy of the earnings gap from the 1950s is a short-run phenomenon and cannot be extrapolated into the more distant past. The ratio of female to male earnings in the economy as a whole rose from just over 0.45 to just under 0.60 during 1890 to 1930. It rose to just over 0.60 by 1950 but has been virtually stable from then, declining somewhat during the early to mid-fifties and rising after 1981. The ratio in the manufacturing sector rose from about 0.35 in 1820, to 0.50 in 1850, and to 0.58 in 1930.

Advances in the labor market experience of the female working population account for 24 percent of the increase in the earnings ratio over the 1890 to 1940 period. Increases in the returns to education and, to a lesser extent, in educational attainment, account for about 40 percent of the increase from 1890 to 1970. It is also possible that the decreased return to physical attributes (such as strength) accounts for another 28 percent of the increase in the female to male earnings ratio. The various factors considered account for about 85 percent of the entire increase in the ratio from 1890 to 1970 (some factors served to decrease the ratio). The constancy of the gender gap from the 1950s is a function of the increased labor force participation of women which served to stabilize the work experience of the working population of women and to make the future highly unpredictable for many cohorts.

Claudia Goldin
Department of Economics
3718 Locust Walk
University of Pennsylvania
Philadelphia, PA 19104
(215) 898-7733

Over the long-run, advances in technology, work organization, educational standards, social norms, and life-cycle labor force participation ought to increase the relative earnings of females to males. The labor market's rewards to strength should be minimized by the adoption of machinery and those to brain-power should be increased. Formal education, supplied by the employee, should replace on-the-job training possibly denied individuals in groups having brief life-cycle employment. As more women enter and remain in the labor market, their experiences in jobs and with firms should approach that of the male labor force. Economic progress, it seems, should narrow and eventually eliminate differences in the earnings of females and males.

The evidence on trends in the gender gap, however, appears to run counter to this hypothesis. The ratio of female to male full-time earnings has been virtually stable over the last 35 years, hovering just under 0.60 (0.66 adjusted for hours of work) with a mild decline in the early to mid 1950s and a rise beginning around 1981.[1] Although short-run data, those for the past three to four decades, do not appear consistent with this depiction, are longer-run historical data? The answer to this question has not been readily available because the Current Population Reports, which made comprehensive national earnings data accessible, began in the 1950s. There are no corresponding figures for earlier periods.[2]

Numerous data sources are used in this paper to piece together a 170-year history of the earnings of females relative to those of males and the variables that determine earnings in the market place. In brief, the constancy of the earnings gap from the 1950s to the 1980s is a short-run phenomenon; it cannot be extrapolated into the more distant past. Furthermore, economic progress has decreased the earnings gap by increasing the returns to schooling, by increasing

the labor market experience of women, and by decreasing the returns to physical strength.

The ratio of female to male earnings in the economy as a whole rose from just over 0.45 to just under 0.60 during the period 1890 to 1940, but was virtually stable from 1950, declining somewhat during the early to mid-fifties and rising after 1981. The increase in the ratio from 1890 to 1940 can be traced primarily to an increase in the ratio of female to male earnings within broad occupational groupings. The increase in the ratio within these groupings was, in turn, a function of increases in educational norms in general and the emergence of jobs, such as those in the clerical sector, in which the returns to education were enhanced.

Although an economy-wide series cannot be extended before 1890, a history of relative earnings for the manufacturing and agricultural sectors can be constructed. The gender gap in both sectors shows a narrowing from around 1815 to 1900, but stays virtually constant thereafter. The early narrowing was due to the enhanced division of labor in manufacturing and the increased demand for relatively unskilled labor. The virtual stability in the gap after 1900 appears to be due to the growing heterogeneity of the female labor force. By 1960 the manufacturing sector was employing among the least educated female workers, working the fewest hours and weeks per year.

Finally, the absence of a narrowing of the gap during the past three to four decades is shown, here and elsewhere (Smith and Ward, 1984), to be a function of the increased labor force participation of women. Many social commentators (for example, Hewlett, 1986) have claimed that the social significance of increased participation of women is called into question by the stability of the earnings gap between men and women. However, the earnings gap has been

stabilized precisely because of changes in the role of women in the economy and not in spite of them.

This paper examines three related topics: (1) the history of the ratio of female to male earnings; (2) an analysis of the ratio at various points in time with an explanation for changes in the ratio over time; and (3) the reasons for the relative constancy of the gender gap over the past 35 years. The reasons for the earnings gap at various dates have been the subjects of a lengthy and inconclusive literature, which is only briefly discussed here. My focus is, instead, on changes in the gap over time.

1.0 The Ratio of Female to Male Earnings, 1815 to 1985

The history of relative earnings can begin almost two centuries ago with data from the agricultural and manufacturing sectors. Earnings ratios for the entire economy, however, can be constructed only for the last century and with caution for the pre-1950 period. It should be noted at the outset that all earnings and wage data presented have been adjusted, where possible, for differences in weeks worked per year between men and women, but not necessarily differences in hours of work per day among full-time workers. Thus the data refer to full-time workers, unless otherwise indicated.

The wage of females relative to males was fairly low in the northeastern states prior to industrialization but rose quickly wherever manufacturing activity spread (Goldin and Sokoloff, 1982, 1984). Around 1815 the ratio of female to male wages in agriculture and domestic activities was 0.288 and rose to about 0.303 to 0.371 among manufacturing establishments at the inception of industrialization in the United States in 1820. By 1832 the average ratio in manufacturing was abont 0.44, and it continued to rise to just below 0.50 in the northeastern states by 1850. Early industrialization, therefore, increased

the wage of females relative to males by over 70 percent (from 0.288 to 0.50) and the ratio in the industrial sector expanded by 43 percent (from about 0.35 to 0.50). In the briefest of periods, a mere two decades, the gender gap in manufacturing narrowed by about 15 percentage points. Nationwide the ratio rose slowly to about 1900 when it reached its current value of about 0.56 (see Table 1 and Figure 1). The magnitude and implications of the initial advance are sufficiently important to warrant further attention.

The observations of those who lived through the transitionary times of the early nineteenth century support the fragile quantitative evidence that the wages of females relative to males rose considerably over this period. Perhaps the best known commentary on the relative productivity of females in the preindustrial period and on the opportunities in manufacturing for their employment is that of Alexander Hamilton. "In general, women and children [would be] rendered more useful, and the latter more early useful, by manufacturing establishments than they would otherwise be (Taussig, 1892, p. 9)." These notions were echoed by another Secretary of the Treasury, Albert Gallatin, who knew in 1831 far better than Hamilton could have imagined in 1791 that "female labor employed in the cotton and woollen [sic] manufactures appears from the rate of their wages to be more productive than applied to the ordinary occupation of women (Taussig, 1892, p. 192)." Henry Carey, whose essay on wage rates appeared in 1835, noted that:

> agricultural labor has not varied materially in these forty years [1793 to 1833] in its money price . . . the wages of men having been very steadily about nine dollars per month [with board] . . . [but] the wages of females have greatly advanced being nearly double what they were forty years since (Carey, 1835, p. 26).

But these individuals may not have been entirely uninterested in the impact industrial development would have on particular groups including female laborers.

Additional evidence is readily available from the rather ordinary individuals surveyed by the McLane Report of 1832 (see Goldin and Sokoloff, 1982 for a description of this document). This extraordinary source contains information on the period of transition and on the wages of males and females in areas yet untouched by industrial development. One Aaron Tufts in Dudley, Massachusetts noted in his schedule that, "Comparatively nothing is done in the household manufactory: a female can now earn more cloth in a day than she could make in the household way in a week (McLane, 1832, Vol. I, p. 69)." A fairly typical McLane Report respondent referred to the factories as affording the employment of "females who had little else to do (Vol. I, p. 819)." Thus the commentary of the exceptional individuals who lived through these transitionary decades is corroborated by the many respondents to the McLane Report, all supporting the quantitative evidence on the increase in the relative wages of females to males from around 1800 to 1830.

Relative wages continued to rise in the manufacturing sector across most of the nineteenth century but stabilized sometime before 1900. The only indication of an increase in the ratio is in Beney (1936), particularly those of the Depression years, and the data for the immediate post-World War II period. The Beney data appear to produce a somewhat inflated ratio in comparison with the Brissenden (1929) data, which are consistent with those from the 1890 Census of Manufacturing, the Dewey Report from Long (1960), and the First Annual Report of Commissioner of Labor also from Long for 1885. The years of overlap between the Beney and Brissenden data, the early 1920s, suggest that the Beney ratios are inflated by about 10 percent.[3]

One other aspect of the manufacturing data in Table 1 should be noted. The data for 1914 to 1935 from Beney indicate that the ratio of hourly wages in manufacturing was more than 10 percent higher than that for weekly or annual

earnings because of the smaller number of hours per week worked by women in manufacturing. O'Neill (1985, implicit in Table 1) reports similar findings for more recent data. There is little indication, however, that hours worked differed for the earliest years being considered, those for the first half of the nineteenth century. Thus the increase in the ratio of female to male wages in manufacturing corrected for hours worked is somewhat understated by the uncorrected figures in Table 1.

The narrowing of the earnings gap in manufacturing across the nineteenth century resulted from the increasing division of labor and use of machinery. Furthermore, the role of industrialization in increasing the ratio of female to male wages depended on the initial crop; grain, but not cotton, growing areas experienced the greatest increases (see Goldin and Sokoloff, 1984). The relative constancy of the gender gap within the manufacturing sector, extending from the late-nineteenth century to the present, is discussed at length in Goldin (in progress). In short, as the female labor force became more diverse, in terms of levels of experience, education, desired hours of work, and so on, the manufacturing sector, it seems, hired those having the lowest levels of human capital and those desiring to work the fewest hours.

Manufacturing data provide nearly two centuries of information on the gender gap, but the manufacturing sector hired only one-third of all female employees across the last century. It becomes necessary, therefore, to construct earnings data for a wider range of occupations. These constructed data cannot extend to the early nineteenth century but do indicate that the gender gap across all sectors narrowed from 1890 to about 1940.

Full-time earnings for females and males are given in Table 2, Part A, for six major occupational groupings for three bench mark years, 1890, 1930, and

1970. Average earnings are constructed by weighting these earnings by the occupational distributions. The ratios of female to male earnings for the three bench mark years are given in the first line of Part D and the within occnpational group ratios are given in Part B. Ratios of female to male earnings across all occupations for the post-World War II period, obtained from conventional sources, are presented in Table 1.

The ratio of female to male full-time earnings increased from 0.463 to 0.603 from 1890 to 1970 (Part D), or by 30 percent.[4] The latter figure is unadjusted for differences among full-time workers in average hours of work per week and increases to 0.663 when the implied earnings per honr are used (0.603 x 1.1). Data for 1890 indicate that scheduled hours per day were approximately the same in female and male-intensive industries, thus there is no adjustment for full-time workers.

Thus the increase in the ratio of female to male earnings is between 30 and 43 percent, depending on whether one uses the hours correction, over the eighty-year period considered. This finding distinctly overturns the notion that the economy-wide earnings gap was stable for a period extending into the distant past. Furthermore the gender gap closed to about 1940, and, with some nps and downs, has remained virtually stable to about 1980. Thus the narrowing from 1890 by about one-third extended over only a forty to fifty-year period.

Part B of Table 2 gives the ratios of female to male earnings within each occupational group and most show a rise over time, particularly in the period from 1890 to 1930. An exception would be the manufacturing sector, as discussed above. Increases were greatest in the professional and clerical categories, for which advances in education appear to have augmented both the relative earnings of females to males and the numbers employed in these sectors (see Goldin 1984).

Part C constructs aggregate earnings for each year using the earnings and occupational weights of that year. Average earnings data using the earnings of a particular year but the occupational weights of another are also given. Part D uses these data to construct a matrix of female to male earnings ratios in which the occupational structure varies across the columns and the earnings data vary down the rows.

It is generally presumed that the occupational distribution between men and women is a prime determinant of the gender gap and that changes in the occupational distribution, therefore, provide the primary way of altering relative earnings between men and women. There are two ways of formulating this proposition. The first concerns whether changes over time in the occupational distribution have significantly affected the gender gap. If changes in the occupational distribution have been of primary importance, then allowing the distribution to change but keeping earnings constant, should account for most of the increase in female to male earnings over time. The second is to test whether the occupational distribution is important in determining the earnings gap at a particular date. If women are relegated to lower paying occupations, then giving them the male occupational distribution should substantially increase relative earnings.

The matrix of Part D has been constructed to examine the first proposition. Row (1) gives the actual ratio of female to male earnings for the three years. The next three rows hold female and male wages within occupational groups constant for each of the three years, but vary the occupational distributions across the columns. The ratio of female to male earnings increases going down the rows far more than it does going across the columns. The ratio of female to male earnings rose from 0.463 to 0.556 over the first forty-year period. Had the earnings figures by occupation remained at their 1890 levels but had the structure

of occupations changed, the ratio would have increased from 0.463 to 0.489 (row 2, Part D). The remaining difference of 0.067 was due to changes in the structure of earnings, both between the sexes and across all occupations. Similar findings result from holding the structure of earnings at the 1930 and 1970 levels (rows 3 and 4, Part D).

Across the last period, 1930 to 1970, the male labor force moved relatively into the high-paying positions, out of the farm sector and into professional activities. The share of the male labor force in the professional category increased from 14 to 25 percent; that for females increased from 17 to only 19 percent, but the proportion of female employment in the clerical sector continued to expand. As in the previous forty years, the ratio of female to male earnings rose during the 1930 to 1970 period, from 0.556 to 0.603. But had the earnings figures remained at their 1930 levels, this ratio would have declined, from 0.556 to 0.507. Alternatively had the 1970 earnings prevailed, the ratio would have been 0.610 in 1930 but would have declined to 0.603 by 1970. Thus the relative shift of both males and females across sectors from 1930 to 1970 reduced the relative earnings of women. That the aggregate ratio increased at all was due to the increase in the ratio of female to male earnings for professionals and to the reduction of skill differentials for men (Keat, 1960; Williamson and Lindert, 1980). Over the last ten years (not in Table 2, although see Table 1) the average earnings of women relative to those of men have risen precisely because women have progressively shifted into the professional sector, a move previously accomplished by males from 1950 to 1970.

Thus the increase in the relative earnings of females over the past century was due far more to changes in relative earnings within occupations than it was to changes in the distribution of occupations between men and women. The

narrowing of skill premia from 1890 to 1930 with the increase in schooling levels greatly increased relative earnings of women.[5] This finding is particularly noteworthy since it is generally presumed that the occupational distribution is the primary determinant of relative wages. Although the exercise in Table 2, Part D is performed for only six occupational groups, it is still surprising that occupational changes had so little impact on the ratio of female to male earnings and that relative earnings within the broad occupational groups had so much more.

A test of the second proposition, that the occupational distribution was a prime determinant of the ratio of female to male earnings, involves giving the female population the male occupational distribution for each date but holding female earnings for each occupational group at the actual levels. Once again, the number of occupations in the table are very few, but are the largest that can presently be retrieved.

If women had the occupational distribution of the male labor force would their average earnings been substantially greater? The answer is no. Had females in 1890 the male occupational distribution given in the table for 1890, the ratio of female to male earnings would have been 0.473, but it was actually 0.463; had females in 1970 the male occupational distribution for 1970, the ratio would have been 0.629, but it was 0.603. While these findings hold for the limited number of occupational groups in Table 2, there is reason to believe that they would hold as well for more numerous classifications.[6]

The matrix of Table 2, Part D is not a true partitioning of the two factors comprising the change in the ratio of female to male occupation-weighted earnings. To get a full partitioning of the ratio one must use a geometrically-weighted average of earnings by occupation for each of the three bench mark years. The

use of the geometric mean can be defended on the grounds that the underlying structure of earnings is a function of its log, although it is used here strictly out of necessity.[7]

Six terms result from the partitioning of Table 2, Part E, and the two columns alter the weights, using either 1890 or 1970. The first term is the change in the ratio of female to male earnings by occupation, weighted by the female share in the occupation; the third term is the change in male earnings by occupation weighted by the ratio of the female to male share of employment by occupation. The change in male earnings captures changes in skill differentials within the male labor force. The second term is the change in the structure of occupations weighted by the ratio of female to male earnings for each occupation; the fourth term is the change in the ratio of the female to male share of employment weighted by male earnings. The last two terms are interactions, for which row (5) is added to the 1890 weighted average but subtracted from 1970, with the reverse for row (6).

The partitioning of the change in the relative earnings of females to males reinforces the results given in the matrix of Part D. Over the entire period 1890 to 1970, the change in relative earnings (terms 1 and 3) encompassed 83 to 111 percent of the entire change (depending on the weights used), while the change in structure (terms 1 and 4) added only -11 to 17 percent respectively (the interaction terms add the remainder).[8]

The largest of the first four terms, the first, demonstrates that the rise in relative earnings of females to males within occupations greatly increased the overall ratio. The effect is greater given the structure of female occupations in 1970 than it is for the 1890 structure, as would be expected if female employment increased in sectors experiencing relative increases in earnings.

The second, third, and fourth terms, while relatively small, change signs depending on the year chosen for the weights. The second term weights the change in the structure of female occupations by the ratio of female to male earnings. Females moved relatively into their more highly paying pursuits, thus the 1970 weights yield a positive effect and the 1890 weights a negative one. The same logic holds for the fourth term, which weights the relative occupational shift of females to males by male earnings. Females moved into those occupations which were high paying within the male earnings distribution. The third term, negative for the 1970 structure while small but positive for 1890, indicates for the 1970 weights male earnings increased relatively more in occupations that contained more males. In this manner it serves to diminish the effect of the first term.

The complete partitioning and the matrix are proximate determinants, or mechanical features, of the gender gap. Before exploring how the underlying determinants of the earnings gap have changed over time, it will be instructive to examine several features of the female labor force.

2.0 Labor Force Participation Rates

Earnings are highly dependent on the degree of labor market involvement, and the manner in which participation rates affect earnings depends, in part, on the relationship between labor force participation and life-cycle labor market experience. Expected life-cycle experience determines whether individuals appropriately invest in training, both on and off the job, and it is the stock of human capital which, to a very great extent, determines monetary rewards in the labor market.[9]

Participation rates for a group can be low, but its members can remain in the labor force for long periods of time. If they do and if they had perfect

foresight, their investments in job training could have been appropriately formed and substantial. Participation rates for women have increased rapidly over time, particularly over the last four decades. The marketable skills of this emerging labor force will depend on the degree to which these women worked in the past; this in turn depends on the precise meaning of labor force participation.

A participation rate of, say, 50 percent can indicate that one-half of all individuals are in the labor force and one-half are not. But a participation rate of 50 percent can also indicate that all individuals are in the labor force half time, say 26 weeks per year (see Ben-Porath, 1973 for an early statement of this distinction). Combinations of these two extreme cases could also exist. The meaning of labor market participation in a historical context is further complicated by changes, beginning with the 1940 census, in the procedures used to compile the national labor force participation rate. Before 1940 the "gainful worker" definition was used and after that date the "labor force" construct. Under the latter definition, individuals were in the labor force if they responded positively to a question concerning the amount they worked in the previous week. Under the former definition individuals were in the labor force if they stated they had an occupation. Because there was no clear notion of what it meant to have an occupation, it is difficult to assess the precise meaning of the "gainful worker" data. Fortunately, other data sets provide the necessary information to distinguish between the two extreme views of labor force participation (see Goldin, forthcoming).

Labor force participation rates for women have varied markedly by age, marital status, nativity, and race. Table 3 presents labor force participation rate data by race and marital status for 1890 to 1980. The starting point for these data, 1890, is dictated by the availability of labor force statistics in

published format (although see Goldin and Sokoloff, 1982 for earlier estimates).

The labor market involvement of white married women was very low until well into the twentieth century. Rates for single women increased steadily over time, although they were quite high in most industrial and urban areas throughout the nineteenth century. For much of American history the labor force participation rate of all adult women was low but began to expand during the 1920s. These rates rapidly increased after 1950, first for women over age 35 and later for those under 35 years (see also Goldin, 1983b and Easterlin, 1980).

But the issue of the relationship between labor force participation and life-cycle experience depends on the actual experiences of cohorts of women. When the data on labor force participation for adult married women are arrayed by birth cohort, as they are in Figure 2, the increase in participation rates over time is reflected in average labor market life-cycle experiences. For every cohort of women within their married years, participation rates rose with age, with younger cohorts of women having progressively increased participation rates.[10] Some cohorts, such as those born around 1906 to 1915 and 1946 to 1955, had larger increases in participation rates than those preceding them. But all cohorts experienced similar changes across their own life cycles and had participation rates that were higher than those before.

Three aspects of these data, together with the relationship between participation and life-cycle labor force experience, affect the ratio of female to male earnings and changes in the ratio over time. Because participation rates for adult women were low until the relatively recent past, most women and their families would not have found it profitable to invest in job training. Therefore the earnings and occupations of these women could be expected to have differed considerably from those of men, even when these women were young and

had high participation rates.

Participation rates for adult women eventually began to increase, and it becomes necessary to understand what brought the change about. Were more women participating or were the same women participating more? It appears that while some combination of these two extreme views is the most accurate depiction, a large proportion of women who participated in the labor force when young continued to do so (for the 1910 to 1940 period see Goldin 1983a; corroborating evidence on the more recent period is in Heckman and Willis, 1979; Moulton, 1985; O'Neill, 1985; Smith and Ward, 1984). As participation rates increased over time, women with little labor force experience entered the market joining those with more accumulated labor force experience. Thus periods of rapidly increasing female participation rates may have been associated with a stable, if not declining, number of years work experience for the working population.

Furthermore, because each cohort's participation rates exceeded the previous one's, all women may have had difficulty predicting their own future labor force participation rates. Each cohort when young may have extrapolated from the experiences of their elders and thereby underestimated their own future labor force participation rates. The implications of these remarks are explored further below.

3.0 Explaining the Gender Gap: At Various Dates and Over Time

The degree to which human capital measures can explain differences in the earnings of males and females has been a matter of continuing debate, although a general consensus has emerged that around 30 to 50 percent can be explained by differences in conventional factors, such as job experience, education, and hours of work.[11] Many interpret the unexplained portion of the gap, on average 60 percent or 24 percentage points, as a measure of discrimination against

women. Others cite omitted factors under the control of individuals, such as work intensity, which might close the entire gap. Yet others, moving in the opposite direction, note that the factors used to explain the gap are themselves endogenous, possibly rooted in discrimination against women.

Has our ability to explain the gap in earnings increased or decreased over time with its narrowing? It appears that the explanatory power of the conventional earnings equation, in terms of the percentage of the difference in the log of earnings that is "explained," has decreased over time. However, the difference in the log of earnings that is unexplained -- the residual -- has remained roughly constant over time. Therefore although the proportion that is unexplained has increased, the increase is almost entirely due to the narrowing of the gap itself.[12]

Evaluating how much of the difference in nineteenth century earnings between males and females can be explained by human capital variables involves estimating earnings equations for both. There are numerous studies using recent data, but only a handful for the late-nineteenth century. One of these has looked at male and female workers in California manufacturing industries in 1892 and is consistent with several other studies for this period.[13]

The difference in the log of male and female earnings in the 1892 sample is 0.767 of which 0.466 to 0.492 can be accounted for by differences in the mean values of the independent variables (depending on whether the male or female weights are used) -- that is, 62.5 percent can be explained. The remaining 0.302 or 0.275 is explained by differences in the coefficients, including the constant terms. Therefore, if one defines "discrimination" as that which cannot be explained, discrimination accounts for 37.5 percent of the difference in the log of earnings in this sample, or 0.288 in absolute value.

One recent study has found that discrimination, computed in this manner,

accounts for 56 percent of the difference in the log of earnings.[14] The difference in the log of the hourly wage was 0.438 (its value when the ratio of wages is 0.645). Therefore the explained portion is 0.193 and the unexplained portion is 0.245, or just below its value around 1890. Thus the value of the unexplained portion has fallen slightly, but the proportion that is unexplained has risen, and that which is explained has fallen, with the narrowing of the earnings gap.

What are the factors accounting for the decline in the explained proportion of the difference in the log of earnings? Table 4 details the consensus coefficients and variable means of recent earnings function studies and those from the turn of this century. The variables that can be considered are experience, education, and "home time," although variable accounting for physical strength is discussed below. The coefficients on experience and experience squared have been condensed.[15] Because workers in the late-nineteenth century entered the labor market when they were quite young, some of the measured returns to experience are really those to simple maturation and a maturation factor is deducted. Although the coefficients and mean values for the current studies apply to the entire labor force, those that have been computed for 1890 apply only to manufacturing. Therefore certain assumptions were made to convert the 1890 values to represent those of the entire working population.

The framework employed assumes that female and male earnings equations are given by:

$$\begin{aligned} \ln w_f &= \alpha_0 + \sum \alpha_i X_i \\ \ln w_m &= \beta_0 + \sum \beta_i Z_i \end{aligned} \qquad (1)$$

The closing of the gap can then be written in four ways, one of which is:

$$\ln (w_f^1/w_m^1)/(w_f^0/w_m^0) = (\Delta\alpha_0 - \Delta\beta_0) + \qquad (2)$$

$$\sum\Delta\alpha(X^0 - Z^0) + \sum Z^1(\Delta\alpha - \Delta\beta) + \qquad (2a)$$

$$\sum\Delta Z(\alpha^0 - \beta^0) + \sum\alpha^1(\Delta X - \Delta Z) \qquad (2b)$$

where superscript 1 = circa 1970, 0 = circa 1890, $\Delta y = y^1 - y^0$, and all i subscripts have been dropped for convenience. Portion (2a) of equation (2) is due to changes in the coefficients, while (2b) is due to changes in the characteristics. The change in the constant terms is a residual.

The estimated and approximated coefficients and means in Table 4 yield a total explained portion of 0.205. Of the total, 0.085 is due to changes in the experience variable, 0.143 is due to changes in the education variable, and the increase in home time reduces the total by 0.023 (see detail in Table 4). Changes in characteristics have had a greater effect for experience, while changes in coefficients have had the greater effect on education. These findings are robust to the method of decomposition. They are also consistent with the conclusions of Table 2, that increases in female earnings within certain occupations were most important in narrowing the earnings gap. These occupations were those for which returns to education were highest.

One variable that has not been included in the decomposition is the premium paid to men for their larger average size and strength, a premium that ought to have declined over the last century with technological advances. In the early nineteenth century the relative wage of female to males, and boys to adult males, was very low in the northeastern United States. While the early factory system and its machinery almost doubled the ratio, it was still much below one in 1850 (Goldin and Sokoloff, 1982). It is clear that machinery and the division labor augmented the earnings of females relative to those of males, but how much of the remaining gap was due to physical differences?

The extensive use of piece-rate wages for females in manufacturing enables a lower-bound estimate of the wage premium for strength and other physical differences correlated with gender. The premium can be measured only for jobs in which both men and women were employed, and, given extensive occupational segregation, this is a rather short list. Because of this, the difference between the wages of males and females working on piece rates for a particular job may understate the difference across all occupations, had men and women been found in all jobs. Males may have been temporarily placed until a job in a "male" position came available; alternatively males employed in these jobs may have been less productive than the average.

Data on piece-rate earnings in 1895 indicate that males earned on average 30 percent more than did females (that is, the wage ratio was 0.77), when the piece-rate was identical for both, and when both worked at the same job, in the same factory, and were in the same age group.[16] Because piece rates are paid on actual physical product, any difference in earnings for full-time workers occupying the same position in the same firm must reflect a difference in strength, dexterity, determination, or the quality of the complementary inputs. The average ratio of female to male earnings for time-rate work in the factories sampled was about 0.60 in the 1895 report. The ratio for piece-rate work was 0.77. Thus the difference in physical product accounts for 23 percentage points and the residual is 17 percentage points, out of a possible 40 percentage points. If the basis ratio in manufacturing for this period was 0.77, rather than 1.00, the gender gap would narrow to 0.78 (= 0.60/0.77) from 0.60.

Thus the premium paid to men for gender-specific abilities, of which strength may have been a factor, was at least 58 (= 23/40) percent of the actual difference of 40 percent. It was at least this amount because time-rate

jobs, in which there were few women, paid more, and men may have been preferred to women in such jobs because of various gender-specific skills. Comparable data for other periods of time and other occupations are not presently available. But it is clear that as desk jobs have replaced manual labor the returns to gender-specific differences such as strength must have decreased, and the piece-rate data give one measure. A variable for the decrease in strength with advances in technology and the replacement of white collar for blue collar labor, could well add another 0.10, bringing the total change to 0.305.[17]

The left hand side of equation (2), that is the difference in the log of the ratio of female to male earnings in 1970 and 1890, was 0.2642 using the data in Table 2. It increases to 0.3595 when the 1970 figure is corrected for hours of work among full-time workers and to 0.3921 when the actual data (as opposed to those in Table 2) are corrected for hours.[18] The three factors in Table 4 -- experience, education, and home time -- account for a substantial share of the change -- from 52 to 78 percent -- and the addition of a factor to chart the declining return to strength would increase the percentage even further.

4.0 Evidence on the Recent Stability in the Earnings Gap

For most of American history the vast majority of women have not participated in the labor market on par with men and the participation rate of white married women was low until the 1950s. Despite the low degree of labor market participation of married women, those in the labor force could have remained in for substantial periods of time, if their labor market turnover was low. If this was the case, the expansion of the female labor force over time implies that new entrants, with little prior labor force experience, must have joined existing workers. Their entry would have tended to decrease the average level of experience of

the currently working population of women.

Data on life-cycle labor force participation and the average labor market experience of working women are scarce even for the post-World War II period with the exceptions of certain panel surveys that begin in 1967. Two separate studies have constructed estimates of these variables for the period from 1930 to 1980.[19] The findings indicate that average years of labor market experience for currently working women have barely increased over this period, despite the rather large increases in labor force participation so evident from the data in Table 1.[20] Years of job experience for the currently working population of married women increased from 9.06 in 1930, to 9.78 in 1940, to 10.52 in 1950 (Goldin, 1983a, p. 26). The labor market experience of working women age 40 remained roughly constant at 13.5 years from 1940 to 1980, while the work experience of the entire population of women aged 40 rose by over 4 years (Smith and Ward, 1984).

The apparent paradox afforded by these two disparate trends, that for working women and that for the entire population of women, is easily resolved. Adult women in the labor force have had a strong tendency to remain in the labor force for substantial periods of time, and those just entering the labor force have had relatively low experience levels. The average work experience of the entire population of working women increased greatly over the last fifty years, but the average work experience of those currently working did not, as new entrants continually brought down the average. For similar reasons the educational attainment of the working population of women did not increase along with that of the entire population, until recently (see the discussion in Smith and Ward, 1984).

These data cut in two different ways in the explanation for the relative

earnings data and the changes in these ratios. In terms of the absolute level, the tendency for women to remain in the labor force should have led to higher wages and better jobs. But the stability of average years experience should have lessened the relative gains in the ratio of female to male earnings. Because earnings are only observed for individuals in the labor market, the experience level and educational attainment of the working, and not the entire, population is the relevant variable. The findings with respect to change over time in life-cycle work experience are consistent with those concerning change over time in the ratio of female to male earnings.

Yet another reason for the relative stability in the earnings gap over the past 35 years concerns the method by which individuals form expectations about their future. Labor force participation among cohorts of white married women has increased within marriage (at least until age 55) for every cohort of women born in the United States since about 1890. As was shown in Figure 2, each successive decade brought an expanded participation of married women in the market economy. The actual cohort labor force participation rates have been substantially different from the cross section ones (e.g. contrast the 1970 cross-section line with any of the cohort lines).

The differences between the true cohort participation profiles and those of the cross sections are of critical importance in understanding how older generations socialize the younger, how the younger form their own expectations about their future labor market participation, and how society and employers do the same. The vast differences between the true cohort profiles and those in the cross sections imply that no generation of young women in America could have predicted solely from the experiences of their elders what their own work histories would have been.

In 1930, for example, a cohort of 20 year old daughters born in 1910 would have been off by a factor of about 4 in predicting their own participation rates in 25 years had they simply used the experiences of their 45 year old mothers born in 1885 as a guide. But they were far more informed than this simple extrapolation would suggest. They knew, for example, that their years of schooling were higher than their mothers', and they may have been aware that the jobs they held when unmarried were different from their mothers'. Knowledge of these differences would have narrowed the gap between the simple extrapolation and the actual value of the daughters' labor force participation (see Goldin, 1983b for an estimated model). However empirical evidence indicates that many cohorts have vastly underestimated their own future labor force participation and therefore may have underinvested in job related skills.

In 1968 the National Longitudinal Survey asked young females 14 to 24 years old whether they believed they would be in the labor force at age 35. The response was 29 percent for whites and 59 percent for blacks (Sandell and Shapiro, 1980). More than half of these young women are now age 35, and their labor force participation rate already exceeds 60 percent if they are married and even higher if not. The figures they had reported when young were more in line with their mothers' labor force participation rates, at age 35, than with their own (as can be seen in Figure 2 by assuming their mothers were born around 1925). Although the expectations of young women in 1968 were much below their eventual labor force participation, a similar question asked of young women in 1973 indicates a rapid convergence of expected and actual participation rates.

These data suggest that during periods of rapid labor market change it may be difficult to forecast one's future labor force participation. Individuals extrapolate from the world around them and in doing so they may underestimate

their need for formal and on-the-job training. The result may be that the actual returns to job experience for women are less than are those for men and wage ratios are less than one even when job experience is equal.[21]

5.0 Summary Remarks

Is the scenario described at the beginning of this paper an accurate depiction of the historical record? Have technological advance, economic progress, education, and increased female labor force participation served to raise the average earnings of females relative to males?

The answer is generally in the affirmative. Relative earnings across all occupations have increased throughout most of this century and have advanced within manufacturing across the nineteenth century. Certain occupations that rewarded intellect more than strength witnessed increased earnings for women relative to men, but others that required, in addition, a long labor force commitment have not, at least until recently. Earnings ratios have been stable during the last century for occupational groups requiring little skill and education.

Advances in the labor market experience of the female working population account for 24 percent of the increase in the earnings ratio over the 1890 to 1940 period. Increases in the returns to education and, to a lesser extent, in educational attainment, account for about 40 percent of the increase from 1890 to 1970. It is also possible that decreased returns to physical attributes (such as strength) accounts for another 28 percent of the increase in the female to male earnings ratio.[22] The various factors considered account for about 85 percent of the entire increase in the ratio from 1890 to 1970.

Increased female labor force participation over the last four decades has served to stabilize, and not increase, accumulated years of labor force experience

and educational attainment of the average female worker.[23] Furthermore, the rapid expansion of the female labor force throughout this century may have made the future highly unpredictable for many cohorts; one should not underestimate the extent of the social revolution that has occurred in the labor market and the difficulties in forecasting the future in times of rapid change. Today's young women, however, seem to have revised their expectations in light of past change, and may provide a true test of the ideals of the competitive marketplace.

The stability of the gender gap over the last 35 years has raised questions about the meaning of the increased labor market participation of women over that period. But the historical record indicates that the greatest narrowing within the industrial and agricultural sectors took place during the period of early industrialization, and that the gender gap across all occupations was narrowed to about 1930 or 1940. The presence of change during the period from 1815 to 1940 did not indicate social advancement, just as the absence of change in the period after 1940 does not indicate the opposite.

FOOTNOTES

1. On recent trends in the gender gap see Smith and Ward (1984) and O'Neill (1985).

2. Smith and Ward (1985, Table 9) construct earnings ratios by applying earnings for 1970 to occupational distributions from 1890 to the present. Because the ratio of female to males earnings within occupations changed considerably over this period, their procedure is incorrect and results in ratios that do not reveal the increases indicated in the actual data.

3. The reasons for the inflated ratio in the Beney data probably concern the industries surveyed. Although the Brissenden data are consistent with the somewhat earlier ratios, they are virtually stable from 1899 to 1925. The Beney ratio rises in the immediate post-World War I period and then declines somewhat, a pattern consistent with the general rise in the unskilled to skilled wage ratio in that period.

4. The ratio in 1970 of 0.603 is a weighted average of the median earnings of various occupational groups. The ratio of the actual medians (for weekly, as opposed to year-round employment, see Table 1 for distinction) is 0.623 in 1970 and 0.617 in 1973, the date for which the data in Table 2 pertain.

5. Goldin (1984) presents evidence on the role of educational advances during the first few decades of this century in increasing the supply of clerical workers.

6. Polachek (1984) finds a similar result for recent data and notes that the occupational classification would have to be considerably finer to overturn the conclusion that changes in occupational structure matter less than changes in relative wages within occupations. Polachek estimates that occupational segregation explains only 17 to 21 percent of the 1970 earnings gap using 195 occupations. Following Polachek's definition of a narrowing of the earnings gap and using the data in Table 2 yields only 5.7 percent for 1970. This result suggests that while increasing the number of occupations does not overturn the conclusion of the exercise, the use of only 6 occupations is limiting. Treiman and Hartmann (1981, Table 9) present evidence pertaining to 12, 222, and 479 occupations. Occupational segregation explains only 11 to 19 percent of the differential for 222 occupations. Although the authors claim that occupational segregation explains 35 to 39 percent of the differential for 479 occupations, there is an error in the table that reduces one of the figures to 19 percent. Furthermore, it is unclear that 479 occupations is an appropriate number.

7. See the justification for this assumption in Mincer (1974). The geometric means are not entirely good substitutes for their arithmetic counterparts. The implied ratio of female to male earnings using the geometric means is 0.487 in 1890, rising to 0.586 in 1970, while the arithmetic means are 0.463 and 0.603

8. For example, using the 1890 weights the impact of relative earnings is (0.1452 + 0.0071) or 83% of the entire change of 0.1836.

9. Polachek (1975) estimates such a model and finds that it explains almost all of the earnings gap, or about twice that of other models.

10. For a more detailed description and analysis of the cohort labor force data see Goldin (1983b).

11. Treiman and Hartmann (1981, Table 10) summarize various studies. The wide range of estimates owes, primarily, to differences in the measure of experience for women. For example, Polachek (1975) is an outlier at the upper end. By including a measure of life-cycle human capital, his earnings equations explain over 90 percent of the gap between married male and female workers. In the discussion that follows, the estimates of Corcoran and Duncan (1979), who employ a direct measure of experience and tenure, will be used.

12. This technique is generally attributed to Ronald Oaxaca (1973).

13. Goldin (1980, 1984) contain estimates for female manufacturing workers in 1888 and 1907; Hannon (1977) has estimates for various ethnic groups of males in Michigan industries. Eichengreen (1984) estimates equations for both males and females in manufacturing in California in 1892. The ratio of female to male earnings in his sample, 0.464, is considerably lower than that in all U.S. manufacturing industries at that time (see Table 1). The coefficients from his sample differ in only small ways from those in the Goldin and Hannon studies. Eichengreen adds a "schooling" variable to his equation that is defined as the age at which work began minus 6. Because many of these individuals did not attend school for that period of time (the derived years of attendance are far too high), this variable probably measures, in part, the return to maturity.

14. Corcoran and Duncan (1979, pp. 10 and 18) for all (white) working household heads and wives, ages 18 to 64. The explanatory variables are education, work history including current job, and other indicators of labor force attachment.

15. This is accomplished by setting the contribution of experience equal in the quadratic and linear versions. Thus if β_1 and β_2 are the coefficients on experience and experience squared and if β is the coefficient on experience in a regression without the squared term, then $\beta = \beta_1 + \beta_2 E$, where E = the mean experience level.

16. All cigar, clothing, cotton, and printing factories were sampled from U.S. Commissioner of Labor (1897). The figure of 0.77 is derived from a regression across 134 firms of the ratio of female to male wages regressed on the male wage. The mean male wage of $11.74 was used to compute the 0.77 figure. See Goldin (in progress).

17. A figure of 0.10 may well be a lower bound. The 1890 estimate was about 0.30 for manufacturing. There are no comparable studies of piece rates for the recent period, but various productivity studies reveal no differences between men and women (Voos, 1985). In 1890 about one-third of the labor force was in manufacturing, but over another third was in agriculture. Therefore if the 1890 figure applies only to manufacturing, that for the aggregate is about 0.10, relative to the figure for 1970 (which is assumed to be zero).

18. The difference between the 1970 figure in Table 2 and the actual statistic is that the former is the average of median earnings by occupation and the latter is the average across all individuals.

19. Goldin (1983a) produces estimates of life-cycle labor force experience for 1920 to 1950, and Smith and Ward (1984) constructs estimates for 1940 to 1980.

20. See also estimates of labor market tenure in O'Neill (1985) and Moulton (1985).

21. Sandell and Shapiro (1980) show that young women who had lower labor market expectations did invest less. It should be noted that future labor force participation rates will, in turn, be reduced by this lower rate of investment and thus lower future earnings.

22. These figures express the percent explained in terms of the log of the earnings ratios and are those in Table 4, where the log of the earnings ratios in the two years is 0.3595.

23. If the increase in the labor force participation of women is, in part, due to a shifting out of their labor force supply function over time, then a relative wage decline would be expected. Estimates in Smith and Ward (1984) of the selectivity effect indicate that it is rather small compared with the other factors.

BIBLIOGRAPHY

Ben-Porath, Yoram. "Labor-Force Participation Rates and the Supply of Labor." Journal of Political Economy 81 (May/June 1973): 697-704.

Beney, M. Ada. Wages, Hours, and Employment in the United States, 1914-1936. New York: National Industrial Conference Board, 1936.

Brissenden, Paul F. Earnings of Factory Workers, 1899 to 1927: An Analysis of Pay-roll Statistics. Census Monographs X. Washington, D.C., 1929.

Carey, Henry C. Essay on the Rate of Wages: With an Examination of the Causes of the Differences in the Condition of the Labouring Populations Throughout the World. Philadelphia, 1835.

Corcoran, Mary and Greg J. Duncan. "Work History, Labor Force Attachment, and Earnings Differences Between the Races and Sexes." Journal of Human Resources XIV (Winter 1979): 3-20.

Easterlin, Richard. Birth and Fortune: The Impact of Numbers on Personal Welfare. New York: Basic Books, 1980.

Eichengreen, Barry. "Experience and the Male-Female Earnings Gap in the 1890s." Journal of Economic History XLIV (Sept. 1984): 822-34.

Gallatin, Albert. "Free Trade Memorial." In F. W. Taussig (ed.) State Papers and Speeches on the Tariff. Cambridge, Mass., 1892.

Goldin, Claudia. "The Work and Wages of Single Women, 1870 to 1920." Journal of Economic History XL (March 1980): 81-88.

------. "Life-Cycle Labor Force Participation of Married Women: Historical Evidence and Implications." National Bureau of Economic Research Working Paper No. 1251 (Dec. 1983a).

------. "The Changing Economic Role of Women: A Quantitative Approach." Journal of Interdisciplinary History 13 (Spring 1983b): 707-33.

------. "The Historical Evolution of Female Earnings Functions and Occupations." Explorations in Economic History 21 (Jan. 1984): 1-27.

------. "Maximum Hours Legislation and Female Employment in the 1920s." University of Pennsylvania Working Paper. March 1986.

------. "The Female Labor Force and American Economic Growth, 1890 to 1980." In Stanley Engerman and Robert Gallman (eds.) Long-Term Trends in the American Economy. Chicago: University of Chicago Press, forthcoming.

------. "Assessing Various Theories of Discrimination by Sex Using Manufacturing Data: 1890 to the present." In progress.

Goldin, Claudia and Kenneth Sokoloff. "Women, Children, and Industrialization in the Early Republic: Evidence from the Manufacturing Censuses." Journal of Economic History XLII (Dec. 1982): 741-74.

------. "The Relative Productivity Hypothesis of Industrialization: The American Case." Quarterly Journal of Economics XCIX (Aug. 1984): 461-87.

Hamilton, Alexander. "Report on Manufactures." In F. W. Taussig (ed.), State Papers and Speeches on the Tariff. Cambridge, Mass., 1892.

Hannon, Joan. "The Immigrant Worker in the Promised Land: Human Captial and Ethnic Discrimination in the Michigan Labor Market." Ph.D. dissertation. University of Wisconsin (1977).

Heckman, James J. and Robert J. Willis. "A Beta-logistic Model for the Analysis of Sequential Labor Force Participation by Married Women." Journal of Political Economy 85 (Feb. 1979): 27-58.

Hewlett, Sylvia Ann. A Lesser Life: The Myth of Women's Liberation in America. New York: William Morrow and Company, 1986.

Keat, Paul G. "Long Run Changes in Occupational Wage Structure, 1900-1956." Journal of Political Economy 68 (Dec. 1960): 584-600.

Long, Clarence D. Wages and Earnings in the United States, 1860-1890. Princeton: Princeton University Press, 1960.

McLane, Louis. Secretary of the Treasury. U.S. House of Representatives, Documents Relative to the Statistics of Manufactures in the U.S., Vols. I and II, Serial Set Nos. 222 and 223. Washington, D.C., 1833.

Mincer, Jacob. Schooling, Experience, and Earnings. New York: NBER, 1974.

Mincer, Jacob and Solomon Polachek. "Family Investments in Human Capital: Earnings of Women." Journal of Political Economy 82, Pt. II (March/April 1974): 576-608.

Moulton, Brent R. "Human Capital Accumulation and Trends in the Male-Female Wage Gap in the United States, 1956-1983." xerox. (Sept. 1985).

Oaxaca, Ronald. "Male-Female Wage Differentials in Urban Labor Markets." International Economic Review 14 (Oct. 1973): 693-709.

O'Neill, June. "The Trend in the Male-Female Wage Gap in the United States." Journal of Labor Economics 3 (Jan. 1985): S91-S116.

Polachek, Solomon. "Differences in Expected Post-School Investment as a Determinant of Market Wage Differentials." International Economic Review 16 (June 1975): 451-70.

-----. "Women in the Economy: Perspectives on Gender Inequality." Paper presented to the U.S. Commission on Civil Rights, Consultation on Comparable Worth. Washington, D.C. June 1984.

Sandell, Steven and David Shapiro. "Work Expectations, Human Capital Accumulation, and the Wages of Young Women." Journal of Human Resources 15 (Summer 1980): 335-53.

Smith, James P. (ed.) Female Labor Supply: Theory and Estimation. Princeton: Princeton University Press, 1980.

Smith, James P. and Michael P. Ward. Women's Wages and Work in the Twentieth Century. Santa Monica: The Rand Corporation, 1984.

------. and ------. "Time-Series Growth in the Female Labor Force." Journal of Labor Economics 3 (Jan. 1985): S59-S90.

Treiman, Donald J. and Heidi Hartmann. (eds.) Women, Work and Wages: Equal Pay for Jobs of Equal Value. Washington, D.C.: National Academy Press, 1981.

U.S. Census Office. Report on Manufacturing Industries in the United States at the Eleventh Census: 1890. Part I: Totals for States and Industries. Washington, D.C., 1895.

U.S. Commissioner of Labor. Eleventh Annual Report of the Commissioner of Labor, 1895-96. Work and Wages of Men, Women, and Children. Washington, D.C., 1897.

Voos, Paula. "Wage Discrimination: A New Approach Based on the Direct Measurement of Productivity." Paper presented at the A.E.A. Meetings, New York City. Dec. 1985.

Williamson, Jeffrey and Peter Lindert. American Inequality: A Macroeconomic History. New York: Academic Press, 1980.

Table 1
Wage Ratios for Males and Females in Manufacturing Employment, 1815 to 1970 and Across All Occupations, 1950 to 1983

Except where noted these ratios are based on full-time, year-round employees.

Agriculture
1815 0.30

Manufacturing
1820 0.37-0.30
1832 0.44-0.43
1850 0.46-0.50

1885 0.559

1890a 0.539

1890b 0.538

	Full-time	Actual	Full-time weekly	Full-time hourly
1899	0.535	0.536		
1904	0.536	0.535		
1909	0.536	0.537		
1914	0.535	0.534	0.568	0.592
1920			0.559	0.645
1921	0.536	0.536	0.617	0.653
1922			0.612	0.677
1923	0.535	0.536	0.607	0.672
1924			0.593	0.664
1925	0.536	0.536	0.592	0.657
1926			0.585	0.662
1927			0.587	0.652
1928			0.573	0.645
1929			0.575	0.637
1930			0.578	0.635
1931			0.612	0.621
1932			0.653	0.618
1933			0.661	0.656
1934			0.688	0.704
1935			0.653	0.700

	Manufacturing		All Occupations		
	Full-time	Total	Median, Year-Round	Median, Weekly Actual Hours	Median, Weekly Adjusted
1939	0.539	0.513			
1950		0.537			
1951		0.532			
1952		0.558			
1953		0.512			
1954		0.497			
1955	0.580	0.526	0.639		
1957	0.554	0.496	0.638		
1959	0.580		0.613		
1961	0.534		0.594		
1963	0.544		0.596		
1965	0.532		0.600		
1967	0.563		0.578		
1969	0.544		0.605		
1971			0.595	0.62	0.68
1973			0.566	0.62	0.68
1975			0.588	0.62	0.68
1977			0.589	0.61	0.67
1979			0.596	0.62	0.68
1981			0.592		
1982			0.617	0.65	0.71
1983				0.66	0.72

Sources:

1815–1850. Goldin and Sokoloff (1982, Table 5). The range is for New England and the Middle Atlantic. The (b) results from Table 5 are given and use Lebergott's male common laborer wage as the base.

1885. Long (1960, p. 146), from First Report of the U.S. Commissioner of Labor, daily wages.

1890a: Long (1960, p. 148), from Dewey, actual wages used.

1890b: U.S. Census Office (1895), actual wages used.

1899–1935. First two columns. Brissenden (1929, Table 33, p. 85). Second two columns Beney (1936, Table 3, pp. 48–51).

1939–1983. Manufacturing. Historical Statistics, G 372–415, pp. 304–305. Female earnings for operatives were multiplied by 1.02 to adjust for craft and supervisory positions where such data were unavailable. Male earnings were weighted equally between craft and operative positions, consistent with the labor force percentages.

All Occupations. O'Neill (1985, Tables 1 and 3). The difference between the year-round and the weekly data is primarily the exclusion of teachers and other less-than-year-round workers from the former. Median earnings of weekly workers are higher for women than for men because of the higher-than-average earnings of female teachers. Both sets of data are from the Current Population Surveys. From 1955 to 1980 only odd numbered years have been given.

Table 2
Full-Time Earnings and Occupational Distributions of the Female and Male Labor Forces, 1890, 1930, and 1970: Entire United States

Part A: Full-Time Earnings (Current $) and Occupational Distributions

	1890				1930				1970			
	Male		Female		Male		Female		Male		Female	
	$	%	$	%	$	%	$	%	$	%	$	%
Profes.	1391	10.2	366	9.6	3713	13.6	1428	16.5	12250	24.9	8700	18.9
Clerical	943	2.8	459	4.0	1566	5.5	1105	20.9	8750	7.6	6000	34.5
Sales	766	4.6	456	4.3	1580	6.1	959	6.8	10150	6.8	4450	7.4
Manual	587	37.6	314	27.7	1532	45.2	881	19.8	8891	48.1	4950	17.9
Craft, superv.		(12.6)		(1.4)		(16.2)		(1.0)		(21.3)		(1.8)
Operative, lab.		(25.0)		(26.3)		(29.0)		(18.8)		(26.8)		(16.1)
Service	445	3.1	236	35.5	1220	4.8	730	27.5	7100	8.2	3965	20.5
Farm	445	41.7	236	19.0	1220	24.8	730	8.4	7050	4.5	4151	0.8

Part B: The Ratio of Female to Male Earnings Within Each Occupation

Professional	0.263	0.385	0.710
Clerical	0.487	0.706	0.686
Sales	0.595	0.607	0.438
Manual	0.535	0.575	0.557
Service	0.530	0.598	0.558
Farm	0.530	0.598	0.589

Part C: Male and Female Earnings in Current Dollars (θ = occupational share)

$\sum \theta_i w_i$	624	275	1741	968	9581	5776
$\sum \theta_i w_{1890}$	624	289	683	325	809	368
$\sum \theta_i w_{1930}$	1618	864	1741	968	2043	1035
$\sum \theta_i w_{1970}$	8306	4834	8874	5411	9581	5776

Part D: Ratios of Female to Male Earnings (θ varies across the columns)

(1) $[w_{fi}/w_{mi}]$	0.463	0.556	0.603
(2) $[w_f/w_m]_{1890}$	0.463	0.489	0.455
(3) $[w_f/w_m]_{1930}$	0.534	0.556	0.507
(4) $[w_f/w_m]_{1970}$	0.571	0.610	0.603

Part E: Partitioning Change in the Ratio of the Log of Female to Male Earnings, (average earnings are geometrically weighted averages of the six occupations)[a]

	1890 Weights	1970 Weights
1. $\sum\theta_f(R^1 - R^0)$	+0.1452	+0.3018
2. $\sum R(\theta_f{}^1 - \theta_f{}^0)$	-0.0880	+0.0687
3. $\sum a(W_m{}^1 - W_m{}^0)$	+0.0071	-0.0981
4. $\sum W_m(a^1 - a^0)$	+0.0679	-0.0373
5. $\sum(R^1 - R^0)(\theta_f{}^1 - \theta_f{}^0)$	+0.1567	-0.1567
6. $\sum(W_m{}^1 - W_m{}^0)(a^1 - a^0)$	-0.1052	+0.1052
Total Change	+0.1836	+0.1836

a Where $w = \sum w_i{}^{\theta_i}$, for males and females. A geometrically weighted average enables a partitioning of the various factors accounting for change in the ratio of female to male earnings. $W = \log(w)$; $R = (W_f - W_m)$; $a = (\theta_f - \theta_m)$; 1 = 1970; 0 = 1890. Note that the total change in the ratio when earnings are a geometrically weighted average is considerably less than when average earnings are the arithmetic mean. The geometrically weighted results are: (w_f/w_m) = 0.487, but 0.463 for the arithmetic mean in 1890; the results for 1970 are 0.586 for the geometric weights, but 0.603 for the arithmetic means. Therefore the geometrically weighted averages understate the total increase. Columns may not add up due to rounding error.

Sources and Notes: See Appendix.

Table 3
Female Labor Force Participation Rates by Marital Status, Race, and Nativity, 1890 to 1980

	≥ 16 years old				≥ 15 years old			≥ 16 yrs.		
	1890	1900[a]	1920	1930	1940	1950	1960	1970	1980	
Total	18.9	20.6	23.7	24.8	25.8	29.0	34.5	42.6	51.5	(49.9)
Married	4.6	5.6	9.0	11.7	13.8	21.6	30.7	40.8	50.1	(49.2)
Single	40.5	43.5	46.4	50.5	45.5	46.3	42.9	53.0	61.5	
White	16.3	17.9	21.6	23.7	24.5	28.1	33.7	41.9	(49.4)	
Married	2.5	3.2	6.5	9.8	12.5	20.7	29.8	39.7	49.3	(48.1)
Single	38.4	41.5	45.0	48.7	45.9	47.5	43.9	54.5	64.2	
Nonwhite	39.7	43.2	43.1	43.3	37.6	37.1	41.7	48.5	(53.3)	
Married	22.5	26.0	32.5	33.2	27.3	31.8	40.6	52.5	59.0	(60.5)
Single	59.5	60.5	58.8	52.1	41.9	36.1	35.8	43.6	49.4	
Foreign Born	19.8			19.1						
Married	3.0			8.5						
Single	70.8			73.8						

Sources: See Goldin (forthcoming). All data are from U.S. Population Censuses except 1980 data are the Current Population Survey figures. Figures in parentheses are from are the population census figures.

a The 1910 labor force figures have been omitted. See Goldin (forthcoming) for a discussion of the overcount of the agricultural labor force in that year.

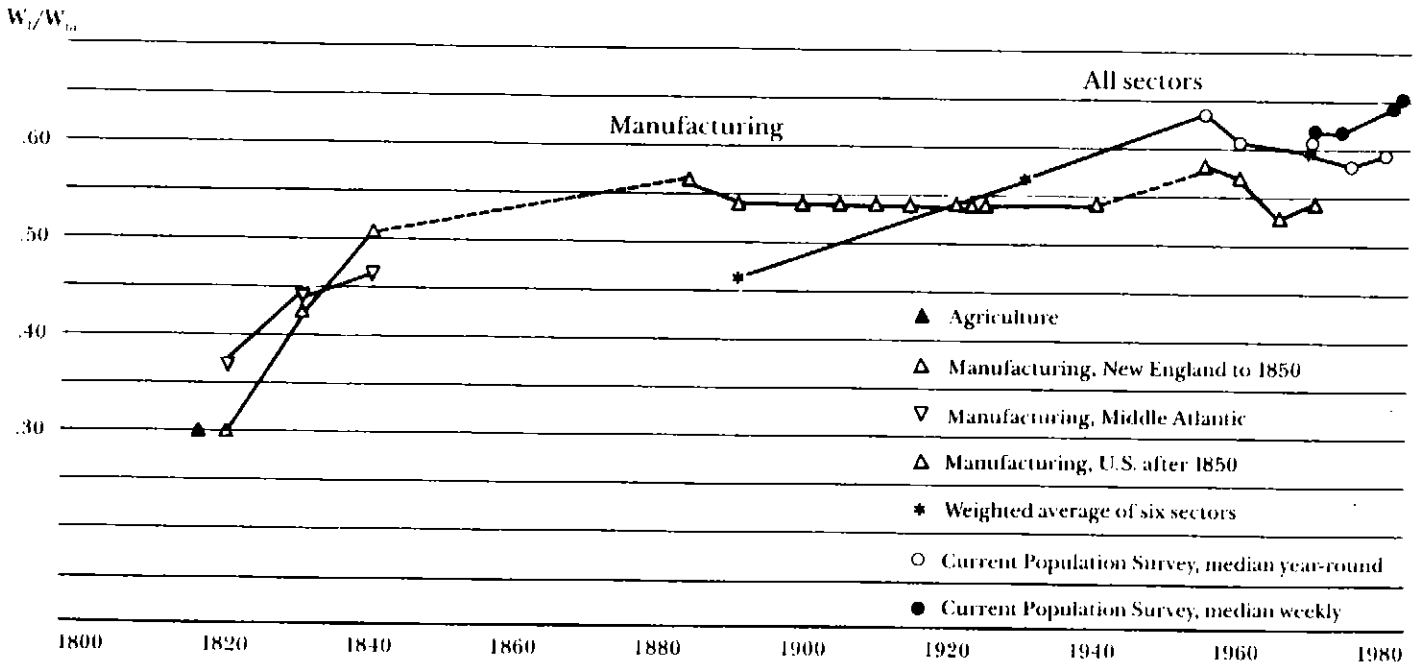
Table 4
Estimated and Approximated Coefficients and Means from Earnings Equations, and a Decomposition of the Change in the Earnings Gap, 1890 to 1970

	Coefficients		Means	
	Male	Female	Male	Female
circa 1890				
Experience	0.05	0.065	15.0	5.0
Education	0.02	0.010	7.0	5.4
circa 1970				
Experience	0.035	0.020	16.0	11.0
Education	0.065	0.070	12.7	12.6
Home time	0.0	-0.005	0.0	4.6

		Experience	Education	Home time
Due to	$\sum \Delta\alpha(X^0 - Z^0)$	+0.450	-0.096	0.0
coefficients	$\sum Z^0(\Delta\alpha - \Delta\beta)$	-0.480	+0.191	0.0
Due to	$\sum \Delta Z(\alpha^0 - \beta^0)$	+0.015	-0.057	0.0
characteristics	$\sum \alpha^1(\Delta X - \Delta Z)$	+0.100	+0.105	-0.023
TOTAL	($\sum$ = 0.205)	+0.085	+0.143	-0.023

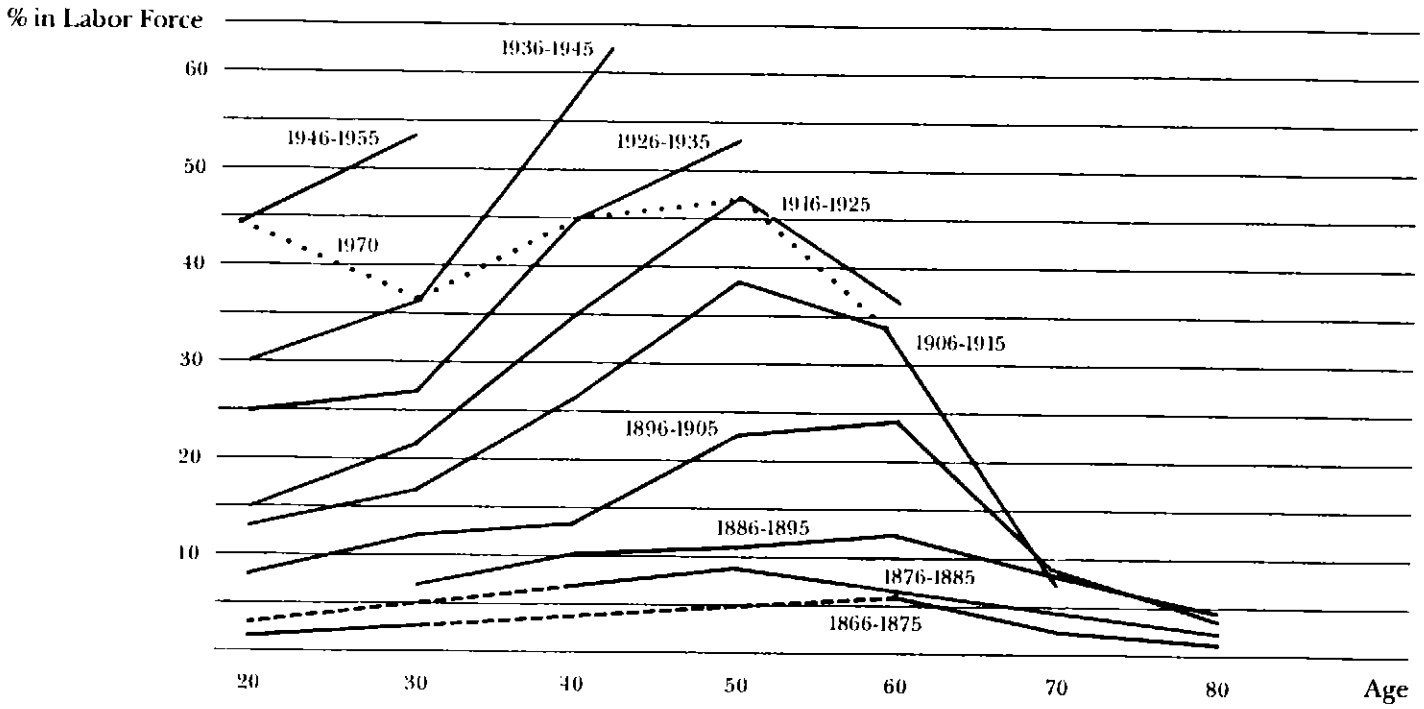
Notes and Sources:
c.1890: Experience. Eicheugreen (1984), Goldin (1980), and Hanuon (1977) produce similar estimates of the returns to experience among manufacturing workers. The coefficient for female workers has been reduced by 0.015 to account for returns to maturity; that for the male labor force has not been adjusted because the age at beginning work has a far smaller effect with longer experience. The mean values for experience are from Eichengreen (1984) and are consistent with those from the other studies. Education. Goldin (1980) estimates returns to education among female manufacturing workers in 1907 using actual schooling data. The higher estimate for the male labor force is assumed, based on their proportion in nonmanual activities. Mean education levels are based on data in Smith and Ward (1984). Male workers are assigned the mean education level for their cohort; female workers are assigned 0.75 times the meau level because the labor force contained less educated female workers. The 0.75 figure was computed from data used in Goldin (1980) and Smith and Ward (1984).
c.1970: Experience. The coefficients are consistent with those in Corcoran and Duncan (1979) for both males and females, Heckman (1980) for females, Schultz (1980) for males, Mincer and Polachek (1974) for males and females, Moulton (1985) for males and females, although Mincer (1974) has somewhat higher returns for males. The means are from Corcoran and Duncan (1979) and are consistent with those in the other studies cited when corrected for differences in coverage. Educatior. Coefficients are from Corcoran and Duncan (1979); Moulton (1985), among others, also estimates a slightly higher coefficient for females. Means are from Corcoran and Duncan (1979), averaged for the black and white labor forces using population (not sample) proportions. Home time. The coefficient is from Corcoran and Duncan (1979) which is somewhat lower than that in Mincer and Polachek (1974). Mean value is based on Corcoran and Duncan (1979) with an adjustment for single women from date in Mincer and Polachek (1974).

Figure 1: The Ratio of Full-time Female to Male Earnings: United States, 1815 to 1983



Sources: Tables 1 and 2.

Figure 2 Labor Force Participation Rates of Cohorts of White, Married Women, Born 1866 to 1955, Entire U.S.



Source: Derived from population census data.

Dashed lines denote missing data. Data for 1890 to 1920 are for native-born women with native-born parents. Dotted line is 1970 cross section.

APPENDIX: Sources and Notes for Table 2

OCCUPATIONAL DISTRIBUTION.
Historical Statistics, series D 182-232, pp. 139-40. The 1900 occnpational distribution was used for 1890. The professional category includes professional, technical, and kindred workers, and managers, officials and proprietors (lines 218 + 219).
EARNINGS. All earnings are annual, full-time, and in current dollars.
1890, Male, Professional: Weighted average of professional (34 percent) and managerial (66 percent) workers. Professional earnings for six categories, representing over 75 percent of all professionals, were obtained from: Stanley Lebergott, Manpower in Economic Growth: The American Record Since 1800 (New York, 1964), p. 500, gives $1662 for 1st to 3rd class postal workers (government officials); Historical Statistics, series D 793, p. 168 gives $731 for ministers (clergy); a value of $460 for male teachers was derived from Historical Statistics series D 763, p. 167, given the assumption that the ratio of female to male teacher salaries was 0.8 and a value of $1505 for the 5 percent who were college teachers; the figures for physicians ($2540), lawyers ($2691), engineers ($2108), and college teachers ($1505) were derived from Historical Statistics, series D 913-920, p. 176 for 1929, extrapolated back to 1900 on federal employee earnings, Historical Statistics, series D 764, p. 167. Managerial earnings were derived from U.S. Census Office, Report on Mannfacturing Industries in the United States at the Eleventh Census: 1890, Part II: Statistics of Cities (Washington, D.C., 1895), Table 6, using the category "officers or firm members actively engaged in the industry or in supervision." A figure of $1264 was converted into a 1900 figure of $1285, based on nonfarm money (when employed) earnings, Historical Statistics, series D 735, p. 165. The final estimate of $1391 ($1414, for 1900) was constrncted by weighting by the actual occnpational distribution, and it is consistent with the notion that the ratio of full-time earnings in manufacturing jobs to those in professional occupations must have been smaller in 1890 than it was in 1930; Jeffrey Williamson and Peter Lindert, American Inequality: A Macroeconomic History (New York, 1980).
Clerical: U.S. Census Office, Report on Manufacturing, 1890, Part II, p. 10, yields data for urban clerical workers excluding salaried personnel.
Sales: Data for dry goods salesmen in U.S. Commissioner of Labor, Eleventh Annual Report of the Commissioner of Labor, 1895/96: Work and Wages of Men, Women and Children (Washington, D.C. 1897) for 11 states yield a mean of $13.58/week or $706/year for 1895, and conversion to 1890 based on nonfarm money (when employed) earnings gives $766.
Manual: Paul F. Brissenden, Earnings of Factory Workers, 1899 to 1927: An Analysis of Pay-roll Statistics (Washington, D.C. 1929), p. 94; full-time manufacturing earnings are used. Although these are given for 1899, the accompanying actual fignres are identical to those for 1890. See also Elyce Rotella, From Home to Office: U.S. Women at Work, 1870-1930 (Ann Arbor, 1981), pp. 197-212, Appendix B on the 1890 figures. The implied ratio of full-time to actual earnings is 1.18.
Service and Farm: Lebergott, Manpower; common laborer's wage x 310 days. The figure for service is almost identical to that in Lucy Maynard Salmon, Domestic Service (New York, 1972; orig. pub. 1897), p. 96, of $6.93/week, given 52 weeks and $100/year board. Conversion was made to 1890 based on full-time annual earnings. The farm figure poses problems because no data exist for owner operator farmers in 1890, and those for more recent periods indicate lower earnings for operators than for farm laborers. Farm wage laborers received less than the wage for common laborers, but owner operators earned far more.

The ratio of female to male farm wages for yearly contracts in 1909 was 0.578 and those for seasonal contracts (with board) was 0.538; George Holmes, Wages of Farm Labor, U.S. Department of Agriculture Bureau of Statistics, Bulletin 99 (Washington, D.C. 1912). Therefore the relationship between male and female earnings on farms does not differ significantly from that given by the rate for farm wage laborers.

1890, Female, Professional: Eistorical Statistics, series D 760, 763, p. 167, for 1900.

Clerical: Rotella, From Home to Office, pp. 197-212, Appendix B.

Sales: See source for male earnings. The 1895 figure is $421.

Manufacturing: U.S. Census Office, Census of Manufacturing: 1890, Part I.

Service: Historical Statistics, series D 758, p. 167, for 1900. Salmon, Domestic Service, gives an average of $3.23/week or $268/year, including $100 board. Lebergott, Manpower, p. 542, gives an estimate of $3.14/week in 1900. 1930, Male, Professional: A weighted average of the earnings of lawyers, physicians, engineers, and dentists from Milton Friedman and Simon Kuznets, Income from Independent Professional Practice (New York, 1945); semiprofessionals, clergy, professors, and teachers from Historical Statistics, series D 793, D 792, D 913), $4099. The earnings of proprietors, managers and officials are from U.S. Bureau of the Census, Sixteenth Census of the United States: 1940, Population, Vol. III: The Labor Force, Part 1, United States Summary (Washington, D.C., 1943), p. 121, for males who worked 12 months in 1939, adjusted to 1929 dollars, $3500.

Clerical: Rotella, From Home to Office, pp. 197-212, Appendix B.

Sales: U.S. Bureau of the Census, Sixteenth Census: 1940, Vol. III, p. 121, for males who worked 12 months in 1939, adjusted to 1929 dollars.

Manual: The weekly full-time wage from Beney, Wages, Hours, and Employment, for 50 weeks; also in Historical Statistics, series D 835, p. 172. The Beney data imply a ratio of female to male earnings for manufacturing workers of 0.575 in 1929 which might be too high in light of Brissenden's ratios for the 1920s which are lower than Beney's for the same period.

Service and Farm: Unskilled manufacturing laborers, Historical Statistics, series D 841, p. 172 x 50 weeks.

1930, Females, Professional: A weighted average of professors, teachers, nurses, and attendants from Historical Statistics, series D 763, p. 167, and Department of Labor, Women's Bureau, "The Age Factor as it Relates to Women in Business and the Professions," by Harriet A. Byrne, Bulletin of the Women's Bureau, No.117 (Washington, D.C., 1934).

Clerical and Manual: The weekly full-time wage from Beney, Wages, Hours, and Employment, for 50 weeks; Rotella, From Home to Office, pp. 197-212, Appendix B gives 868. Department of Labor, Women's Bureau, "The Employment of Women in Offices," by Ethel Erickson, Bulletin of the Women's Bureau, No. 120 (Washington, D.C., 1934) gives median clerical earnings for 1931 of between $1044 and $1308.

Sales: U.S. Bureau of the Census, Sixteenth Census: 1940, Vol. III, p. 125; see 1930, Males above.

Service: Historical Statistics, series D 758, p. 167, for 1929.

1970, Male and Female, All Sectors: U.S. Department of Labor, Bureau of Labor Statistics, Labor Force Statistics Derived from the Current Population Survey: A Databook, Vol. I, Bulletin 2096 (Washington, D.C., 1982), p. 732, Table C-23. Median, full-time, weekly earnings for each sex-occupational group. The manufacturing group for males and the service group for females are weighted averages of subgroups. Earnings for the farm sector are those of nonfarm laborers. Annual wages are weekly x 50 weeks.