Changes in Earnings Differentials in the 1980s: Concordance, Convergence, Causes, and Consequence

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Abstract

This paper analyzes changes in U.S. earnings differentials in the 1980s between race, gender, age, and schooling groups. There are four main sets of results to report.

First, the economic position of less-educated workers declined relative to the more-educated among almost all demographic groups. Education-earnings differentials clearly rose for whites, but less clearly for blacks, while employment rate differences associated with education increased more for blacks than for whites.

Second, much of the change in education-earnings differentials for specific groups is attributable to measurable economic factors: to changes in the occupational or industrial structure of employment; to changes in average wages within industries; to the fall in the real value of the minimum wage and the fall in union density; and to changes in the relative growth rate of more-educated workers.

Third, the earnings and employment position of white females, and to a lesser extent of black females, converged to that of white males in the 1980s, across education groups. At the same time, the economic position of more-educated black males appears to have worsened relative to their white-male counterparts.

Fourth, there has been a sizable college-enrollment response to the rising relative wages of college graduates. This response suggests that education-earnings differentials may stop increasing, or even start to decline, in the near future.

The structure of earnings in the United States changed sharply in the 1980s. In contrast to the long-term trend of declining wage differentials between more- and less-skilled workers, the structure of earnings shifted against the less-skilled, with less-educated workers suffering sizable losses in real wages while more-educated workers enjoyed modest gains (see, e.g., Blackburn, Bloom, and Freeman, 1990; Bound and Johnson, 1989; Katz and Revenga, 1989; and Murphy and Welch, 1988). Increases in education-earnings differentials appear to account for part, though not all, of the rise in earnings inequality among males (see Blackburn, 1989; and Juhn, Murphy, and Pierce, 1989), which has in turn contributed to the rise in income inequality among families (Blackburn and Bloom, 1991).

Analyses of the changing pattern of earnings in the 1980s have generally focused on the magnitudes and causes of the increase in education-earnings differentials among white males. Only limited attention has been paid to the earnings structure among females and minority workers, or to the effects of changes in the earnings structure on school enrollment decisions.[1] Have the earnings structure and employment rates of these other demographic groups changed in the same manner in the 1980s as they did for white males? Within education groups, what happened to earnings and employment differentials between white males and other demographic groups? What can be learned about the causes of the changing earnings structure from differences in the experience of the various demographic groups? To what extent have the college-enrollment decisions of the different groups responded to changes in the earnings structure? Are market-supply responses likely to "correct" the massive rise in differentials?

We address these questions using March 1980 and March 1989 CPS data on the earnings and employment status of workers in selected demographic groups.

The March CPS provides information on workers' annual earnings for the calendar year preceding each survey, and on workers' labor-force status at the time of the survey. To capture primarily changes in annual earnings due to changes in wage rates, and not to changes in hours worked, we examine the earnings of full-time, year-round workers only. As our measure of employment, we use employment-to-population ratios rather than unemployment rates, although the fact that unemployment rates and employment rates move inversely for most groups suggests that a focus on unemployment would yield similar results. We focus on the earnings differentials of high school graduates (HS) relative to workers with less than high school education (LTHS) and of college graduates (CG) relative to high school graduates.[2] We also examine changes in the economic position of our specified demographic groups relative to white males, both in terms of earnings and employment.

We find that:

(1) Education-earnings and education-employment rate differentials widened for most, but not all, demographic groups. Education-earnings differentials rose more for whites (*i.e.*, nonblacks, as defined in our analysis) than for blacks, while employment rate differences associated with education increased more for blacks than for whites. Most strikingly, the earnings differential between high school graduates and dropouts narrowed for black men while their employment-rate differential widened substantially. The fact that the change in education-earnings differentials varied across demographic groups in magnitude, and in some cases in direction, implies that distinct factors have affected the different groups. It also suggests that the overall increase in earnings inequality in the U.S. represents the net effect of sometimes discordant underlying currents.

(2) The earnings and employment position of white females improved relative to white males in the 1980s across all education groups. The change in the relative economic position of blacks, however, is less clear.

(3) Much of the change in education-earnings differentials for specific groups is attributable to measurable economic factors: to changes in the occupational or industrial structure of employment; to changes in industry average wages; to the fall in the real value of the minimum wage, and the fall in union density; and to changes in the relative growth rate of more-educated workers. These factors also help in explaining the changes in demographic-group differentials within education categories.

(4) There has been a sizable college-enrollment response to the rising relative wages of college graduates. Females appear to respond more to male than to female earnings differentials, suggesting that they anticipate continued elimination of gender differentials within education groups over time. Looking to the future, the supply responses suggest that college-to-high school differentials will drop in the 1990s, barring accelerated shifts in the relative demand for college graduates.

I. Changes in Earnings and Employment Differentials for Race/Gender Groups

One of the most striking changes in the labor market for male workers in the 1980s was the massive increase in earnings and employment differentials across schooling groups. The increase was most marked for young workers, driven largely by sizable falls in the real earnings and employment of the less-educated rather than by any major improvements in the economic position of more-educated workers.

Table 1 records average real earnings for 24 demographic-education groups in 1979 and 1988, and the implied annual growth rates of earnings

between those years. We distinguish between blacks and whites, men and women, and 25-64 and 25-34 year olds, in addition to the three education groups. The reported statistics are geometric means of annual wage and salary income for full-time year-round workers in the relevant March CPS, adjusted for inflation using the GNP personal-consumption-expenditure deflator. The table illustrates the well-known fall in real earnings for less-educated white males, and the modest rise in real earnings for white males with four or more years of college. The nature of changes in average earnings within education groups is similar for all prime-age white males (ages 25-64) and for those white males who have more recently entered the labor market (ages 25-34), although among the less-educated, real earnings have declined more rapidly for the young than for the old.

[Table 1 about here]

The results for white women show a pattern of change similar to that for white men, with a notable difference in the levels of change: greater increases in real earnings for the more-educated, and smaller decreases in real earnings for the less-educated (both compared to white men). The statistics for blacks, however, are more mixed. Among 25-64 year olds, black-male high school graduates suffered larger losses in real earnings than dropouts, producing a fall in the earnings differential between these educational groups. The earnings of 25-64 year-old black females increased more rapidly than those of white males, but less rapidly than those of white females, in all three education groups. Among 25-34 year olds, black-male college graduates suffered a real earnings loss of almost the same proportionate magnitude as that suffered by high school graduates, with both groups losing ground relative to high school dropouts. Among black women, high school graduates (though not college graduates) had larger losses in real

earnings than dropouts. Taken at face value, the statistics in table 1 suggest that different factors affected the job markets for blacks and whites.

[Table 2 about here]

To examine whether these changes in average earnings are due to changes in the labor-market characteristics of these broad demographic-education groups, we also estimated education-earnings differentials from regressions that control for the effects of age, marital status, and region on earnings.[3] The results of these regressions, reported in table 2, reveal large increases in differentials for both white males and white females, but a mixed pattern of small increases, and some decreases, for blacks.[4] In particular, the rise in the CG/HS differential was much smaller for blacks than for whites, and the change in the HS/LTHS differential for blacks diverged qualitatively from the changes for whites. None of the estimated changes for blacks are statistically significant.[5]

[Table 3 about here]

Turning from earnings to employment patterns, table 3 reports employment-to-population ratios in 1980 and 1989 by level of education for the various demographic groups. For white men, employment rates fell among 25-64 year olds, with a slightly greater fall for the less-educated, but were unchanged among 25-34 year olds (having fallen in the 1970s for that age group). Among black men, by contrast, employment rates dropped sharply -- for all three education groups among 25-64 year-olds, but especially for the less-educated among 25-34 year-olds. The nature of changes in employment rates for women is different. Among whites, employment-population ratios rose; since they tended to rise more for the more-educated, employment differences between educational categories widened (except for the CG/HS differential for 25-34

year-olds). Among black females, the most striking change is a sharp drop in the employment rate for 25-34 year old high school dropouts.[6]

For groups whose relative earnings and employment moved in the same direction, or for which one statistic changed greatly while the other did not, the patterns of change in the two measures give a consistent picture of market changes. However, opposing changes in relative earnings and employment in the HS/LTHS differentials for 25-34 year old blacks (a 17 point drop in the earnings differential coupled with a 7 point increase in the employment rate difference) leave open the question of whether the overall economic position of the more-educated improved or worsened relative to the less-educated. One way to combine the two statistics to reach an overall assessment is to multiply the earnings and employment rates to yield earnings per member of the population.[7] In this case, the overall change would be equal to the change in the logarithmic earnings differential plus the change in the logarithm of the ratio of employment rates. For example, comparing young black-male high school graduates to high school dropouts, this calculation suggests that the change in employment rates had an effect on the "total earnings" differential that is equivalent to a 13 log-point increase in the education/wage differential between these two groups. This essentially offsets the estimated 17 log-point decline in the annual-earnings differential (reported in table 2). The impact of changes in employment rates on the HS/LTHS "total earnings" differential for young black females is even larger -- a 34 log-point increase -- suggesting that the labor market for high school graduates may have improved relative to dropouts among this group.

One way to highlight the cross-group variation of earnings and employment experiences is to reorganize the earnings and employment data to show differentials by demographic group within educational categories. Table

4 does this by reporting changes in earnings and employment rates for black males, white females, and black females relative to changes for white males in the same education category.

[Table 4 about here]

Among 25-64 year olds, white and black women gained relative to white men in both earnings levels and employment. However, the earnings position of black men did not improve relative to that of white men, except among dropouts. With the employment rates of black men falling relative to those of white men in all education groups, more-educated black men fell further behind whites. Among 25-34 year olds, white women gained relative to white men in both earnings and employment. Among college graduates, black men and women had modest falls in relative earnings, while among high school graduates, black males lost ground in both their relative earnings and employment rates. There are remarkable black-white differences among 25-34 year old high school dropouts, as both black men and women gained in earnings but lost in employment. In sum, the economic position of white females clearly improved relative to white males, but the change in the status of blacks relative to white males is less clear.

Can the complex changes in earnings across demographic-education groups be summarized parsimoniously? The following identity links the earnings (W_{ij}) of workers in the ith education category and jth gender-race group to the earnings of white males in the same education group ($W_{i.}$):

$$W_{ij} = W_{i.} + D_{ij} \quad ,$$

where D_{ij} is the difference of the average earnings of workers in the ijth race/gender group with those of the reference group of white males. Focusing on changes over time (Δ), we have

$$(1)\ \Delta W_{ij} = \Delta W_{i.} + \Delta D_{ij} \quad .$$

If the labor market treats all race-gender groups similarly, save for fixed differences due to discrimination, changes in $W_{i.}$ would be associated with identical changes in W_{ij} over time, producing similar changes in educational differentials for all demographic groups. We refer to this as the *concordant* change hypothesis. If market forces were putting equal pressure on non-competitive labor-market differentials to disappear, we would further expect within-group differences to narrow more rapidly the greater the initial differential. This suggests that $\Delta D_{ij} = \beta D_{ij}$, with $-2<\beta<0$; with this relationship, average earnings will increase more rapidly for groups with the largest initial earnings differences relative to white males, while variation in the average level of earnings across groups will decline over time. We refer to this as the *convergent* change hypothesis. The following estimable version of equation (1) links observed changes in a particular group's earnings to the changes in earnings of the reference group, and to the initial deviation of its earnings from those of the reference group:

$$(2) \quad \Delta W_{ij} = \alpha + \gamma \Delta W_{i.} + \beta D_{ij} + e,$$

where e is an error term, and the coefficient γ is allowed to differ from unity in order to capture imperfect transmission to other demographic groups of the factors that alter the relative earnings of white males .[8]

To examine the extent to which changes in the earnings structure among demographic groups can be represented by a simple combination of concordant and convergent changes, we estimated equation (2) using the 1979-to-1988 changes in earnings for 9 education/demographic groups (3 education groups for each of 3 race/gender groups). For 25-64 year olds, the estimated regression is (standard errors in parentheses)

$$\Delta W_{ij} = \underset{(1196)}{-1089} + \underset{(.16)}{.41}\ \Delta W_{i.} - \underset{(.11)}{.19}\ D_{ij} \qquad R^2 = .67$$

which is consistent with both the concordance and convergence hypotheses. For

25-34 year olds, the estimated regression is

$$\Delta W_{ij} = \underset{(1691)}{-2460} + \underset{(.28)}{.35}\ \Delta W_{i.} - \underset{(.21)}{.34}\ D_{ij} \qquad R^2 = .39$$

which, though less precisely estimated, also provides some support for both hypotheses. However, the strong version of the concordance hypothesis (θ=1) is not supported, and the R^2s suggest that substantial variation in wage changes is not accounted for by concordance and convergence. We turn next to explore the reasons for the concordant and convergent changes in earnings differentials, as well as the reasons for the non-concordant and nonconvergent variation.

II. Differential Factors

Studies of rising earnings differentials among white males have considered several measurable economic factors as potential contributors to this rise: the inter-industry distribution of employment, the inter-occupation distribution of employment, the real value of the minimum wage, union density, immigration, educational quality, and relative labor supplies. These studies have accounted for some of the increased differentials, though a sizable residual remains.[9] In this section, we use a regression decomposition analysis to examine how a number of these factors have contributed to the trends in both education-earnings differentials and race/gender differentials. (See Blackburn, Bloom, and Freeman, 1990, for a full description of this method of analysis.)

Table 5 reports our estimates of the contribution of selected factors to changes in education-earnings differentials.[10] The upper panel refers to 25-64 year olds, the lower panel to 25-34 year olds. The first column repeats the estimated change in the regression-corrected earnings differentials reported in table 3; the middle columns report the contributions of each of

the five factors; the penultimate column reports the sum of these contributions; and the final column reports the residual change.

Our estimates of the effects of changes in occupational and industrial mix and the inter-industry wage structure are based on a simple regression decomposition. We pool our 1979 and 1988 samples for all workers in a demographic group and estimate a log earnings equation for the pooled sample. In controlling for the effects of education, age, region, and marital status on earnings, we allow these factors to have separate coefficients for 1979 and 1988. However, when we add dummy variables for occupation as independent variables, we constrain the coefficients on the dummy variables to be the same in both years. In this way, we measure the effect of occupational shifts holding constant the occupational wage structure (at its average level for the two years). The magnitudes by which the estimated changes over time in the regression-corrected education-earnings differential are lowered when the occupation dummies are added is our measure of the occupational-mix effect; these numbers are reported in the second column of table 5.[11] Starting with a specification that includes occupation dummies, we then add industry dummy variables as controls, again estimating only one set of coefficients for the industry variables for both 1979 and 1988.[12] Finally, we estimate the effect of changes in the industrial wage structure on earnings-education differentials by allowing the industry wage coefficients in the earnings regression to vary from 1979 to 1988. The effects of industry shifts and industry-wage changes are reported in the third and fourth columns of table 5.

Because union status is not available for jobs in the previous calendar year in our data, our measures of the impact of changes in union status are based on separate calculations using current-job information in the May 1979 CPS and the March 1989 CPS.[13] We first calculated the percent unionized in

1979 and in 1989 for each demographic-education group; these statistics (in columns 1 and 2 of table A-4) illustrate the well-known fall in union density, particularly among less-educated workers. We then estimated union premia in 1979 for the various groups, by including union dummy variables interacted with education categories in our specifications for a usual-hourly-earnings regression.[14] The estimated premia we obtained for men are consistent with those from other studies, showing a larger union effect on wages for the less-educated. For women, our analysis shows little difference in union premia by education group, the one exception being a very large estimated union effect for 25-34 year old black female college graduates (*i.e.*, 32 percent). Because we doubt the validity of this estimate, we have replaced it with the estimated premium for 25-34 year old white female college graduates. We estimate the effect of deunionization on the average earnings of the relevant education-demographic group by multiplying the decrease in the groups' proportion unionized by the relevant union wage premium. Estimates are reported in the sixth column of table 5.

Our estimate of the effect of the change in the real minimum wage on the relative earnings of different groups of workers is also based on calculations using the May 1979 and March 1989 CPS. We compared the differentials from the actual distribution of hourly earnings in 1989 to the differentials from a simulated distribution constructed under the assumption that from 1979 to 1988 the nominal minimum wage increased at the rate of inflation (so that the minimum wage had the same real value in 1989 as it did in 1979.)[15] Our procedure for simulating the effect of raising the 1989 minimum wage to the real value of the minimum in 1979 is straightforward: first, if a worker's wage is between the actual minimum wage in 1989 ($3.35) and the simulated minimum ($4.61), their wage was raised to the simulated minimum; second, if a

worker's wage was below the actual minimum in 1989, their wage was multiplied by the ratio of the simulated minimum to the actual minimum; and third, if a worker's wage was above the simulated minimum, it was not changed.[16] Our estimate of the impact of the fall in the real minimum wage on an earnings differential (reported in the fifth column of table 5) is simply the difference between the actual change in the earnings differential and the change in our simulated data that hold the real minimum constant.

[Table 5 about here]

Changes in the occupational structure of employment appear to explain little of the changes in educational differentials, more often suggesting decreases rather than increases in earnings differentials. The estimated effects of shifts in industry employment are, on the other hand, generally in the "right" direction and moderate; the effects of industry-wage shifts also tend to help explain the observed changes. Taken together, the shifts in occupation and industry employment and in the industry-wage structure can account for 20 to 40 percent of the increase in differentials for whites, but often suggest declines for blacks. Changes in union density have substantial effects on the pattern of differentials for male workers, while the minimum wage has a sizable effect primarily for the differential involving the lowest paid group -- black female dropouts. The drop in unionization is the dominant factor explaining the change in the HS/LTHS differential among white males, and the change in the CG/HS differential among black males.[17]

There are a large number of decomposition statistics in table 5. In some cases the statistics suggest that our decomposition analysis explains a sizable proportion of the observed changes; in other cases, our analysis "over-explains" changes; and in yet others, it fails to explain much of the change at all. Can we summarize this diverse set of results using a single

measure of the overall success of our analysis in accounting for the observed changes in education-earnings differentials? We propose a pseudo-R^2 measure that contrasts the sum of the squared changes in relative earnings after our analysis (the residual changes in the final column) to the sum of the squared changes in relative earnings for all groups before our analysis (in the first column). If $\Sigma(\Delta W)^2$ is the sum of the squared changes in actual earnings differentials, and if $\Sigma(\Delta W_r)^2$ is the sum of squared residual changes, we measure the proportion of the earnings-differential changes explained by our analysis as

$$1 - [\Sigma(\Delta W_r)^2 / \Sigma(\Delta W)^2].$$

If we explain all of the change in relative earnings for all groups, this statistic will equal unity. However, because the decompositions can increase rather than decrease the squared residuals, the statistic can be negative. Measuring the goodness-of-fit of our analysis in this way, we find that our analysis accounts for 53 percent of the squared changes in relative earnings for 25-64 year olds, and for 48 percent of the squared changes in relative earnings for 25-34 years olds.[18]

Demographic Differentials Within Education Groups

Table 6 reports the results of analyses designed to explain changes in differentials between various demographic groups and white males. The estimated effects of occupation and industry on changes in between-group differentials are from log earnings regressions estimated separately by educational group.[19] The estimated effects of unionization and minimum wages are calculated as the estimated effect of each factor on the average earnings of the specified group minus the effect on average earnings for white males. Using our pseudo-R^2 measure of the explanatory power of the model, our analysis accounts for 39 percent of the variation in changes between groups

among 25-64 year olds, and 62 percent of the variation in changes across groups among 25-34 year olds.[20] This result for 25-34 year olds mainly reflects the effect of deunionization on the relative earnings of high school dropouts, since white males were the most highly unionized group in this education category. Note also that occupation, which explains little of the changes in education-earnings differentials, helps explain several of the changes in demographic differentials within education categories, particularly for LTHS workers. Changes in industry employment are also an important factor. By contrast, changes in the inter-industry wage structure often work in the opposite direction to the actual changes. As before, the decline in the minimum wage has its major effect on black female dropouts.

[Table 6 about here]

The Effect of Relative Labor Supplies

Several recent analyses have stressed the slowdown in the relative growth of more-educated to less-educated white males, and the actual decline in the relative proportion of more-educated workers among 25-34 year old white males, as contributing to the rise in education-earnings differentials (see Blackburn, Bloom, and Freeman, 1990; Katz and Revenga, 1989). It seems natural to explore the extent to which the relative supplies of workers with differing levels of schooling have changed within demographic groups. To what extent, if at all, are cross-group differences in the change in the relative supply of more-educated workers -- taken as predetermined by earlier market conditions due to the time lag involved in obtaining schooling -- related to differences in the change in relative earnings? To address this issue, we estimated the annual growth rate of the relative number of labor-force participants in specified education groups. The results of these tabulations for 1980-89 are presented in the top panel of table 7. There was an increase

in the ratio of more- to less-educated workers for most demographic groups, with two exceptions: declines among both white males and black males in the number of college graduates relative to high-school graduates among 25-34 year olds. In addition, the table reveals considerable variation across groups in the change in relative supplies in the 1980s.

[Table 7 about here]

To determine whether supply changes help explain changes in the residual earnings differentials, we calculated correlation coefficients between the 1980-89 annual growth rates of relative supply (from table 7) and both the actual changes in the HS/LTHS and CG/HS differentials, and the residual earnings changes after correcting for the five factors in table 5.[21] If differences in rates of growth of relative supply contributed to the differing changes in education-earnings differentials, these correlation coefficients should be negative. The estimated correlation coefficients, presented in table 8, are uniformly negative, supporting this conclusion.

[Table 8 about here]

Finally, we also examined the correlation between the growth rate of relative supply and the change in earnings differentials between white males and our other race/gender groups. These correlations, presented in table 8, are also uniformly negative, but tend to be smaller than the correlations for the education differentials.

III. Market Responses

The preceding analyses provide evidence that the relative economic position of more-educated workers improved during the 1980s within race, gender, and age groups. However, the form of the improvement exhibits some cross-group variation. The relative earnings of more-educated white males and

more-educated white females increased sizably and significantly (both for 25-64 and 25-34 year olds), though their relative employment rates increased only slightly (if at all). By contrast, the relative earnings of more-educated black males and black females tend to show small and statistically insignificant increases, though the relative employment rates for these groups tended to increase sizably.

Our results also provide some evidence of convergence during the 1980s between the wages of white females in different educational categories and those of white males in corresponding categories. But there is little evidence of similar convergence between the wages of either black males or black females and those of white males.

Our analyses suggest that multiple factors are required to explain changes in the relative earnings of more-educated workers and that a number of plausible explanations are not borne out by the data. In particular, deunionization and changes in the industrial composition of employment account for small, but non-negligible, portions of relative earnings increases for college graduates in different demographic groups. On the other hand, we find little evidence that changes in the occupational distribution of employment or (except for black females) the fall in the real value of the minimum wage are associated with the widening of education-earnings differentials. Since the variation across demographic groups in the change in the supply of more-educated workers supports a negative association between supply changes and the change in relative earnings, changes in relative supply also appear to be a contributor to changes in the wage structure observed in the 1980s.

Thus far, our analysis has focused almost exclusively on the comparison of 1979 and 1988 data. In figures 1a and 1b we plot the 1967-1987 time series of education-earnings differentials for males and females aged 25-34 -- of all

races.[22] These plots suggest that the data for 1979 and 1988 are not anomalous in any obvious way; they also reveal that the level that education-earnings differentials reached in the 1980s is not unprecedented, at least for men.

[Figures 1a and 1b about here]

What are the future consequences for the U.S. labor market of recent increases in education-earnings differentials? The most important consequence one might expect would be a supply response to the change in relative wages. In order to examine this hypothesis, we have plotted in figures 2a-2d time-series data from 1965 to 1989 on school enrollment rates for 18-19 and 20-21 year olds in four race/gender groups. For 18-19 year old white males and white females, enrollment rates track changes in relative earnings fairly closely throughout this time period. Though weaker, there is also some correspondence between the time series patterns of relative earnings and school enrollment rates among white males and white females aged 20-21. For black males and black females, enrollment rates exhibit too much year-to-year variation (mainly because the rates are calculated from much smaller samples than for the whites) to draw any firm conclusions. Since enrollment rates can be viewed as leading indicators of changes in the relative supply of more-educated workers, we may expect that an accelerated growth rate of more-educated workers will depress education-earnings differentials in the coming years.

[Figures 2a, 2b, 2c, and 2d about here]

The closeness of the time-series patterns in figures 1 and 2 suggests that individuals are responding in their schooling investment decisions to signals being sent from the labor market about the private returns to schooling.[23] But schooling decisions would also be expected to depend upon

the private costs of schooling investments. One component of the direct costs of attending college -- tuition and fees -- is plotted in figure 3 (in inflation-adjusted terms for two- and four-year public institutions combined). Especially notable in this series is the sharp rise in tuition and fees from 1980 to 1987, a trend that would, all else equal, be expected to discourage school enrollment.

[Figure 3 about here]

To test this idea, we estimated probability models of the school enrollment behavior of college-age youths using the *CG/HS* differential, corrected for tuition costs, and a linear trend variable as explanatory variables.[24] The results are reported in table 9 for white males and white females.[25] For white males, enrollment rates tend to increase when the earnings differential for males rises; the enrollment-rate elasticity with respect to changes in the differential is 0.34 (evaluated at the average enrollment rate). For white females aged 18-19, enrollment rates also tend to increase when relative earnings increase, though the magnitude of the response is less than that among males. In addition, females aged 18-19 appear to treat male relative earnings as a more relevant factor than female relative earnings in their decision to enroll in school. (The elasticity with respect to changes in the male differential is 0.25). The results for white females aged 20-21 do not suggest a strong connection between enrollment decisions and the relative earnings differentials of females or males. Holding constant the earnings differential, enrollment rates have been increasing over time for white women, but falling for white men.[26]

[Table 9 about here]

These results provide evidence that school enrollment decisions are quite sensitive to changes in the net return on schooling, particularly for

white men. If the difference in real earnings between college graduates and high-school graduates had not increased over the 1980s, our probit estimates suggest that the school enrollment rate for 18-19 year old white males would have been 8 percentage points lower than it actually was in 1987. Alternatively, if tuition had not increased as it did over the 1980s (see figure 3), school enrollment rates would have been higher, though by less than one percentage point.[27]

What do these responses portend for changes in education-earnings differentials in the near future? One of the primary factors causing differentials to decline in the early 1970s was the increase in enrollment rates in the late 1960s -- itself a result of the high level of differentials that existed in the late 1960s. In similar fashion, one might expect that the high enrollment rates of the late 1980s (particularly among whites) will cause education-earnings differentials to fall in the 1990s. A dependable forecast of changes in the differentials in the near future would require a careful model of the impact of supply changes on earnings differentials, something that we have not provided. But it does appear from the results we have provided that the market is responding, and responding strongly, to the increased incentive to acquire a college education.

Can government policy influence education-earnings differentials? Given that the value of a college education has increased, policymakers may consider it socially beneficial to promote investment in this area. As our analysis of enrollment-rate behavior suggests that college-age individuals do respond to financial incentives, government could attempt to amplify this response by increasing the after-tax return to a college education. Whether this would be done most efficiently by increasing tuition subsidies, adjusting marginal tax rates, or providing wage subsidies to college graduates is not clear.

While it appears that the government can influence college-enrollment behavior, it is not obvious from our analysis whether it would be appropriate for it to do so. It is true that the social value of a college education increased in the 1980s, but we see no reason to believe that the value of a college education to private individuals has not increased by a similar amount.[28] If there was no strong argument for increasing the subsidization of college education in the late 1970s, there would appear to be no strong argument for doing so now. Also, further increasing the number of college graduates would have uncertain effects on earnings variation across individuals -- reducing the earnings differences between college graduates and high school graduates but increasing the number of individuals at the top end of the earnings distribution. Given these uncertainties, and the strong market response to the increased differentials, the case for increased tuition subsidies does not appear to be all that compelling.

NOTES

1. Katz and Revenga (1989) focus on women as well as men, while Blackburn, Bloom, and Freeman (1990) present earnings differentials for four race/gender groups.

2. The educational grouping of the sample is actually based on completed years of schooling: college graduates are individuals with 16 or more years of completed schooling; high school graduates are individuals with exactly 12 years of schooling; and individuals with less than a high school education have less than 12 years of schooling. We will sometimes refer to LTHS workers as high school dropouts, even though a substantial portion of these workers never reached high school.

3. The differentials are taken from coefficient estimates for education dummy variables in a log-earnings regression. Therefore, the differentials are in log points, and can roughly be interpreted as measuring percentage differences in (geometric) means between the two groups being compared.

We also estimated education-earnings differentials using the hourly wage data in the May 1979 and March 1989 CPS surveys; the results are presented in Appendix Table A-1. One advantage of the hourly wage data is that we do not need to restrict the sample to full-time, year-round workers; however, it has the disadvantage that the data are available for only one-fourth of the sample, resulting in higher standard errors for the changes.

4. In terms of magnitudes, the table suggests a greater absolute log-point increase in the CG/HS differential than in the HS/LTHS differential for most groups. This pattern should not, however, be interpreted as indicating a

greater increase in the educational premium per year of schooling for the CG/HS than the HS/LTHS differential: college graduates have on average more than four years of additional schooling compared to high school graduates, while high school graduates have about two more years of schooling compared to dropouts.

5. This is likely due to the relatively smaller samples available for blacks in the March CPS (see Appendix Table A-2): there are only 65 LTHS black males aged 25-34 in our samples for 1988, and only 41 LTHS black females aged 25-34.

6. The 12 point fall in employment rates for 25-34 year old black male dropouts raises the possibility that their increased real earnings (reported in table 1) reflect a change in the selection process into employment, with the fall in employment concentrated among those with the lowest earnings. The identical 12 point fall in the employment rate for 25-34 year old black female dropouts does cast some doubt on this interpretation, however, as the real earnings of young female dropouts fell. Nevertheless, testing this hypothesis more carefully for the 1980s would be a useful subject for future research.

7. This procedure is valid under the assumption that the differential in average hours worked between education groups has not changed over time. There is also an implicit assumption that the extra leisure associated with a fall in the employment rate for a particular group has no value to individuals in the group. If this latter assumption is not true, we will tend to overstate the impact of changes in employment rates on changes in the relative position of the more- and less-educated.

8. The changes in earnings within demographic groups, and the initial

earnings differences, are calculated using the average earnings statistics reported in table 1.

9. The residual may at least partly be accounted for by technological change, or changing patterns of international trade. For attempts to measure these influences, see Allen (1991), Krueger (1991), Mincer (1991), and Murphy and Welch (1988).

10. Appendix Table A-3 presents the white-female CG/LTHS differentials in 1979 and 1988 within age cohorts. The results show that education-earnings differentials have increased for both young and old cohorts, suggesting that changes in educational quality do not appear to be an important factor increasing earnings differentials. (A similar result for white males was reported by Blackburn, Bloom, and Freeman, 1990).

11. For example, the change from 1979 to 1988 in the regression-corrected HS/LTHS differential for white males aged 25-34 is .06; when we add occupation dummies to the regression, the estimated change is .05, implying that .01 of the change is due to the effects of occupational employment shifts.

12. In our analysis, we add occupation dummies, then industry dummies, to the regression. Since the two are likely to be correlated, it could be the case that occupation picks up part of the industry-shift effects, so that we overstate the occupation effect and understate the industry effect. However, our measured contributions are essentially invariant to the order in which we add these two sets of variables to the regression -- which is not surprising, given the small estimates we obtain for the occupation effects.

13. For the details of these calculations, see Appendix Table A-4.

14. The hourly-wage regressions were estimated with industry dummies as independent variables in order to avoid double-counting the industry-shift effect as part of the union effect. One might also suspect that the declines in unionization rates are also partly due to industrial shifts, which would again imply double-counting; however, calculations made for Blackburn, Bloom, and Freeman (1990) suggest that the estimated impact of industrial shifts on unionization rates is very small.

15. We utilized the usual hourly earnings data in the March 1989 CPS instead of the annual earnings data because the usual earnings figures likely provide more reliable information on hourly pay.

16. As noted in Blackburn, Bloom, and Freeman (1990), this simulation will not capture any effects that changing the minimum may have on the employment or unemployment rates of workers above and below the minimum, or the effect it might have on the wage distribution above the minimum.

17. One odd result is the union effect for black females, where a larger drop in density for college graduates than for high school graduates acted to reduce rather than increase the CG/HS differential.

18. Our goodness-of-fit measure uses squared deviations of the estimated differentials (and residuals) from zero, rather than from their sample averages. A pseudo-R^2 measure could also be constructed using the deviations from the sample average, *i.e.*, one minus the ratio of the variance of the residual changes to the variance of the actual changes. These alternative R^2s are 11 percent for the 25-64 year-olds, and 36 percent for the 25-34 year-olds. However, this alternative R^2 does not take into account the extent to which our analysis explains changes that are operating in a similar fashion

for all four demographic groups, but rather only measures the extent to which we account for discordant changes in differentials.

19. Since marital-status effects on wages tend to be very different for males and females, we omitted marital-status dummies from these regressions.

20. The alternative pseudo-R^2's are even higher for the changes in demographic-group differentials -- 62 percent for the 25-64 year-olds and 72 percent for the 25-34 year-olds. This implies that much of our "explanation" of the changes in these differentials pertains to how the changes in differentials vary across groups, and less to why the changes are different from zero.

21. Since the analysis combines two different education groups, with elasticities of substitution that presumably differ, the correlations should be viewed as giving crude indicators of the direction of the effects.

22. These differentials were calculated using arithmetic means reported in the Current Population Reports P-60 series. They are for all races combined, since average earnings statistics within races were not available in all years. Two adjustments were made to the pre-1975 statistics: one, for changes in the imputation procedure for income that were first implemented with the 1975 data; and, two, for using average income in our pre-1975 calculations rather than average earnings (since the latter was not available). For more detail on these adjustments, see Blackburn, Bloom, and Freeman (1990).

23. This type of response would be suggested by a recursive, or "cobweb," model of enrollment decisions. Cobweb models have been used successfully in the past in analyzing enrollment behavior (*e.g.*, see Freeman, 1975).

24. The differential we use as an explanatory variable in our enrollment equations is constructed as:

$$D^* = (C-H)/(H+T) \quad ,$$

where C is college-graduate earnings, H is high-school-graduates earnings, and T is tuition. Under several simplifying assumptions, the internal rate of return to investing in a college education can be shown to be reasonably approximated by a linear function of D^*, *i.e.*,

$$r = \theta_0 + \theta_1 D^* \quad .$$

In our estimations, we use the college-graduate and high-school earnings for 25-34 year-olds in the numerator of D^*, and high-school earnings for 18-24 year-olds in the denominator.

Among individuals, we assume the best alternative rate of return $r_A \sim N(\mu,\sigma^2)$, so that the probability of enrolling in school is

$$P_E = P(r>r_A) = \Phi[(r-\mu)/\sigma] \quad .$$

We use grouped-probit methods to estimate θ_1/σ and $(\theta_0+\mu)/\sigma$ from time-series estimates of P_E and D^*, *i.e.*, we estimate, by least-squares

$$\Phi^{-1}(P_E) = (\theta_0+\mu)/\sigma + (\theta_1/\sigma)D^* + \epsilon \quad .$$

We also add a linear-trend term as a right-hand-side variable, which can be thought of as measuring changes over time in μ. The error term (ϵ) arises in

part because P_E is an estimate of the true percentage attending school, and so will necessarily be heteroskedastic (see Maddala, 1983). However, a weighted-least-squares estimator that takes this problem into account left the coefficients and standard errors virtually unchanged from our OLS estimates.

25. We do not report results for blacks because the published data used to estimate these equations do not report average earnings figures by race, and the apparent differences between blacks and whites in the pattern for education-earnings differentials in the 1980s suggests that the combined differentials in figure 1 would be a much poorer proxy for blacks.

26. There is no apparent reason to believe that young males are "under-responding" to the increased differentials. In fact, estimates allowing the coefficient for the corrected differential to vary before and after 1979 suggest that the response to the differential was higher after 1979 (though the change in the coefficient is not statistically significant).

27. This is because tuition is a very small part of the overall cost of a college education, even after the tuition increase. Our analysis likely understates the impact of tuition changes, since it does not take into account the fact that tuition costs are certain but the CG/HS earnings difference over one's lifetime is varying and uncertain. However, estimates that allowed the C-H and H+T to enter linearly provided highly imprecise coefficient estimates for H+T that were also not robust to the years used for estimation.

28. It is true that private tuition costs increased in the 1980s, but over the same period the average real expenditures per college student were also increasing.

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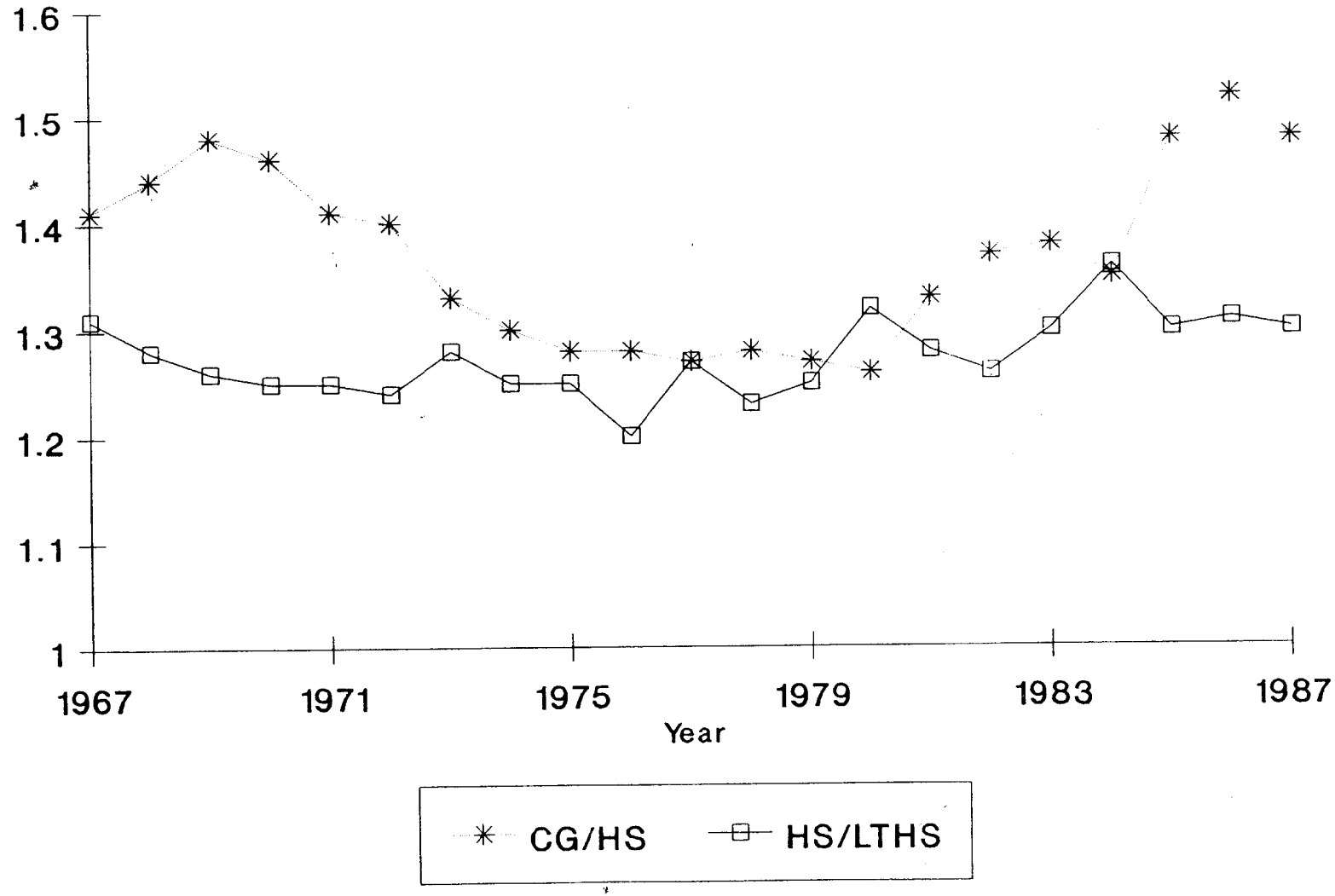
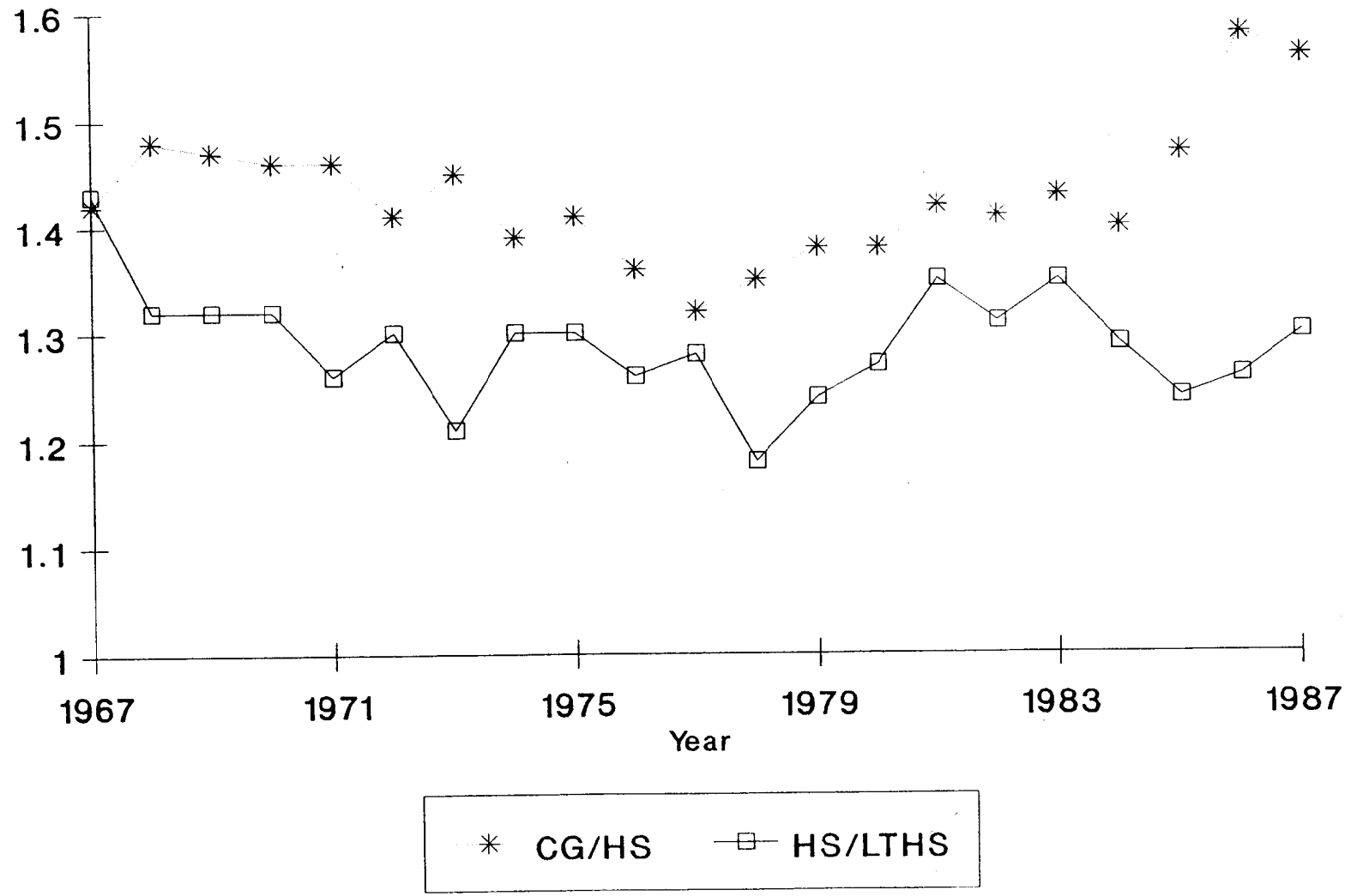
Figure 1a
Earnings Ratios for Males, 25-34



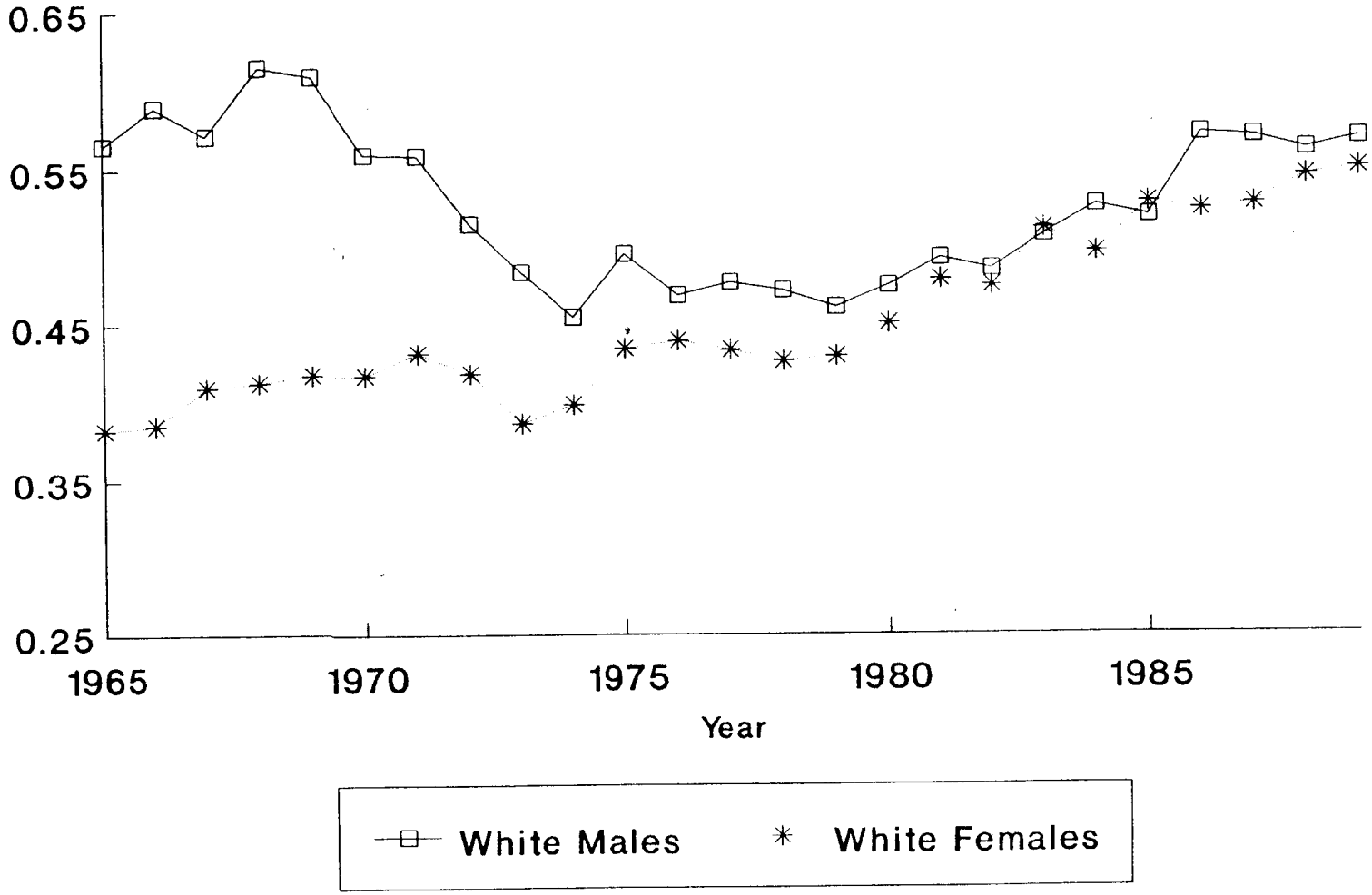
Source: Current Population Reports, P-60

Figure 1b
Earnings Ratios for Females, 25-34



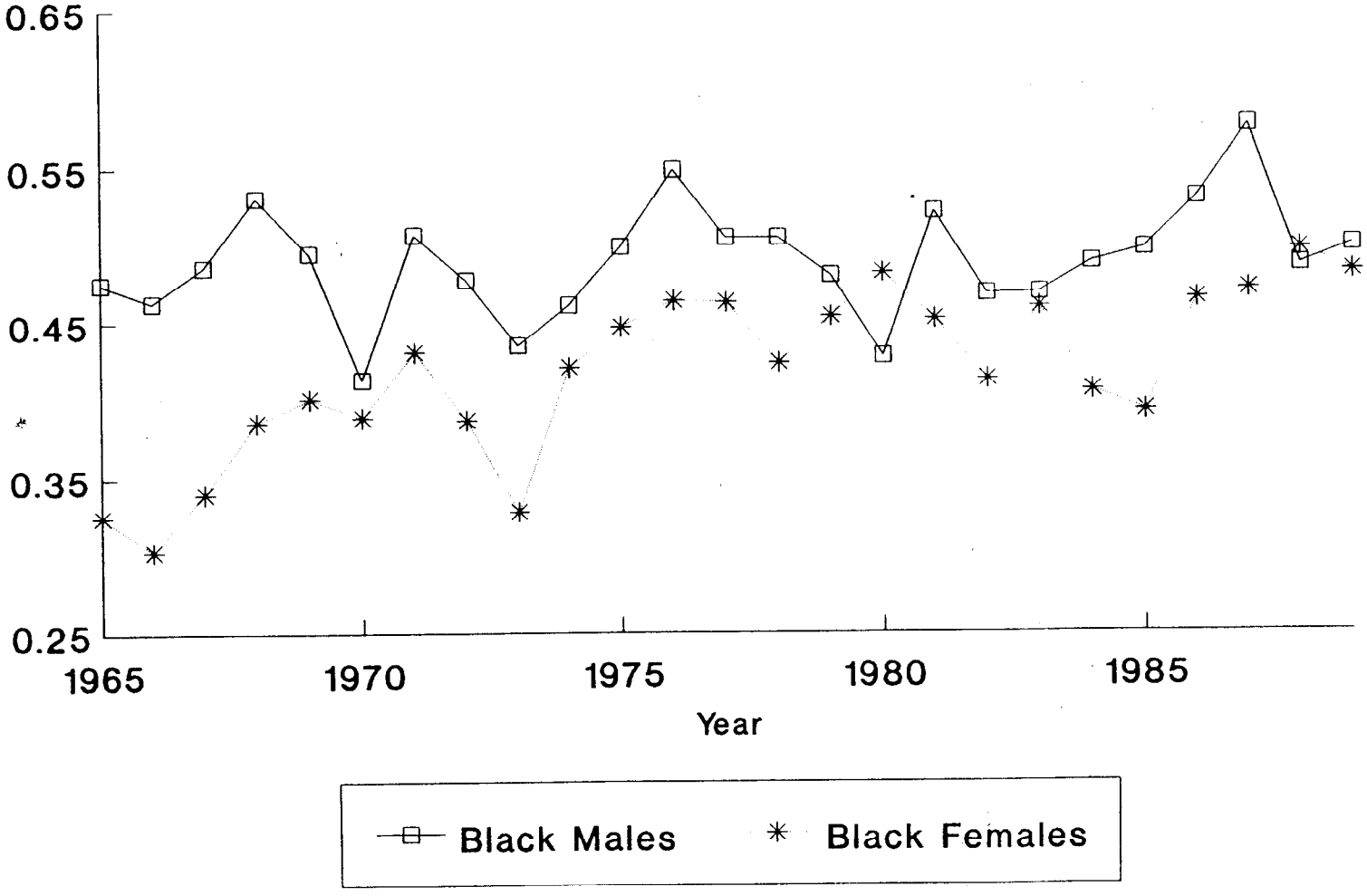
Source: Current Population Reports, P-60

Figure 2a
Enrollment Rates Among 18-19 Year-Olds
By Race/Gender Group



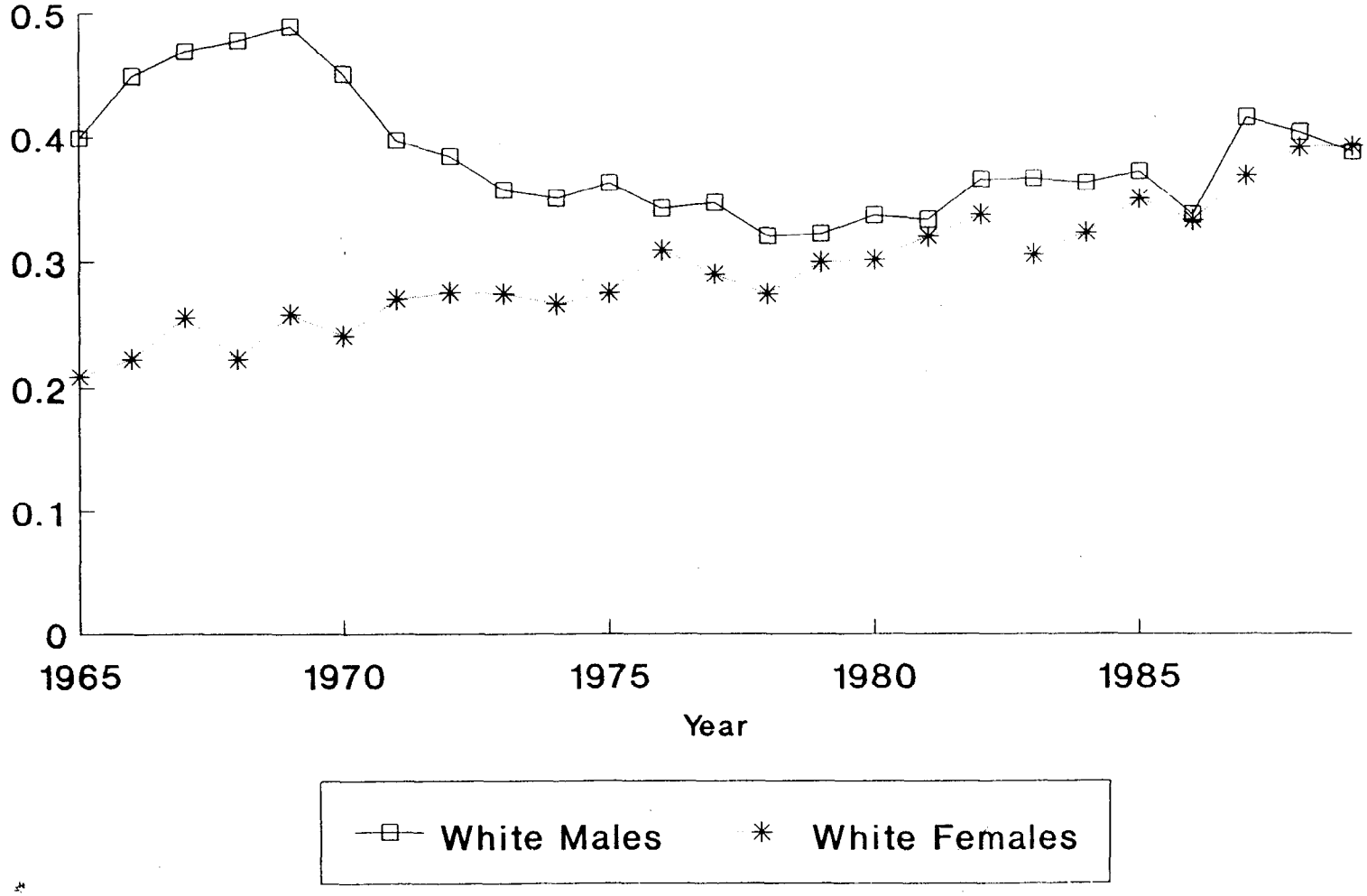
Source: Current Population Reports,
Series P-20

Figure 2b
Enrollment Rates Among 18-19 Year-Olds
By Race/Gender Group



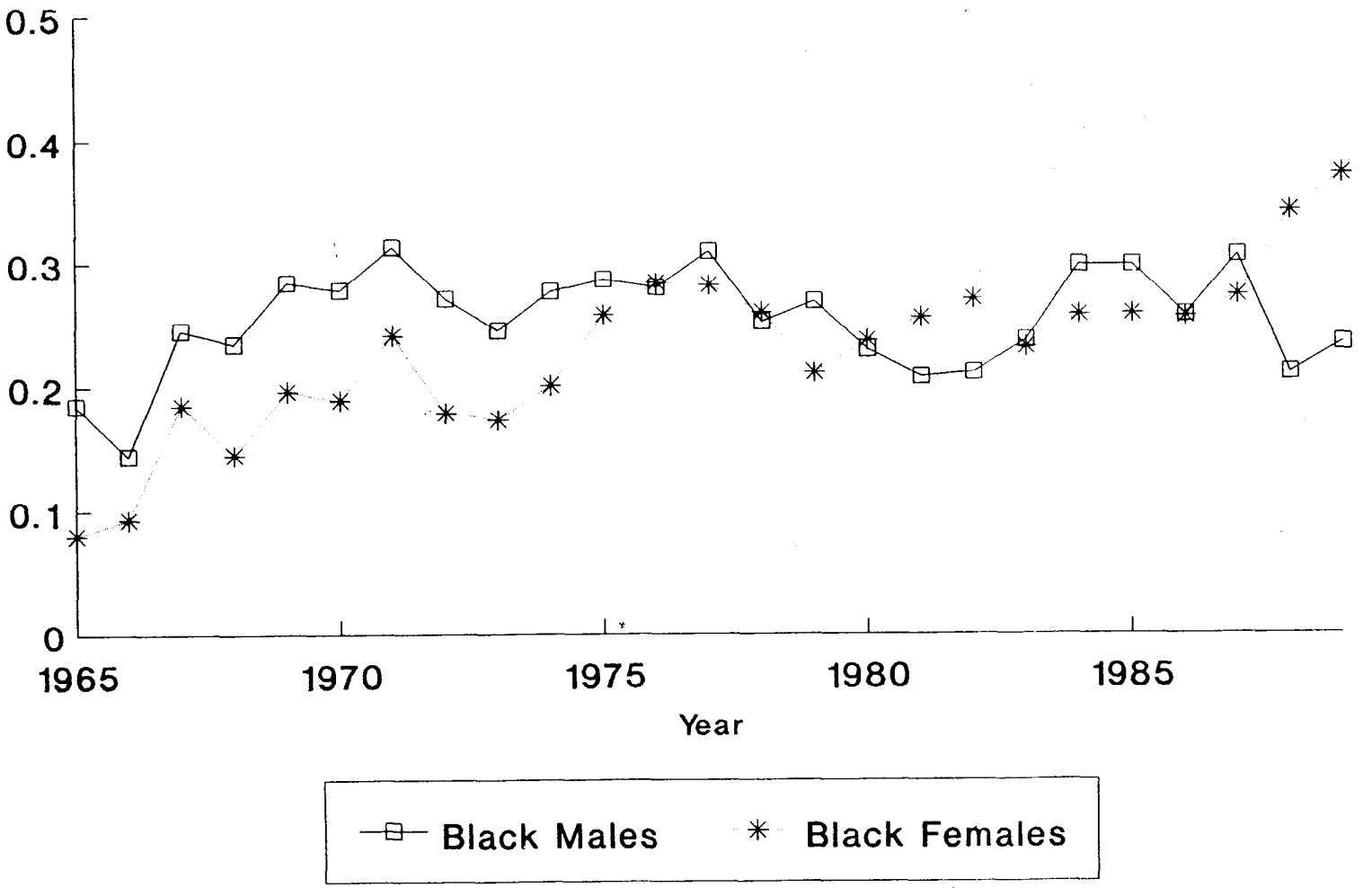
Source: Current Population Reports,
Series P-20

Figure 2c
Enrollment Rates Among 20-21 Year-Olds
By Race/Gender Group



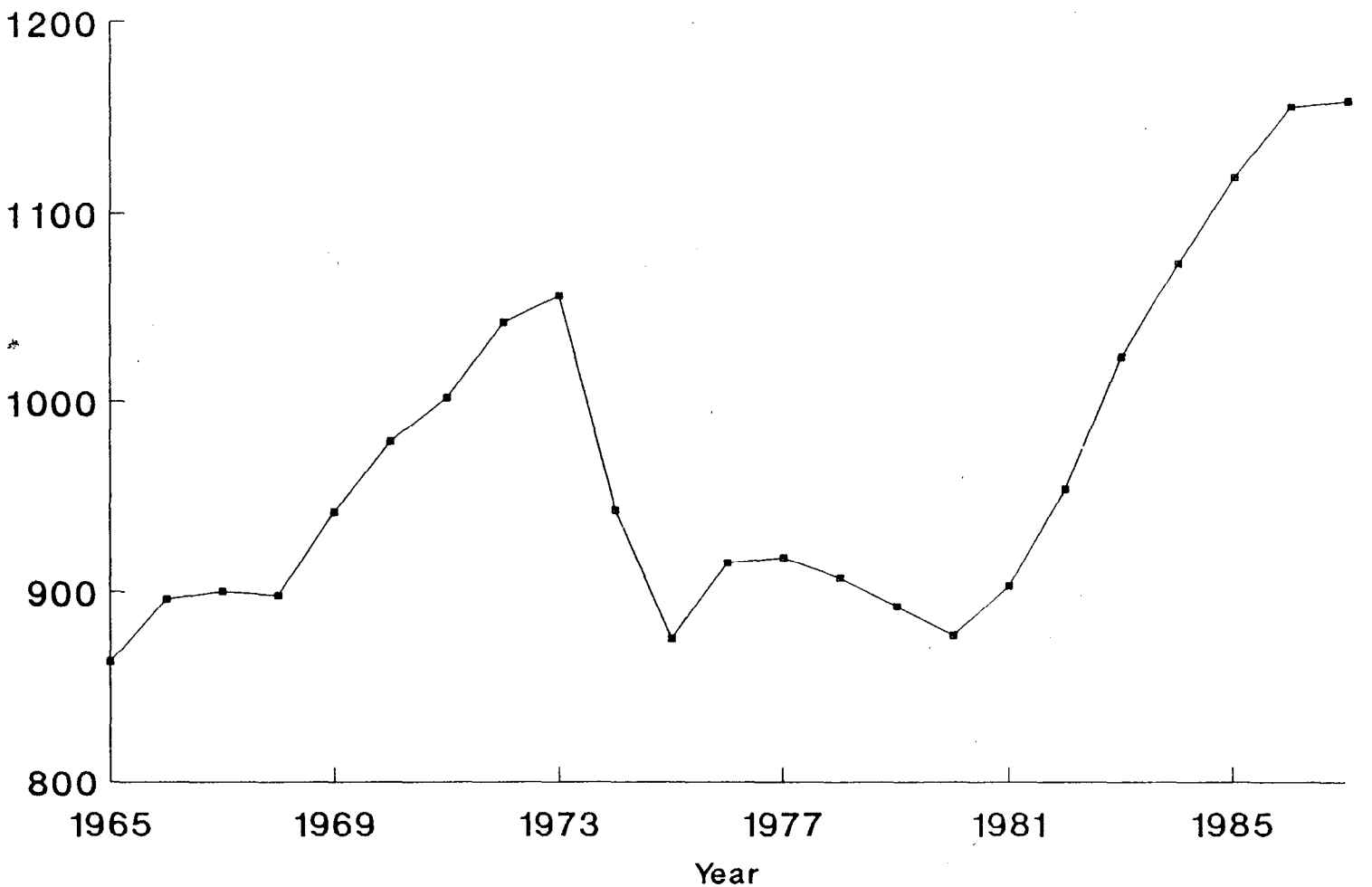
Source: Current Population Reports, Series P-20

Figure 2d
Enrollment Rates Among 20-21 Year-Olds
By Race/Gender Group



Source: Current Population Reports, Series P-20

Figure 3
Average Undergraduate Tuition and Fees
All Public Institutions (1987 dollars)



Source: Digest of Education Statistics, 1989

Table 2
Regression Estimates of Changes in Education-Earnings Differentials Within Demographic Groups, 1979 and 1988 [a]

Age: 25-64

	White Males			Black Males		
	1979	1988	Δ[b]	1979	1988	Δ
HS/LTHS[c]	.23	.29	.06(.01)	.21	.18	-.03(.04)
CG/HS	.28	.39	.11(.01)	.34	.40	.06(.06)
	White Females			Black Females		
	1979	1988	Δ	1979	1988	Δ
HS/LTHS	.20	.27	.07(.02)	.23	.25	.02(.04)
CG/HS	.35	.46	.11(.01)	.45	.49	.04(.05)

Age: 25-34

	White Males			Black Males		
	1979	1988	Δ	1979	1988	Δ
HS/LTHS	.23	.30	.07(.03)	.30	.15	-.15(.09)
CG/HS	.17	.33	.16(.02)	.28	.35	.07(.09)
	White Females			Black Females		
	1979	1988	Δ	1979	1988	Δ
HS/LTHS	.21	.36	.15(.04)	.21	.19	-.02(.09)
CG/HS	.31	.43	.12(.02)	.32	.38	.06(.07)

[a] These statistics are estimated differentials from logarithmic earnings regressions that include nine age dummies, three marital status dummies, and eight region dummies, as well as education dummies. The dependent variable is annual wage and salary income, and the sample is restricted to full-time, year-round workers.

[b] This is the estimated change in the differential from 1979 to 1988. The number in parentheses is the standard error for this change.

[c] HS/LTHS is the differential between high-school graduates and dropouts, and CG/HS is the differential between college graduates and high school graduates.

Table 3
Measures of Labor Market Activity Within Education Groups, 1980 and 1989

Age: 25-64

	White Males			Black Males		
	1980	1989	Δ	1980	1989	Δ
E/POP*						
LTHS	.75	.71	-.04	.64	.57	-.07
HS	.88	.86	-.02	.84	.76	-.08
CG	.94	.93	-.01	.90	.86	-.04
HS-LTHS	.13	.15	.02	.20	.19	-.01
CG-HS	.06	.09	.01	.06	.10	.04

	White Females			Black Females		
	1980	1989	Δ	1980	1989	Δ
E/POP						
LTHS	.40	.42	.02	.43	.41	-.02
HS	.58	.65	.07	.64	.68	.04
CG	.71	.79	.08	.85	.86	.01
HS-LTHS	.18	.23	.05	.21	.27	.06
CG-HS	.13	.14	.01	.21	.18	-.03

Age: 25-34

	White Males			Black Males		
	1980	1989	Δ	1980	1989	Δ
E/POP						
LTHS	.80	.80	0	.68	.56	-.12
HS	.90	.90	0	.80	.75	-.05
CG	.94	.94	0	.90	.90	0
HS-LTHS	.10	.10	0	.12	.19	.07
CG-HS	.04	.04	0	.10	.15	.05

	White Females			Black Females		
	1980	1989	Δ	1980	1989	Δ
E/POP						
LTHS	.43	.44	.01	.41	.29	-.12
HS	.59	.67	.08	.64	.64	0
CG	.75	.82	.07	.84	.88	.04
HS-LTHS	.16	.23	.07	.23	.35	.12
CG-HS	.16	.15	-.01	.20	.24	.04

*E/POP is the employment-to-population ratio. The statistics were calculated using the March 1980 and March 1989 Current Population Surveys.

Table 4
Changes in Earnings and Employment Rates of Demographic Groups Relative to White Males

-- Within Education Categories

Age Group:	25-64		25-34	
	Change in		Change in	
Group	Earnings[a]	E/POP[b]	Earnings	E/POP
College Graduates				
Black Males	-.02 (.04)	-.03	-.06 (.06)	0
White Females	.09 (.02)	.09	.09 (.02)	.07
Black Females	0 (.04)	.02	-.02 (.06)	.04
High School Graduates				
Black Males	0 (.02)	-.06	-.03 (.04)	-.05
White Females	.12 (.01)	.09	.13 (.02)	.08
Black Females	.07 (.02)	.06	.03 (.04)	0
Less than High School				
Black Males	.09 (.03)	-.03	.19 (.07)	-.12
White Females	.12 (.02)	.06	.08 (.05)	.01
Black Females	.09 (.04)	.02	.14 (.09)	-.12

[a]This is the estimated change (from 1979 to 1988) in the earnings differentials between the specified race/gender group and white males, within the specified education category. The differentials are from regression estimates that include region and age dummies as independent variables. Standard errors are reported in parentheses.

[b]This is the change (from 1980 to 1989) in the difference in the employment-to-population ratio between the specified group and white males.

Table 5
Contribution of Changes in the Occupational and Industrial Mix, the Minimum Wage, and Unionization to Changes in Earnings Differentials Within Demographic Groups

Differential	*Actual Change*	*Change Due to:*[a] Occ.	Indus.	I. Wage	Minim.	Union	Total	*Not Expl.*[b]
Age: 25-64								
White Males								
HS/LTHS	.06	.01	0	.01	.01	.05	.08	-.02
CG/HS	.11	0	.02	0	0	.01	.03	.08
Black Males								
HS/LTHS	-.03	-.02	.01	-.01	.01	-.02	-.03	0
CG/HS	.06	.01	-.02	-.02	0	.05	.02	.04
White Females								
HS/LTHS	.07	0	.01	.02	.02	.01	.06	.01
CG/HS	.11	.01	.03	-.01	0	-.01	.02	.09
Black Females								
HS/LTHS	.02	0	.01	0	.04	0	.05	-.03
CG/HS	.04	-.01	.02	.02	.01	-.03	.01	.03
Age: 25-34								
White Males								
HS/LTHS	.07	.02	0	.01	.01	.03	.07	0
CG/HS	.16	0	.03	0	0	.03	.06	.10
Black Males								
HS/LTHS	-.15	-.01	-.02	.02	.01	-.03	-.03	-.12
CG/HS	.07	0	.02	.03	0	.06	.11	-.04
White Females								
HS/LTHS	.15	.02	0	.01	.01	.01	.05	.10
CG/HS	.12	0	.05	0	.01	-.01	.05	.07
Black Females								
HS/LTHS	-.02	-.04	0	.01	.04	-.02	-.01	-.01
CG/HS	.06	-.03	.02	-.02	.01	-.02	-.04	.10

[a]These are the estimated effects of the change on the specified earnings differentials. The changes refer to:

Occ. -- the occupational mix of the demographic group
Ind. -- the industrial mix of the group
I. Wage -- the interindustry wage structure
Minin. -- the real value of the minimum wage

Table 5 (continued)

Union -- the percentage of the group unionized.
Total -- the sum of the five estimated effects.

[b]The portion "not explained" is the actual change in the differential minus the total change explained by the five effects listed in note (a).

Table 6
Contribution of Changes in the Occupational and Industrial Mix, the Minimum Wage, and Unionization to Changes in Earnings Differentials Relative to White Males

Differential	*Actual Change*	*Change Due to:* Occ.	Indus.	I. Wage	Minim.	Union	Total	*Not Expl.*
Age: 25-64								
College Graduates								
B. Males	-.02	-.03	-.02	0	0	0	-.03	.01
W. Females	.09	.02	.02	0	0	-.02	.02	.07
B. Females	0	.01	.04	-.01	0	-.05	-.01	.01
HS Graduates								
B. Males	0	-.02	-.01	0	0	-.04	-.07	.07
W. Females	.12	.01	.01	.01	0	0	.03	.09
B. Females	.07	.01	.02	.01	-.01	-.01	.02	.05
Less Than HS								
B. Males	.09	.03	0	.01	0	.03	.07	.02
W. Females	.12	.03	0	-.02	-.01	.04	.04	.08
B. Females	.09	.02	-.01	-.02	-.03	.04	0	.09
Age: 25-34								
College Graduates								
B. Males	-.06	-.03	0	0	0	0	-.03	-.03
W. Females	.09	.01	.04	-.01	0	-.02	.02	.07
B. Females	-.02	-.02	.04	-.02	0	-.04	-.04	.02
HS Graduates								
B. Males	-.03	-.01	-.02	0	0	-.03	-.07	.04
W. Females	.13	0	.01	.02	-.01	.02	.04	.09
B. Females	.03	.01	0	.03	-.01	.01	.04	-.01
Less Than HS								
B. Males	.19	.03	.02	0	0	.03	.08	.11
W. Females	.08	0	.01	-.01	-.01	.04	.03	.05
B. Females	.14	.01	0	.03	-.03	.06	.07	.07

Table 7
Annual Growth Rates of the Relative Supply of Labor Force Participants, 1980-1989

A: Relative Supply Within Demographic Groups

Age:	25-64		25-34	
	HS/LTHS	CG/HS	HS/LTHS	CG/HS
White Males	.04	0	.01	-.02
Black Males	.06	.03	.05	-.02
White Females	.04	.04	.02	.01
Black Females	.07	.02	.08	.02

B: Supply Relative to White Males, Within Education Categories

Age:	25-64			25-34		
	LTHS	HS	CG	LTHS	HS	CG
Black Males	.01	.02	.04	-.02	.02	.03
White Females	.01	0	.06	-.02	.00	.03
Black Females	0	.03	.04	-.07	0	.04

Table 8
Correlation of Changes in Earnings Differentials and Relative Supply

Differential	Age:	Correlation Coefficients[a] 25-64	25-34
Education Differentials[b]			
Actual Change		-.64*	-.69*
Residual Change		-.69*	-.37
Group Differentials[c]			
Actual Change		-.48	-.69**
Residual Change		-.46	-.45

[a]These are correlation coefficients of the growth rate in relative supply and the change in the relevant earnings differential. Tests of the hypothesis that the correlation coefficient differed from zero were conducted using an F-test for independence. One star denotes statistical significance at the 10 percent level, two stars at the 5 percent level.

[b]These correlations are for the actual and residual changes in the education-earnings differentials (both HS/LTHS and CG/HS) from table 5.

[c]These correlations are for the change in race/gender earnings differentials within education groups, from table 6.

Table 9
Estimates of Enrollment Equations for White Males and Females[a]

Dependent Variable:	% Enrolled of 18-19 Year-Olds				% Enrolled of 20-21 Year-Olds			
	Males		Females		Males		Females	
Indep. Var.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-.32	-.33	-.51	-.49	-.51	-.49	-.78	-.78
	(.06)	(.07)	(.07)	(.06)	(.08)	(.08)	(.06)	(.07)
D^* for Males[b]	.87	.78		.46	.73	.98		.10
	(.11)	(.31)		(.15)	(.13)	(.35)		(.17)
D^* for Females[c]		.18	.43	-.37		-.51	.06	-.11
		(.58)	(.16)	(.30)		(.65)	(.15)	(.34)
Trend	-.006	-.007	.014	.019	-.013	-.010	.016	.017
	(.002)	(.004)	(.002)	(.002)	(.002)	(.004)	(.002)	(.003)
R^2	.79	.79	.84	.90	.77	.78	.86	.86
DW	1.73	1.63	1.08	1.60	1.54	1.56	2.57	2.45

[a]The dependent variable is the inverse of the cumulative normal function evaluated at the percentage enrolled in school among the specified age group. The estimation method is ordinary least squares, with standard errors for the coefficient estimates reported in parentheses. The sample consists of annual observations for 1967-1987. Over this period, the average enrollment percentage was .52 among white males aged 18-19, .46 among white females 18-19, .38 among white males 20-21, and .30 among white females 18-19.

[b]This is the average-earnings differential between male college graduates and male high-school graduates (both aged 25-34), divided by one plus the ratio of tuition to high-school-graduate earnings for males 18-24. Tuition costs are the average undergraduate tuition in public institutions of higher education. When this differential appears in enrollment equations for females, the denominator in the correction uses female, not male, high-school-graduate earnings.

[c]This is the corrected differential for females. When it is used in equations for male enrollment rates, the denominator uses male high-school graduate earnings.

Appendix Table 1
Changes in Education-Earnings Differentials Within Demographic Groups, 1979 and 1989

Hourly Earnings, All Employed Individuals*

Age: 25-64

	White Males			Black Males		
	1979	1989	Δ	1979	1989	Δ
HS/LTHS	.19	.27	.08(.02)	.18	.17	-.01(.08)
CG/HS	.22	.42	.20(.02)	.28	.37	.09(.08)
	White Females			Black Females		
	1979	1989	Δ	1979	1989	Δ
HS/LTHS	.17	.27	.10(.03)	.14	.41	.27(.08)
CG/HS	.34	.48	.14(.02)	.45	.58	.13(.07)

Age: 25-34

	White Males			Black Males		
	1979	1989	Δ	1979	1989	Δ
HS/LTHS	.23	.31	.08(.04)	.18	.13	-.05(.13)
CG/HS	.15	.38	.23(.03)	.31	.37	.06(.11)
	White Females			Black Females		
	1979	1989	Δ	1979	1989	Δ
HS/LTHS	.15	.25	.10(.05)	.08	.25	.17(.13)
CG/HS	.33	.48	.15(.04)	.38	.57	.19(.09)

*These statistics are calculated using the "usual" earnings and hours information available for one-quarter of the CPS sample. We use the May 1979 and March 1989 surveys. Standard errors for the changes are reported in parentheses.

Appendix Table 2
Sample Sizes for Data on Full-Time, Year-Round Workers*

Age:	25-64		25-34	
Demographic Group	1979	1988	1979	1988
Age: 25-64				
All Workers	36135	35505	13113	12703
White Males				
LTHS	4159	2479	846	730
HS	7806	7119	2773	2771
CG	5653	5994	2328	1954
Black Males				
LTHS	559	329	108	65
HS	624	622	252	254
CG	180	300	88	84
White Females				
LTHS	1722	1177	331	258
HS	5256	5557	1721	1857
CG	2391	3489	1213	1508
Black Females				
LTHS	378	232	73	41
HS	602	744	262	291
CG	226	346	101	142

*These are the sizes of the annual earnings samples drawn from the March 1980 and March 1989 Current Population Surveys.

Appendix Table 3
Earnings Differentials for White Females Within Age Cohorts, 1979 to 1988

Annual Earnings, Full-Time Year-Round Workers

Cohort Age in:		CG/LTHS Earnings Differential	
1979	1988	1979	1988
18-24	27-33	--	.81
25-30	34-39	.52	.76
31-36	40-45	.60	.77
37-42	46-51	.50	.70
43-48	52-57	.50	.70
49-54	58-63	.63	.71

Appendix Table 4
Impact of Deunionization on Changes in Average Hourly Earnings
from 1980 to 1989

Hourly Earnings, All Employed Individuals Aged 25-64

Demographic/ Education Group	Percent Unionized:[a] 1979	1989	Δ	Union Premium[b]	Effect on Δ in Wages[c]
Age: 25-64					
White Males					
LTHS	.48	.24	-.24	.24	-.06
HS	.47	.32	-.15	.10	-.01
CG	.24	.17	-.07	-.01	0
Black Males					
LTHS	.42	.29	-.13	.22	-.03
HS	.56	.30	-.26	.18	-.05
CG	.41	.42	.01	-.12	0
White Females					
LTHS	.27	.11	-.16	.14	-.02
HS	.19	.12	-.07	.11	-.01
CG	.35	.25	-.10	.15	-.02
Black Females					
LTHS	.32	.18	-.14	.17	-.02
HS	.43	.24	-.19	.10	-.02
CG	.52	.28	-.24	.21	-.05
Age: 25-34					
White Males					
LTHS	.37	.12	-.25	.25	-.06
HS	.46	.25	-.21	.16	-.03
CG	.24	.13	-.11	.03	0
Black Males					
LTHS	.28	.17	-.11	.31	-.03
HS	.55	.22	-.33	.18	-.06
CG	.48	.51	.03	.03	0
White Females					
LTHS	.18	.06	-.12	.19	-.02
HS	.17	.11	-.06	.16	-.01
CG	.32	.18	-.14	.14	-.02
Black Females					
LTHS	.30	.14	-.16	-.03	0
HS	.40	.16	-.24	.08	-.02
CG	.53	.25	-.28	.14[d]	-.04

[a]This statistic is the number of wage and salary workers who are members of a labor union or employee organization.

[b]This is the estimated effect of being a union member on hourly wages, from log wage regressions using the 1979 data. Separate union effects were estimated for the different demographic/education groups.

[c]This number is equal to the change from 1979 to 1988 in the percent unionized multiplied by the estimated union coefficient for that race/gender/education group.

[d]Since the estimated union premium for black female college graduates aged 25-34 was likely an overestimate, we use the estimated union premium for white female college graduates.