

The College Gender Gap in Comparative Perspective, 1950-2000

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ABSTRACT

Women now earn about 57 percent of bachelor's degrees awarded in the United States, a reversal of the gender gap in college education that existed before the late 1970s. A similar reversal can be observed in a substantial majority of developed (OECD) countries, and in a large number of non-OECD countries as well. This paper documents the trend in the college gender gap over the past half century and explores some potential explanations. Within the United States, rising returns to human capital for women may help explain some of the change, but returns to college are now very high for both men and women, and men's enrollment rates have remained stagnant while women's continue to increase. Examining cross-country data, I show that the trend in the college gender gap persists even after controlling for changes in women's labor-force participation rates, per-capita GDP, and total fertility rates. Within the sample of OECD countries, changes in the divorce rate help explain much of the trend in the OECD, suggesting that changes in family structure or divorce risk may have played an important role, although of course marital status is likely to be endogenous to other social and economic changes that affected schooling decisions as well.

But I say, that the women of today:
Smarter than the man in every way.
That's right!
The woman is... smarter!

– Harry Belafonte¹

The enrollment of women in American institutions of higher learning passed that of men for the first time in 1979. Women now earn about 57 percent of bachelor's degrees awarded in the United States. Before the 1970s, however, men were much more likely to attain a college education than women. A similar trend can be observed in a majority of developed countries. As of 1970, tertiary enrollment rates were greater for men than women in almost all countries with data. But by 2000, this had reversed in most developed countries and even a large number of developing countries. Among 29 OECD countries with recent data, more women than men now attain the equivalent of a bachelor's degree in 22 of them. Even among non-OECD countries, women's tertiary enrollment exceeded men's in just under half (58 of 117) of the countries with data for circa 2000. In Jamaica, where Harry Belafonte spent some of his childhood, women now earn three-fourths of the bachelor's degrees, perhaps the highest proportion in the world.

In this paper I begin by documenting trends in the gender gap in college enrollment and degrees over the past half century, for the United States and other countries. I then discuss some potential explanations for the observed trends. The near ubiquity of the trend in the gender gap across developed countries suggests focusing on explanations that are likely to apply widely, rather than country-specific factors. For example, the alleged “war on boys” in American schools and society at large is sometimes cited as a factor in the lagging educational attainment of American males; yet it remains to be shown that the war is being waged on a global basis.

Another potential explanation for the U.S. trend, which could be relevant elsewhere as well, is that the pecuniary return on investment in higher education may have increased more rapidly for women than for men and may now be greater for women. According to the theory of investment in human capital,

¹ “Man Smart (Woman Smarter),” words and music by Norman Span.

this differential in returns could have provided an incentive for women to invest in more education than men. Measuring the full returns to college education in this setting is complex, however, because in addition to the conventional college earnings premium in paid employment, higher education may yield a return in non-market (household) activities, and in the marriage market. The latter two sources of returns to education are historically more significant for women than for men.

Analyzing trends in the college earnings premium using U.S. census data, I find that the conventionally measured return to a college degree in full-time employment increased more for women than for men after 1970. Since 1980, this gender gap has slightly favored women, at least among those under 40 years old, but the gender difference is small. To the extent that the returns to college education are realized predominantly in paid employment,² the overall rate of return to college estimated from full-time earnings must be heavily discounted for women, who work far fewer total hours than men on average and therefore recoup less of the cost of schooling. Under this assumption women's overall returns to college would be lower than men's up to the present day, although the gap has narrowed more rapidly as women's total paid hours have converged toward men's during the postwar period.

In an attempt to account for the effect of college on returns in the marriage market as well as individual earnings, I also estimate the returns to college in terms of total family income, adjusted for family size. Although the measured college premium in family income has risen in recent decades, the levels and trends are both very similar for women and men. That is, in terms of its impact on overall material standard of living, a college education appears to be little more attractive for women than for men.

The evidence, then, that gender differences in the college premium have shifted in the right direction to help account for the shifting college gender gap in the United States is weak. Whether such changes may have been more significant in other countries remains to be investigated using microdata, but it seems likely that changes in the gender gap in the college earnings premium will if anything be

² This assumption might reasonably be questioned (see below).

more difficult to find, as recent changes in the wage structure by skill have tended to be greater in the United States than elsewhere.

Direct cross-country comparisons offer a different approach to identifying covariates of the college gender gap. Using a large country-level panel data set for 1970-2000, I find a strong upward trend in women's tertiary enrollment rates, controlling for men's tertiary enrollment rates. Within the OECD countries in the sample, the trend persists even after controlling for changes in women's labor-force participation rates, per-capita GDP, and total fertility rates. Interestingly, adding a variable for the divorce rate helps explain much of the trend in the OECD, suggesting that changes in family structure or divorce risk may have played an important role, although the effect is smaller in a larger sample of countries. Given the difficulties of defining marital status consistently across countries and the likely endogeneity of marital status (as well other variables), this result must be treated very cautiously, but it suggests that changes in family structure or underlying changes in the social status of women may be a promising avenue for further inquiry.

Evolution of the college gender gap

The United States

Rates of college attendance and completion by gender in the United States can be obtained from several different sources. Data on enrollment and degrees by gender and level of education are collected and published by the U.S. Department of Education. These data essentially represent the flow of newly educated individuals into the population. Data on educational attainment are collected by the Census Bureau in the decennial censuses and the monthly Current Population Survey. Attainment is a measure of the stock of education in the population at any point in time. However, the "stock" data of the Census can be used to calculate flows by examining attainment by age cohort.

Figure 1 displays the trend since 1870 in number of bachelor's degrees awarded by gender. The gender gap in higher education favored men throughout the century until 1980, but prior to World War II

the gap had narrowed substantially. In terms of college *attendance*, the proportion female actually slightly exceeded that of men during the early twentieth century (Goldin 1995; see also Solomon 1985). The discrepancy between the percent female in attendance and bachelor's degrees reflects the disproportionate enrollment of women in postsecondary programs that were completed short of the four-year degree (e.g. teaching programs). The dramatic jump in male college attainment between 1940 and 1950 reflects the combined impact of "pent-up demand" for higher education by returning World War II soldiers and the GI Bills (Bound and Turner 2002; Stanley 2003). Male college enrollments were also inflated during the 1960s by the availability of the college deferment to avoid the draft during the Korean and Vietnam wars (Card and Lemieux 2001).

Since 1980, the gender gap has gone the other way, with women now about 30 percent more likely than men to obtain a bachelor's degree, and near or beyond parity in advanced degrees. Figure 2 plots annual series of the percentage of postsecondary degrees of various types awarded to women since 1960. Women achieved parity with men in both bachelor's and master's degrees by the early 1980s, and the gap has nearly closed for professional and doctoral degrees.³

Using data on educational attainment from population surveys, it is possible to examine rates of college completion by age as well as for different demographic groups.⁴ Figure 3 shows rates of college

³ In addition to the reversal in the overall gender gap in attendance and completion rates, there have also been important changes in the fields of study of women, with a striking shift in composition away from fields such as teaching and nursing and toward business administration and professional degrees (Goldin 2004).

⁴ Educational attainment measures from the Census and Current Population Survey are subject to various measurement errors. One problem arises because of a substantial change in the way educational attainment questions were asked in these surveys. Prior to the Census of 1990 and the March 1992 CPS, the surveys essentially asked for completed years of schooling, not degrees; thereafter, the question asked for highest degree attained. The usual practice (applied here) is to use four years of college as the equivalent of a bachelor's degree, but obviously the first does not always imply the second. Fortunately, this discrepancy does not seem to vary much by gender, although it may affect estimates of the college earnings premium differently for men and women (see Frazis and Stewart 1999). A second problem is the tendency of respondents to overreport educational attainment (Goldin 1998; Black et al 2003). Black et al (2003) show that respondents to both the Census and the CPS on average overstate their educational attainment. Among those who reported having attained a bachelor's degree to the 1990 Census, 7.4 percent of the men and 7.4 percent of the women actually had no degree, according to data linked to the

completion for 25-29 year old high-school grads in the March Current Population Surveys for 1964 through 2003. Because these individuals would on average have received their bachelor's degree about six years earlier, the timing of the crossing point when white women passed men is consistent with the evidence on degrees in Figure 2. The rate of college completion among high-school educated white men has been essentially stagnant since the late 1960s, while that for women increased by 10-15 percentage points during the same period. Among blacks, no gender gap is discernible.⁵

The decennial census began collecting information on educational attainment in 1940, so attainment figures can be extended further back in time. Figure 4 displays the rates of college attainment of 25-year-old high-school grads at each census date. Because I am interested in education attained while in the United States, I restrict the data to the native born, although the picture changes very little if immigrants are included.⁶ Among whites, the gender gap favoring men began to close some time around 1960. In contrast with the CPS data, the Census data suggest the emergence of a sizable gap in college attainment between black women and black men after 1980.⁷

In sum, these figures point to a distinctive feature of the reversal of the college gender gap in the

National Survey of College Graduates. Although this bias is troubling, the fact that there is no gender difference in the bias is reassuring. Black et al did find a large gender difference in the reliability of data on higher degrees, with women much more likely than men to report a professional degree on the survey when in fact they had none, but I restrict my attention to bachelor's degrees here.

⁵ One might speculate that the parity of black men and black women in Figure 3 could be due to conditioning on high-school completion, if black men were less likely to complete high school. However, the figure looks rather similar if the denominator is changed to population rather than high-school grads.

⁶ Information on nativity was not available for every year of the CPS, so a similar restriction cannot be made for Figure 3.

⁷ I have not yet determined the source of this discrepancy. The Census data exhibited here include the institutional population, whereas the CPS do not, and it might be thought that the high incarceration rate of uneducated young black men could be the source of the discrepancy. However, the difference largely remains even when the Census data are restricted to the noninstitutional population. Although misreporting of educational attainment (at least for higher education) seems to be worse in the Census than the CPS, among blacks there is not a significant gender difference in misreporting of educational attainment in the Census, so it seems unlikely that this is at the root of the problem here. I am grateful to Dan Black for checking this and providing relevant data analysis in an email communication (2/17/04).

United States— namely, that it reflects a steady increase in female college attainment and the stagnation of male attainment rates. Card and Lemieux (2000) show that both of these trends— upward for women, flat for men— remain even after basic controls for changes in socioeconomic background, cohort size, returns, college costs, and interest rates. It is tempting to think that the true puzzle resides in the failure of men’s educational attainment to advance over the past 35 years. Yet the reversal of the college gender gap in many other developed countries occurred alongside ongoing increases in attainment for both women and men.

International trends

Data on higher education degrees and enrollment for a large number of countries are assembled and reported by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). International comparability is clearly a difficult issue, because national educational systems vary considerably. Here I focus on trends in enrollments by gender in tertiary education as defined by UNESCO, encompassing levels 5 through 7 of the International Standard Classification of Education (ISCED). These levels cover post-secondary education in universities, colleges, professional programs, and teachers’ colleges, and include full- and part-time students.

Clearly, not all students enrolled in tertiary programs will go on to complete four-year bachelor’s-type degree programs. This creates potential biases if, say, more women than men tend to enroll in teacher training programs of short duration, and the prevalence of such programs varies across countries. Yet international patterns and trends in the gender gap in tertiary enrollment generally resemble those for more narrowly defined four-year university degrees. For example, looking across a set of mostly developed countries, Figure 5 plots percent female in all tertiary enrollment against percent female in tertiary 5A degrees awarded, which is the ISCED classification that most closely resembles the U.S.

bachelor's degree.⁸ The correlation is 0.86, and in fact it can be seen that the percentage female in tertiary enrollment tends to understate the percentage in 5A degrees (most points lie below the 45-degree line).

Postwar trends in the gender gap across countries are summarized in Figure 6. For the 27 countries with data available for most years (again, mostly developed countries), the figure shows the percentage female in tertiary enrollment for the median country and for the countries at the 25th and 75th percentiles.⁹ Women had achieved parity in the median country of this sample as of 1990, and by circa 2000 women's tertiary enrollment exceeded men's in three-quarters (21 of 28) of the countries.

For the period 1970-2000 a larger sample of countries, including many outside the developed West, is available. Figures 7 and 8 are cross-country scatter plots of an index of tertiary enrollment rates of women against those of men for OECD and non-OECD countries, respectively. The enrollment rate here is proportional to the ratio of tertiary enrollment to the college-age population by gender.¹⁰ In each figure, the year 1970 is represented by the filled diamonds and 2000 by the hollow squares. Gender parity in enrollment rates is represented by the dashed 45-degree line in each diagram. In both diagrams, it can be seen that as of 1970, male enrollment rates exceeded those of females in the large majority of countries, including all OECD countries. By 2000, women's enrollment rates were greater than men's in

⁸ The 40 countries for which both figures are available circa 2000 include 28 OECD countries, along with Brazil, Chile, India, Indonesia, Israel, Jamaica, Jordan, Malaysia, Paraguay, Thailand, Tunisia, and Uruguay.

⁹ The countries are Argentina, Australia, Austria, Belgium, Canada, Chile, Denmark, France, Hungary, Iceland, India, Ireland, Italy, Jamaica, Japan, Korea, South, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Thailand, Turkey, United Kingdom, United States. The percent female was interpolated (straight-line) for all countries for the years 1955 and 1995, and for selected other years for some countries with missing years.

¹⁰ Specifically, the number enrolled in tertiary institutions is divided by the population ages 15-24, then multiplied by 2.5, and expressed per thousand. Multiplying by 2.5 expresses enrollment as a proportion of four years worth of population, and thus would represent the fraction of individuals receiving a college education if each individual went to college for four years. The choice of the 15-24 age group was based on availability of population data. The sample is restricted to those countries for which there are observations for both years. In Figure 10, the observation for male enrollment in South Korea is rounded to 1200 (from 1212) to accommodate the scale. The enrollment data are collected by UNESCO: for 1970 they are available in United Nations (1999), Table 2.5; for 2000 in UNESCO (2003).

the large majority of OECD countries. Even outside of the OECD, women's enrollment rates exceeded men's in about half the countries in the sample (26 of 53).

Figures 9 and 10 track the trend in enrollment rates by gender for the median country in OECD and non-OECD samples with observations in each of the years 1970, 1980, 1990, and 2000. Two features are clear from these figures. First, in both the OECD and non-OECD samples, women's enrollment rates tend to have grown faster than men's, with a particular acceleration during the 1990s. Second, although women have pulled ahead of men in most countries, men's enrollment rates did increase fairly steadily throughout the period 1970 to 2000. Thus the case of the United States, where men have made little progress in college attainment since the late 1960s and the reversal of the gender gap could be thought a consequence of some absolute male educational "failure," does not generalize globally.

Explaining the convergence and reversal of the gender gap

The narrowing and recent reversal of the college gender gap in the United States has of course attracted the attention of scholars and journalists, and there has been much speculation about its cause. Given the dramatic changes in the social and economic role of women during the post-war period, the convergence of educational attainment should not be surprising. Disentangling the precedence and impact of government antidiscrimination measures, feminism and changing social norms, widespread access to reliable contraception, and changing occupational demand has proven daunting. For both Goldin (2004) and Jones (2004), the episodic nature of American women's entry into colleges and particularly professional programs and careers since the 1960s suggests that long-run, continuous changes such as rising labor-force participation cannot offer a complete explanation. Goldin emphasizes the importance of increased access to the birth-control pill for unmarried women beginning in the late 1960s, which facilitated delay of marriage and child-bearing and made investment in human capital less costly (Goldin and Katz 2002; see also Bailey 2004). Jones (2004) argues that the transformation of women's higher education was a tipping phenomenon, as a critical mass emerged to challenge the collective social

pressures constraining young women's educational choices.

Such arguments from discontinuity seem compelling in analyzing the rapid entry of women into the professions, but perhaps less so when it comes to women's participation in higher education generally. After all, Figure 1 suggests that the percentage female among bachelor's degrees has been on an upward trajectory for nearly a century, with the dramatic exception of a mid-century drop that is attributable to a temporary bubble in male degrees. Furthermore, the stagnation of men's college attainment is neglected in a focus on changes for women.

That the college gender gap has reversed and continues to widen is unexpected, and has fueled concerns that American schools are engaging in a putative "war against boys" (Sommers 2000) or perhaps simply that "the world is changing and males are not changing along with it" Mortenson (1999, p. 17). The concerns themselves are hardly new. A century ago, in a careful study of city school records, Ayres (1909) found that boys were significantly more likely than girls to stay back or drop out, beginning at an age before labor-market opportunities might be expected to draw boys out of school, and he echoed popular concerns that the "feminization" of education was to blame. At around the same time, women had achieved parity in enrollment at both Stanford and Chicago, raising fears of a female takeover and leading to admissions quotas to protect men (Solomon 1985). More recent evidence for the United States and other developed countries also shows that girls tend to get better grades in school, have better work habits, exhibit fewer behavioral problems, have fewer diagnosed learning disabilities, and enjoy school more, although males continue to perform better in some areas, such as tests of math and science achievement (e.g., Willingham and Cole 1997; OECD 1986; Abe 2001).

It might be supposed that these gender differences in performance could give rise to differential probabilities of college admission, and consequently that in steady state women might outnumber men, given roughly equal demand for higher education. Yet differences in admission rates seem to be much less important than differences in application rates in determining who goes to college. Manski and Wise (1983) note that in the 1970s, most college applicants were accepted by their first-choice institution, and

even a student with very poor qualifications (25th percentile in class rank and combined SAT score of 700) had a 74 percent probability of admission to the average college. What seems more likely is that the gender differences in grades and attitudes could make college appear less costly (in a nonpecuniary sense) to women and thus increase both their demand for college and their persistence in college relative to men.

Several attempts to explain the reversal of the gender gap have focused on gender differentials in the measured returns to human capital. In a recent paper, DiPrete and Buchmann (2003) argue that a college degree has a much greater proportional impact on the personal income of women than men, providing a greater incentive for women to obtain the degree.¹¹ Charles and Luoh (2003), on the other hand, observe that while the mean college premium in weekly earnings of workers has increased overall since the 1960s, there is very little differential between men and women that could account for the gender gap in attainment. They do, however, find that the within-education-level *dispersion* of earnings has increased much more for men than women. They interpret this as evidence of a relative increase in uncertainty about the returns to college for men, which has led men to invest less in human capital than women, given risk aversion.

Analyzing recent survey data, Jacob (2002) finds that the cross-sectional gender difference in college attendance can largely be explained by a mix of economic factors (such as the return to schooling in the student's state of residence) and "non-cognitive" variables (such as reports of behavior problems in high school and time spent on homework). The economic and non-cognitive factors appear to explain about equal amounts of the gender differential. Because of data limitations, what remains unexplained by Jacob's work is the trend: Have gender differences in the returns to college or in non-cognitive behaviors— or perhaps the relevant regression betas— actually changed over time?

Human capital and the college gender gap

¹¹ Their estimate does not adjust for hours of work, and the high "return" to college that they find for women appears to arise because college-educated women work more hours in the market. Thus their estimate differs from what economists would typically think of as the return to human capital.

The standard model of investment in human capital suggests that, *ceteris paribus*, an individual will invest in more education if the return on that investment is greater. The conventional proxy for the investment value of education is the wage premium associated with increased schooling, often measured as the coefficient on years of education in an earnings regression or simply as the percentage difference between the average wages for college- and high-school educated individuals. In the case of gender comparisons, however, it is critical to consider two additional dimensions of the value of education, other than the return to own paid employment— namely, the returns to schooling in non-market activities, such as household production or consumption, and the returns to schooling in the marriage market (via assortative mating as well as differential marriage and divorce rates).

The return to education in market and household labor

The return to schooling in non-market activities is not directly measurable using conventional data, but it does have implications for the measurement and interpretation of market returns. To see why, consider a simple human capital model that incorporates a time allocation decision. In this model, education beyond high school is obtained instantaneously and life after school is collapsed into a single lifetime utility function.¹² The full return to continuing education beyond high school can be modeled as the marginal willingness to pay for more school, given optimal time allocation. Utility is a function of lifetime earnings, Y , lifetime production of a household good, Z , and lifetime leisure hours, L . For simplicity I assume that utility does not depend directly on schooling. Normalizing total lifetime hours to 1, the individual chooses hours of paid labor, h , and household labor, m , which together imply leisure hours of $L = 1 - h - m$. Earnings in paid employment are equal to the product of the hourly wage and lifetime hours, where the hourly wage is a function of schooling, s : $Y = w(s)h$. Z -goods are produced according to a household production function, and may also depend on s : $Z = f(m, s)$, with f_m, f_s , and $f_{ms} >$

¹² Obviously the model abstracts from all issues that involve the evolution of wages and work decisions over the life cycle.

0, and $f_{mm} f_{ss} < 0$.

Given a level of schooling s , the individual's decision is to choose the h^* and m^* that maximize lifetime utility:

$$U = U(Y, Z, L) = U[w(s)h, f(m, s), 1 - h - m]$$

Given the optimal choices of h and m , the envelope theorem implies that the marginal impact of an increase in education on utility is

$$\frac{dU^*}{ds} = U_Y w_s h^* + U_Z f_s,$$

where the subscripts indicate derivatives. Making use of the first-order conditions, the marginal value of (willingness to pay for) more school is

$$(1) \quad WTP = \frac{dU / ds}{U_Y} = w_s h^* + \frac{U_Z}{U_Y} f_s = w_s h^* + w \frac{f_s}{f_m}$$

Some implications of (1) for the estimation of the returns to education are worth pointing out. First, if there is no household production, or if schooling has no effect on household productivity, then the second term is zero, and the marginal value of schooling is simply $w_s h^*$, which is the wage effect of additional schooling scaled by lifetime paid work hours. Total paid labor hours tend to be greater for men than for women, which would imply a greater return to education for men at any given wage rate. But it is also the case that average paid work hours for women have been growing over much of the postwar period, compared with the relative stagnation of men's hours (on women's hours trends see Pencavel 1998b).

Second, if schooling does affect household productivity, the value of schooling depends not only on its impact on lifetime earnings, captured in the first term in (1), but also on its effect on the shadow

value of household production, captured by the second term.¹³ That term is the marginal rate of technical substitution between education and work hours in household production, evaluated at the market wage. Given the assumptions about the household production function, for any value of s , the term f_s / f_m is increasing in hours of household labor, m . Thus if schooling has a significant impact on household productivity, ignoring household labor and using earnings to measure the returns to schooling ($w_s h^*$) will not only underestimate the full returns to schooling, but will underestimate it to a greater extent for those who allocate more of their time to household labor (i.e., traditionally women more than men), *ceteris paribus*. In the special case where schooling has the same proportional impact on productivity in all activities and utility is homogeneous, the allocation of time is independent of education, and the estimated coefficient on education from an hourly wage rate regression (w_s) suffices as a measure of the returns more generally.

Because non-market returns to schooling are generally not observable, it is difficult to know which of these scenarios is closest to reality, but there can be little doubt that education yields some non-market returns: a survey of the evidence is provided by Wolfe and Haveman (2001). Additional circumstantial evidence is provided by Pencavel (1998a), who finds that for married women in the labor force, controlling for the market wage, paid work hours and education are negatively correlated. He notes that this is consistent with a positive return to education in the household (i.e., education causes an upward shift in the marginal product of household labor). How large this household return is relative to the return in the market is difficult to know, but if we assume that it is bounded between zero and parity with the market return, the range of plausible values for the return to education is bounded by the coefficient from a wage regression and the same coefficient normalized by total work hours.

The picture is further complicated by a number of factors. First, as Charles and Luoh (2002) suggest, the decision to attend college may be affected not only by average returns to education but also

¹³ Educational attainment could also affect the value of leisure, of course, with implications similar to those considered here for household production.

by the dispersion of those returns, if agents are risk averse. Second, especially for women, the pecuniary return to a college education is not merely the effect of education on personal earnings, but also the effect on family income through the impact of education in the marriage market (via assortative mating). Trends in the college premium for individual women within marriage or for unmarried women could also have an impact on the distribution of consumption within marriage by affecting threat points in marital bargaining.

The return to college education in the marriage market

The conventionally measured return to schooling fails to capture returns to education in the marriage market. Given assortative mating, women with more education tend to marry men with more education and higher earnings (Mancuso 2000). This factor is historically of great importance. Indeed, earlier in the century, when the labor force participation rates of married women were very low, the bulk of the pecuniary returns to college for women came through the marriage market, i.e., from obtaining the “Mrs.” degree (Goldin 1992). Goldin shows that in 1960 the return to college in the marriage market was largely due to the increased probability of marrying a more educated man, with an additional return because, controlling for husband’s schooling, earnings tended to be greater for a man with a more educated wife.

The return to education via the marriage market could change over time both because of changes in the college earnings premium for spouses and because of changes in the correlation between spousal education levels (educational homogamy). Clearly the earnings premium increased after 1950 for both male and female workers. But what about homogamy? Studies of assortative mating in the United States tend to find evidence of increased educational homogamy between 1940 and 1970, with the greatest increase in the 1960s, and relative stability since then (Mare 1991; Mancuso 2000).

The impact of these trends would appear to be in the direction of further increasing the value of a college degree relative to high school, but whether these effects would be greater for one gender or the

other is not at all clear. If the proportion of a couple's income earned by the husband had remained stable over the period, and if education had had a greater effect on market than nonmarket returns, then increased educational homogamy would have increased the value of college more for women than for men. But increases in married women's labor force participation over the period would have increased the proportion of household income earned by the wife, thereby increasing men's pecuniary returns to marrying a more educated woman. Furthermore, if education increases the value of labor in household production and this premium has also increased over time, it should have added a further return to education for men in the marriage market. Finally, the picture is complicated by increases in age at marriage and in divorce rates, which have decreased the percentage of women and men who are married at each age group, diluting any impact of education on returns in the marriage market. Marriage and divorce rates are in turn related to educational attainment.

Trends in the returns to college education in the United States: What do the data tell us?

Using U.S. Census data, the estimated wage returns to a college education can be estimated for the past several decades.¹⁴ Figures 11-13 summarize the evolution of the college wage premium for whites women and men since 1960.¹⁵ For each census date, the sample consists of full-time, full-year workers between 25 and 54 years old with either a completed high school education or four years of college.¹⁶ In each census year, I estimate four earnings regressions, one for each gender-education pair, of the form, $\ln Y_{gsi} = \alpha_{gs} + f_{gs}(A_i) + \varepsilon_i$, where $g = f, m$ indexes gender, $s = h, c$ indexes schooling (high

¹⁴ All regression results reported in this section use IPUMS data (Ruggles et al 2003).

¹⁵ Earnings equations can be estimated for 1940 and 1950 as well, but the estimates are much less precise, particularly for 1950, when the sample must be restricted to sample line persons. The estimated gender differential in returns in both 1940 and 1950 show lower returns for women than men at most ages, similar to the findings for 1960.

¹⁶ This is measured as having completed 12 years of school or 16 years of school respectively in 1960, 1970, and 1980, and as having finished high school or obtained a bachelor's degree respectively in 1990 and 2000.

school or college completion), Y_{gsi} is annual wage and salary earnings, and $f_{gs}(A_i)$ is a quartic in age.¹⁷ Because these are full-time, year-round workers, annual earnings should be roughly proportional to average hourly earnings. By estimating separate age profiles for high-school and college grads, I allow for an interaction between education and experience. Figures 11 and 12 show the age profiles of the estimated returns to four years of college versus finishing high school for women and men respectively for each census year, calculated as $f_{gc} - f_{gh}$ at each age. Each curve in Figure 13 represents the age profile of the difference between the female and male profiles in Figures 11 and 12, calculated as the profile $(f_{fc} - f_{fh}) - (f_{mc} - f_{mh})$ at each age.

Figures 11 and 13 exhibit the well-known upward shift in the college premium for both men and women over this period. The rise in returns for women is broadly consistent with the rising rates of college attendance throughout this period, whereas the behavior of men is paradoxical, in the sense that their rates of college attendance have stagnated at a time when the returns to college appear to be at a 50-year high.

Figure 13 shows the gender gap in returns; where the age profile is positive, the estimated return to a college degree is greater for women than for men at that age. The age profile of the gap in each year tends to slope down, consistent with a stronger interaction between education and age (experience) for men than for women. Figure 13 exhibits the upward shift in women's return to college relative to men's, with the return higher for women than for men at all ages by 2000. The figure suggests that if young people and/or their parents base the college attendance decision on the observed labor-market gains of young adults, college may appear somewhat more attractive to women than to men. Still, the gender gap is quite small—less than 10 percentage points out of a college premium of 40-50 percent by 1990 for workers in their late 30s. That this difference is discernible to decision makers could be doubted.

¹⁷ The female regressions were Heckman corrected for sample selection, using the presence of own children under 18 and own children under 5 as additional regressors in the selection equation. Profiles generated from estimates without the selection correction are qualitatively similar to those shown here. Results were also similar when a set of region controls was included.

Figure 14 is analogous to Figure 13, but scales down the return to college by the average annual hours of work in the population (by gender and age).¹⁸ The idea here is to estimate the returns to college in equation (1) under the assumption that college yields no returns in non-market activities— i.e., the full marginal effect of education is captured by $w_j h^*$. Not surprisingly, deflating the return by annual hours drastically reduces the return for women relative to men. The trend over time is still an evident upward shift in the gap, reducing the advantage of men, but by this measure the return to personal pecuniary return to college education remains substantially lower for women than for men.

Finally, Figure 15 examines the trends in the within-group variance of log earnings for college grads by gender by plotting the standard error of the regression (residual) for the college sample.¹⁹ The plot confirms the finding of Charles and Luoh (2003) that the variability of returns increased more for men than for women in the last two decades of the twentieth century. No such gap opened in the residual for high-school grads (not shown). In this sense, college appears to have become somewhat more risky for men than it is for women, at least in terms of own pecuniary returns, although again the difference seems rather small (a 10-percentage point gap in within-group variability).

Incorporating returns in the marriage market

Because returns to college realized in the marriage market may represent a significant proportion of the total returns, estimates of the gender gap in returns based on individual earnings could be misleading. Although a complete accounting of all the returns is beyond the scope of this paper, a simple-

¹⁸ This is accomplished by estimating a quartic age profile of annual hours analogous to the earnings regression for each gender, but using the full sample rather than just the full-time, full-year workers. Individuals not in the labor force are assigned a value of 0 work hours. I then obtain the hours-deflated returns by multiplying the returns to college from Figures 11 and 12 by the predicted hours/2000 (proportion of full-time) at each age. I use hours for a combined sample of high-school and college completers; although average annual hours varied by schooling somewhat, there is no large and consistent difference between the hours of high-school and college-educated individuals of either gender.

¹⁹ Root mean squared error for men, estimate of sigma from the Heckman procedure for women. The diagram is nearly identical using the OLS root MSE for women. These regressions included controls for region.

minded, “reduced-form” approach to quantifying the net impact of college on total pecuniary returns is to compare total family incomes, adjusting for family size. Table 1 does this for Census income data from 1940 to 2000. Family income is assigned to each individual in the sample as follows: For individuals who are not married with spouse present, family income is the individual’s own reported total income (all incomes are pre-tax). For those married with spouse present, family income is the sum of the husband and wife incomes. Family incomes are then adjusted to income per adult equivalent by dividing by $(A+0.7K)^{0.7}$, where A is the number of adults and K the number of children.²⁰

Table 1 reports the return to college education by gender for this measure of family income per adult-equivalent, at the median and 20th percentiles. These figures again show generally rising returns to college education since 1960 for both men and women, and again slightly higher returns for women within the younger age groups. But the gender differences tend to be quite small. For example, in 2000, when the gender gap was greatest, college-educated women ages 25-29 had a median family income per adult-equivalent that was 63 percent greater than the median family income of high-school educated women; for men this college premium was 58 percent. While it seems plausible that young people considering investing in a college education would have at least a rough idea that their college-educated acquaintances were much more prosperous than those with only a high-school diploma, it seems implausible that the gender difference of 5 percentage points out of 60 would be discernible.

Summary of evidence on returns to college education

In the United States, the trends in women’s and men’s pecuniary returns to college have been in the right direction to help explain the reversal of the gender gap, but the gap in returns that currently favors women is quite small.²¹ Furthermore, there remains the puzzle that the returns to college are now

²⁰ This is the formula recommended in National Research Council (1996), using the central value for the household returns to scale parameter.

²¹ Another implication of the human capital framework is that schooling decisions should depend on the direct and opportunity costs of college. Direct college costs are likely to be similar for women and

very high for both women and men, yet men's enrollment rates have stagnated, while women's continue to rise. A limitation of the within-country analysis is the limited variation in institutional and social factors that might be expected to affect college enrollment by gender. As a first step toward a more comparative analysis, in the remainder of the paper I present a preliminary examination of the correlates of changes in the college gender gap in cross-country panels.

Exploring the gender gap in a cross-country panel, 1970-2000

The trend toward a narrowing and reversal of the college gender gap is widespread in the developed and— increasingly— the developing world, but as Figures 7 and 8 indicate there is also significant variation across countries in the relative enrollment of women and men. This variation offers some potential for identifying correlates of the gender gap in higher education.

Using a cross-country panel for the years 1970, 1980, 1990, and 2000, I have estimated regressions of the female tertiary enrollment rate on some observable indicators of economic development, women's participation in the economy, and family structure. The basic model regresses the female enrollment rate on the male enrollment rate, year dummies, and the socioeconomic variables:

$$E_{it}^f = f(E_{it}^m) + \beta X_{it} + \gamma_t + u_{it}$$

where E^f and E^m are the female and male enrollment rates, respectively, X is a vector of other variables, γ_t is the year effect, and u is an error term. Inclusion of the male enrollment rate as a regressor controls for the overall enrollment level in higher education. I enter it as a quadratic to allow for the possibility that as overall enrollment in higher education increases, the representation of women increases more rapidly than that of men. By controlling for men's tertiary enrollment in this way, the coefficient estimates on the remaining variables indicate their marginal effect on women's enrollment above and beyond what would

men, but what of opportunity costs? Measuring the opportunity cost of college as the pay of full-time, high-school educated workers ages 18-21, one can show that the opportunity cost of attending college has tended to be greater for men than women throughout the past 40 years, but that this difference actually shrank between 1975 and 1985 and has remained relatively small since then.

be expected given the enrollment of men.

The X variables used here include real GDP per capita, the adult (25-44) women's labor-force participation rate (LFP), the total fertility rate (TFR), and the proportion of women divorced or separated (ages 45-59). Descriptions of the variables and summary statistics can be found in Appendix Tables A1 and A2. GDP per capita is a control for the overall level of economic development, which may be correlated with the status of women. Women's labor force participation and fertility rates capture aspects of the status and time allocation patterns of women in the country. If returns to higher education are largely earned in the paid labor market, then the value of education will depend on the participation rate. The total fertility rate is a crude measure of the extent to which women's participation in higher education or the labor market might be interrupted by child rearing activities.²² Finally, the divorce rate may pick up multiple impacts of women's status or family structure on educational outcomes: divorce may be associated with greater social or economic independence of women; higher education may be a form of insurance for women against risks associated with divorce; or it may be the case that family disruptions from divorce are not gender-neutral in their impact on educational outcomes of children.²³

Of course, fertility, labor force participation, and divorce rates may all be endogenous to women's education levels. For this reason, the regression results must be viewed as suggestive of important correlations, not necessarily causal relationships. In addition, many other potential explanatory variables are left out, such as labor-market returns to education for women relative to men, or cultural, political, or legal factors affecting women's access to higher education. To the extent that some such variables are time-invariant, however, they can be controlled for using fixed country effects, which I present below.

²² Fertility decline is also, presumably, related to the availability of reliable contraception, with its attendant impacts on educational, career, and labor force decisions (Goldin and Katz 2002; Bailey 2004).

²³ E.g., Mortenson (1999) repeats a commonly held view that boys in single-parent, female-headed households suffer from the absence of a male "role model." The impact of divorce on the economic status of women is subject to some debate (e.g. Bedard and Deschenes 2005).

Table 2 shows the basic results for the full panel of countries. The coefficient on the male tertiary enrollment rate is very close to 1 in all the specifications, and the coefficient on its square is essentially zero. In other words, not surprisingly, countries with higher male enrollment rates tend also to have similarly higher female enrollment rates. In the first column, the rising coefficients on the year dummies show the upward trend in women's enrollment relative to men's. When GDP, women's LFP, and TFR are added to the regression, only LFP is statistically significant, having a positive association with women's higher education (controlling for men's), as expected. These variables appear to mitigate, but do not eliminate, the time trend. The divorce rate is only available for a much smaller sample, so I add it separately. The coefficient is large and positive. A one-standard deviation increase in the divorce rate (0.05) would increase the enrollment rate of women by about 30 per thousand.

Table 3 repeats Table 2 but adds country fixed effects to account for unobserved time-invariant characteristics of countries. The coefficients on the X variables should now be interpreted as the effect of within-country changes in those variables on female enrollment. The basic results are similar, although in this specification women's LFP is no longer significant when the divorce rate is included, and the total fertility rate now has a significantly positive coefficient. The association between women's enrollment and the divorce rate is even stronger here.

Tables 4 and 5 present regressions identical to Tables 2 and 3, but for a sample restricted to developed countries (OECD members). Most of the X coefficients are similar in sign and magnitude to those from the full sample. The divorce rate continues to have a strong positive correlation with female enrollment, and when it is included (column 4) the other X variables become statistically insignificant. The year dummies in column (1) indicate a very strong upward time trend in women's enrollment across the OECD countries. Interestingly, these year coefficients are substantially reduced when the divorce rate is included, at least in the fixed-effect estimates. In other words, for this sample, it appears that changes in the divorce rate are capturing the underlying factors that account for the rising college enrollment of women relative to men.

These cross-country regressions are, admittedly, preliminary, but they suggest some directions for further research beyond the standard returns to human capital approach. Interestingly, the college gender gap appears to be unrelated to average income (GDP per capita), but is correlated with some measures of women's social status, such as female labor force participation and the divorce rate. The significant impact of the divorce rate is particularly striking. One might surmise that divorce is itself a by-product of increased education, and thus the causation runs from education to divorce. But in the United States, at least, the probability of being divorced is not positively correlated with schooling level in cross section.

Conclusions

In much of the world, women's higher education enrollment and graduation rates have converged with and surpassed those of men. Given the dramatic transformation of women's economic and social roles in many countries during the postwar period, the convergence is perhaps not surprising. That women's participation in higher education now exceeds men's by a substantial margin is more surprising. Explanations of this phenomenon that rest on peculiarities of the U.S. setting— including perhaps educational fads that allegedly favor girls, or dramatic changes in wage premiums that make college more attractive for women— must be treated with skepticism given the ubiquity of the trend. It is true that in the United States, the estimated college premium in earnings is now slightly greater for women than it is for men. But the difference is small, and is not robust to an adjustment for the significantly lower lifetime hours of work for women.

A speculative explanation of the reversal of the college gender gap is simply that given a level playing field, the equilibrium educational attainment of women might exceed that of men, and thus the gradual removal of barriers that suppressed women's attainment would eventually result in a reversal of the gap. That female students apparently perform better in school and enjoy it more suggests that the nonpecuniary costs of education might be lower, and the nonpecuniary benefits perhaps greater, for women. Furthermore, to the extent that it is still the case that young men have superior opportunities

outside college, their opportunity cost of college attendance is greater than women's.²⁴ Of course, gender differences in both attitudes toward schooling and opportunity costs may themselves be subject to change over time.

Finally, preliminary analysis of cross-country data suggests that trend changes in family structure are at least correlated with changes in the college gender gap. Much more work needs to be done to determine whether this correlation reflects a causal relationship or merely proxies for other underlying factors.

²⁴ This is a claim about the level of the gender difference in market opportunities, not the trend, which as I note above has not moved in the right direction to explain the trend in the college gender gap.

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Table 1. College income premium for white families, adjusting income with household equivalence scale

| | Year | Median | | | 20th percentile | | |
|------------|------|--------|-------|--------|-----------------|-------|--------|
| | | Female | Male | Diff. | Female | Male | Diff. |
| Ages 25-29 | 1940 | 0.403 | 0.433 | -0.030 | | | |
| | 1960 | 0.329 | 0.228 | 0.101 | 0.309 | 0.237 | 0.071 |
| | 1970 | 0.371 | 0.277 | 0.094 | 0.343 | 0.290 | 0.053 |
| | 1980 | 0.365 | 0.345 | 0.020 | 0.364 | 0.368 | -0.004 |
| | 1990 | 0.623 | 0.573 | 0.050 | 0.677 | 0.599 | 0.079 |
| | 2000 | 0.634 | 0.583 | 0.051 | 0.706 | 0.633 | 0.073 |
| Ages 30-34 | 1940 | 0.371 | 0.354 | 0.018 | | | |
| | 1960 | 0.330 | 0.302 | 0.028 | 0.293 | 0.323 | -0.030 |
| | 1970 | 0.375 | 0.337 | 0.037 | 0.369 | 0.378 | -0.010 |
| | 1980 | 0.300 | 0.288 | 0.011 | 0.302 | 0.306 | -0.005 |
| | 1990 | 0.525 | 0.494 | 0.031 | 0.548 | 0.539 | 0.009 |
| | 2000 | 0.576 | 0.543 | 0.034 | 0.656 | 0.594 | 0.062 |
| Ages 35-39 | 1940 | 0.397 | 0.333 | 0.064 | | | |
| | 1960 | 0.333 | 0.340 | -0.007 | 0.325 | 0.327 | -0.002 |
| | 1970 | 0.386 | 0.368 | 0.017 | 0.383 | 0.376 | 0.007 |
| | 1980 | 0.310 | 0.296 | 0.015 | 0.321 | 0.342 | -0.021 |
| | 1990 | 0.416 | 0.425 | -0.009 | 0.452 | 0.497 | -0.045 |
| | 2000 | 0.511 | 0.496 | 0.015 | 0.551 | 0.553 | -0.001 |
| Ages 40-44 | 1940 | 0.292 | 0.268 | 0.024 | | | |
| | 1960 | 0.361 | 0.364 | -0.004 | 0.344 | 0.354 | -0.010 |
| | 1970 | 0.364 | 0.351 | 0.014 | 0.336 | 0.364 | -0.027 |
| | 1980 | 0.310 | 0.323 | -0.012 | 0.337 | 0.349 | -0.012 |
| | 1990 | 0.418 | 0.414 | 0.004 | 0.464 | 0.467 | -0.003 |
| | 2000 | 0.453 | 0.471 | -0.018 | 0.492 | 0.501 | -0.009 |

Notes: Income from all sources in every year except 1940, which is wage and salary income only. The 20th percentile is not reported for 1940, because the 20th percentile of wage and salary income was zero in some cases. 1950 not available because income and education data cannot be obtained for both husband and wife. Family income adjusted to income per adult equivalent by dividing by $(A+0.7K)^{0.7}$, where A is the number of adults and K the number of children.

Source: IPUMS samples (Ruggles, Sobek, et al 2003).

Table 2. Female tertiary enrollment rate regression, full sample OLS

| | (1) | (2) | (3) | (4) |
|---|----------------------|------------------------|------------------------|------------------------|
| Male tertiary enrollment rate | 1.115** (0.137) | 1.133** (0.198) | 0.996** (0.193) | 0.973** (0.174) |
| Male tertiary enrol. rate squared /1000 | -0.076 (0.244) | -0.132 (0.318) | -0.125 (0.322) | -0.118 (0.290) |
| Year 1980 | 15.692 (9.609) | -11.398 (10.934) | 0.077 (11.423) | 6.411 (11.276) |
| Year 1990 | 29.104** (9.822) | -0.990 (10.756) | 18.473 (12.195) | 11.163 (13.158) |
| Year 2000 | 78.145** (11.386) | 58.333** (14.075) | 131.122** (33.111) | 124.768** (31.395) |
| Female LFP rate (%) ages 25-44 | | 1.464** (0.245) | 1.272** (0.244) | 0.778** (0.231) |
| Real per capita GDP (1996\$) | | 0.002 (0.002) | 0.004 (0.002) | 0.002 (0.002) |
| Total fertility rate | | 3.065 (5.227) | 9.940 (5.918) | 5.859 (5.046) |
| Proportion of women divorced, 45-59 | | | | 663.303** (170.798) |
| Constant | -48.287** (9.432) | -151.906** (49.957) | -171.574** (53.171) | -147.858** (45.261) |
| Observations | 490 | 354 | 220 | 220 |
| R-squared | 0.86 | 0.89 | 0.89 | 0.90 |

Robust standard errors in parentheses. * significant at 5%; ** significant at 1%. Column (3) uses same sample as column (4).

Sources: See text and appendix Table A1.

Table 3. Female tertiary enrollment rate regression, full sample with country fixed effects

| | (1) | (2) | (3) | (4) |
|---|-----------------------|------------------------|------------------------|--------------------------|
| Male tertiary enrollment rate | 1.195** (0.103) | 1.087** (0.116) | 0.967** (0.168) | 0.953** (0.152) |
| Male tertiary enrol. rate squared /1000 | 0.032 (0.094) | -0.059 (0.097) | -0.072 (0.125) | -0.102 (0.113) |
| Year 1980 | -0.166 (10.499) | -4.463 (12.430) | 21.886 (19.215) | 10.457 (17.445) |
| Year 1990 | 19.313 (11.388) | 17.294 (16.318) | 63.803* (28.228) | 20.530 (26.766) |
| Year 2000 | 63.368** (13.987) | 87.815** (21.791) | 182.769** (41.503) | 118.104** (39.418) |
| Female LFP rate (%) ages 25-44 | | 4.073** (0.617) | 3.247** (0.853) | 1.028 (0.881) |
| Real per capita GDP (1996\$) | | 0.001 (0.002) | 0.001 (0.003) | 0.003 (0.003) |
| Total fertility rate | | 37.479** (7.702) | 50.340** (11.250) | 26.132* (11.164) |
| Proportion of women divorced, 45-59 | | | | 1,640.367** (317.774) |
| Constant | -61.751** (10.916) | -446.856** (45.442) | -432.604** (56.278) | -298.992** (56.907) |
| Observations | 490 | 354 | 220 | 220 |
| Number of countries | 180 | 137 | 102 | 102 |
| R-squared | 0.86 | 0.91 | 0.91 | 0.93 |

Robust standard errors in parentheses. * significant at 5%; ** significant at 1%. Column (3) uses same sample as column (4).

Sources: See text and appendix Table A1.

Table 4. Female tertiary enrollment rate regression, OECD sample OLS

| | (1) | (2) | (3) | (4) |
|---|-----------------------|-------------------------|-------------------------|--------------------------|
| Male tertiary enrollment rate | 1.197** (0.368) | 1.201** (0.341) | 1.036** (0.304) | 0.946** (0.249) |
| Male tertiary enrol. rate squared /1000 | -0.244 (0.461) | -0.256 (0.414) | -0.180 (0.384) | -0.118 (0.318) |
| Year 1980 | 37.842 (22.484) | 4.631 (24.583) | 4.450 (24.604) | 26.772 (24.247) |
| Year 1990 | 102.937** (24.299) | 17.044 (29.534) | 17.941 (31.150) | 36.577 (30.746) |
| Year 2000 | 216.281** (42.251) | 108.851* (42.517) | 109.736 (62.963) | 130.524* (57.746) |
| Female LFP rate (%) ages 25-44 | | 3.613** (0.680) | 3.873** (0.771) | 1.323 (0.851) |
| Real per capita GDP (1996\$) | | 0.004 (0.003) | 0.006 (0.003) | 0.001 (0.003) |
| Total fertility rate | | 44.673** (14.869) | 56.298** (18.081) | 27.199 (16.830) |
| Proportion of women divorced, 45-59 | | | | 1,497.351** (499.681) |
| Constant | -125.947* (55.091) | -440.317** (109.463) | -463.726** (114.273) | -265.434** (91.610) |
| Observations | 107 | 104 | 89 | 89 |
| R-squared | 0.85 | 0.88 | 0.87 | 0.89 |

Robust standard errors in parentheses. * significant at 5%; ** significant at 1%. Column (3) uses same sample as column (4).

Sources: See text and appendix Table A1.

Table 5. Female tertiary enrollment rate regression, OECD sample with country fixed effects

| | (1) | (2) | (3) | (4) |
|---|-----------------------|------------------------|-------------------------|--------------------------|
| Male tertiary enrollment rate | 0.798** (0.269) | 1.106** (0.238) | 1.357** (0.299) | 1.309** (0.265) |
| Male tertiary enrol. rate squared /1000 | 0.051 (0.192) | -0.171 (0.169) | -0.336 (0.198) | -0.338 (0.175) |
| Year 1980 | 53.829 (29.190) | 65.414 (39.592) | 32.130 (47.532) | -16.998 (43.779) |
| Year 1990 | 141.029** (36.177) | 137.647* (59.525) | 55.168 (76.502) | -59.956 (73.605) |
| Year 2000 | 282.936** (52.868) | 286.121** (82.697) | 169.794 (108.723) | 13.947 (103.836) |
| Female LFP rate (%) ages 25-44 | | 3.922** (1.287) | 4.109* (1.592) | 2.534 (1.461) |
| Real per capita GDP (1996\$) | | -0.006 (0.004) | 0.003 (0.006) | 0.004 (0.005) |
| Total fertility rate | | 98.201** (21.859) | 121.116** (30.575) | 59.250 (31.242) |
| Proportion of women divorced, 45-59 | | | | 2,136.771** (543.545) |
| Constant | -58.841 (53.220) | -480.882** (95.008) | -680.096** (153.418) | -536.788** (140.244) |
| Observations | 107 | 104 | 89 | 89 |
| Number of countries | 30 | 30 | 30 | 30 |
| R-squared | 0.91 | 0.94 | 0.93 | 0.95 |

Robust standard errors in parentheses. * significant at 5%; ** significant at 1%. Column (3) uses same sample as column (4).

Sources: See text and appendix Table A1.

Table A1. Comparative tertiary enrollment data, 1970-2000: definitions and sources

| Variable | Definition and source |
|----------|--|
| pef | <p>Female tertiary enrollment rate (per thousand)</p> <p>Definition: Number of females enrolled in all institutions (public or private) at the tertiary level of education, as defined by UNESCO, divided by the female population ages 15-24, then multiplied by 2.5, expressed per thousand. Multiplying by 2.5 expresses enrollment as a proportion of four years worth of population, and thus would represent the fraction of individuals receiving a college education if each individual attended college for four years.</p> <p>Sources: for enrollment 1970-1990, United Nations (1999), Table 2.5; for enrollment 2000, UNESCO (2003); for population, United Nations (1999), Table 1.1.</p> |
| pem | <p>Male tertiary enrollment rate</p> <p>Definition: analogous to pef (above).</p> <p>Sources: See pef (above).</p> |
| lfp | <p>Female labor force participation rate, 25-44 (percent)</p> <p>Proportion of females 25-44 years old economically active, as reported by the International Labour Office. The ILO definition of the economically active includes those at work for pay or profit or seeking such work.</p> <p>Source: United Nations (1999), Table 3.1.</p> |
| pcgdp | <p>Real per capita GDP (in 1996\$, PPP)</p> <p>Source: Penn World Tables, Heston et al (2002).</p> |
| tfr | <p>Total fertility rate</p> <p>Definition: For each year, estimated total fertility rate for the succeeding 5-year period (e.g., for 1970 the 1970-75 TFR).</p> <p>Source: United Nations (1999), Table 4.4.</p> |
| ds45 | <p>Proportion of women 45-59 divorced or separated</p> <p>"Marital status is defined as the personal status of an individual in relation to the marriage laws or customs of the country" (United Nations 1999, Table 4.1).</p> <p>Source: United Nations (1999), Table 4.1.</p> |

Table A2. Comparative tertiary enrollment data, 1970-2000: summary statistics

Full sample, combined years

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|----------|-----|----------|-----------|----------|----------|
| pef | 497 | 194.0148 | 240.7483 | 0 | 1295.152 |
| pem | 490 | 193.1349 | 199.4434 | 0 | 1212.363 |
| lfp | 712 | 61.14494 | 22.67584 | 0 | 96.2 |
| tfr | 740 | 4.078108 | 1.971139 | 1.13 | 8.29 |
| pcgdp | 508 | 6727.717 | 6925.101 | 331.6564 | 43989.44 |
| ds45 | 418 | .0564132 | .0479353 | 0 | .2268015 |

OECD sample, combined years

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|----------|-----|----------|-----------|----------|----------|
| pef | 108 | 394.4211 | 296.5919 | 16.52174 | 1295.152 |
| pem | 107 | 401.6653 | 219.8085 | 21.97917 | 1212.363 |
| lfp | 120 | 62.59425 | 19.05692 | 17.1 | 94.8 |
| tfr | 120 | 1.991667 | .7593223 | 1.13 | 6.52 |
| pcgdp | 115 | 16154.96 | 6889.032 | 2715.58 | 43989.44 |
| ds45 | 101 | .0714179 | .048546 | 0 | .2107849 |

Full sample, by year

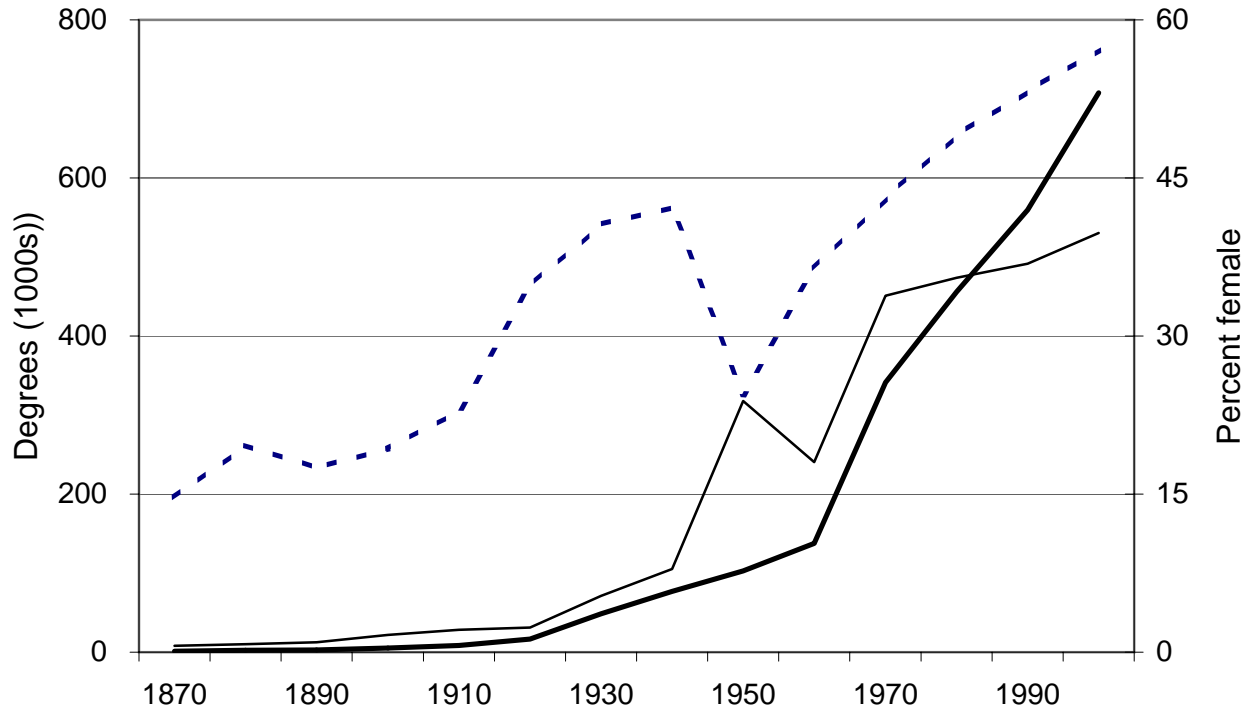
| Variable | Obs | Mean | Std. Dev. | Min | Max |
|----------|-----|----------|-----------|----------|----------|
| 1970 | | | | | |
| pef | 112 | 63.82133 | 90.84783 | 0 | 479.4875 |
| pem | 112 | 102.2066 | 119.3321 | 0 | 683.9547 |
| lfp | 178 | 53.27697 | 25.7246 | 0 | 95.6 |
| tfr | 185 | 4.989351 | 1.935588 | 1.62 | 8.29 |
| pcgdp | 115 | 4707.049 | 4540.744 | 331.6564 | 20610.86 |
| ds45 | 101 | .0397291 | .0338555 | 0 | .1654091 |
| 1980 | | | | | |
| pef | 115 | 145.6578 | 158.3953 | 0 | 738.4204 |
| pem | 111 | 163.1869 | 148.4449 | 0 | 674.6261 |
| lfp | 178 | 59.39213 | 23.32965 | 9.1 | 96.2 |
| tfr | 185 | 4.396054 | 2.012554 | 1.43 | 8.12 |
| pcgdp | 124 | 5878.505 | 5620.935 | 443.0529 | 22322.09 |
| ds45 | 140 | .0526918 | .0445195 | 0 | .2268015 |
| 1990 | | | | | |
| pef | 131 | 189.3414 | 216.3882 | 0 | 1295.152 |
| pem | 128 | 192.2782 | 187.9071 | 0 | 1057.034 |
| lfp | 178 | 63.86742 | 20.48977 | 7.7 | 95.3 |
| tfr | 185 | 3.758108 | 1.854035 | 1.27 | 7.8 |
| pcgdp | 135 | 7212.88 | 7091.035 | 493.6993 | 26891.33 |
| ds45 | 146 | .0635111 | .0512811 | 0 | .2072368 |
| 2000 | | | | | |
| pef | 139 | 343.3309 | 314.1057 | 1.59292 | 1082.356 |
| pem | 139 | 291.1052 | 249.6752 | 4 | 1212.363 |
| lfp | 178 | 68.04326 | 17.85995 | 10.99 | 95.1 |
| tfr | 185 | 3.168919 | 1.581138 | 1.13 | 6.95 |
| pcgdp | 134 | 8758.928 | 8755.678 | 481.8725 | 43989.44 |
| ds45 | 31 | .0941479 | .0592178 | .005646 | .2107849 |

Table A2 cont.

OECD sample, by year

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|----------|-----|----------|-----------|----------|----------|
| 1970 | | | | | |
| pef | 26 | 135.0357 | 99.43586 | 16.52174 | 479.4875 |
| pem | 26 | 232.6931 | 135.0746 | 21.97917 | 683.9547 |
| lfp | 30 | 45.57333 | 17.0047 | 17.1 | 83.5 |
| tfr | 30 | 2.554 | 1.066818 | 1.62 | 6.52 |
| pcgdp | 27 | 11245.06 | 4165.485 | 2715.58 | 20610.86 |
| ds45 | 26 | .0378895 | .0217089 | 0 | .0796434 |
| 1980 | | | | | |
| pef | 25 | 258.3592 | 155.0338 | 22.75862 | 738.4204 |
| pem | 24 | 321.9883 | 137.167 | 41.72414 | 674.6261 |
| lfp | 30 | 59.76 | 17.56885 | 31.1 | 92.6 |
| tfr | 30 | 2.005333 | .6752508 | 1.43 | 4.24 |
| pcgdp | 28 | 14207.88 | 4744.539 | 4271.872 | 22322.09 |
| ds45 | 28 | .0524299 | .030397 | 0 | .1201579 |
| 1990 | | | | | |
| pef | 28 | 432.0822 | 257.7464 | 21.6 | 1295.152 |
| pem | 28 | 425.4064 | 204.7545 | 47.40385 | 1057.034 |
| lfp | 30 | 69.67667 | 14.71032 | 39.2 | 94.8 |
| tfr | 30 | 1.789 | .3920358 | 1.27 | 3.12 |
| pcgdp | 30 | 17291.28 | 5833.776 | 5739.988 | 26891.33 |
| ds45 | 29 | .0880288 | .0472633 | .0125835 | .1837968 |
| 2000 | | | | | |
| pef | 29 | 707.9057 | 245.8926 | 129.4231 | 1082.356 |
| pem | 29 | 596.1749 | 197.5723 | 105.9821 | 1212.363 |
| lfp | 30 | 75.367 | 12.1386 | 47.07 | 94.53 |
| tfr | 30 | 1.618333 | .3227691 | 1.13 | 2.49 |
| pcgdp | 30 | 21254.82 | 7852.934 | 6832.083 | 43989.44 |
| ds45 | 18 | .122623 | .0496307 | .0204954 | .2107849 |

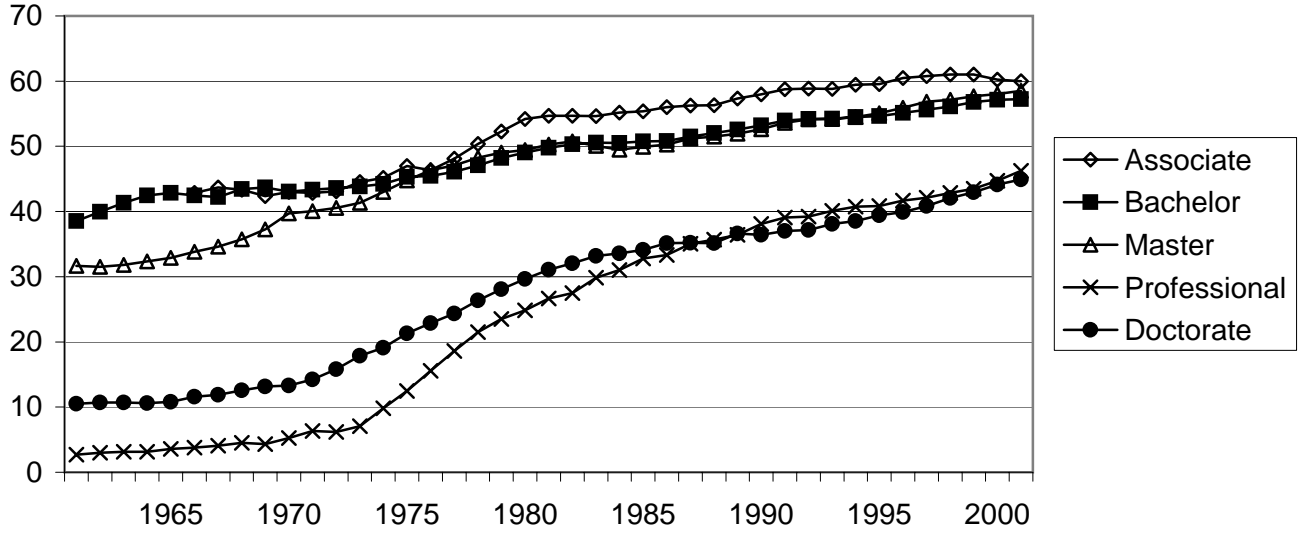
Figure 1
Bachelors degrees by gender, 1870-2000



Source: U.S. Dept. of Education, National Center for Education Statistics

— Males (1000s) — Females (1000s) - - - Percent female

Figure 2
Percent of U.S. postsecondary degrees conferred to women,
1960-61 through 2000-2001 academic years



Note: 1965 refers to 1964-65 academic year, etc. Source: U.S. Dept. of Education, National Center for Education Statistics

Figure 3
Proportion of high-school grads with at least 4 years of college,
ages 25-29 (March CPS)

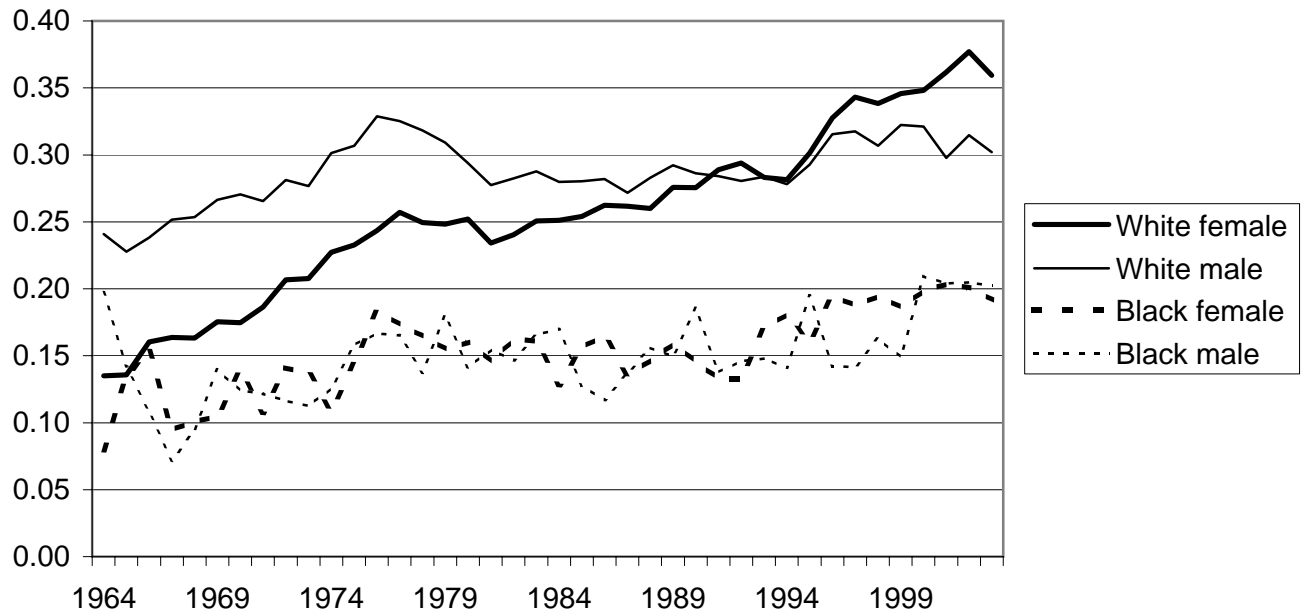


Figure 4
Proportion of 25-year-old HS grads reporting
4+ years of college, by census year

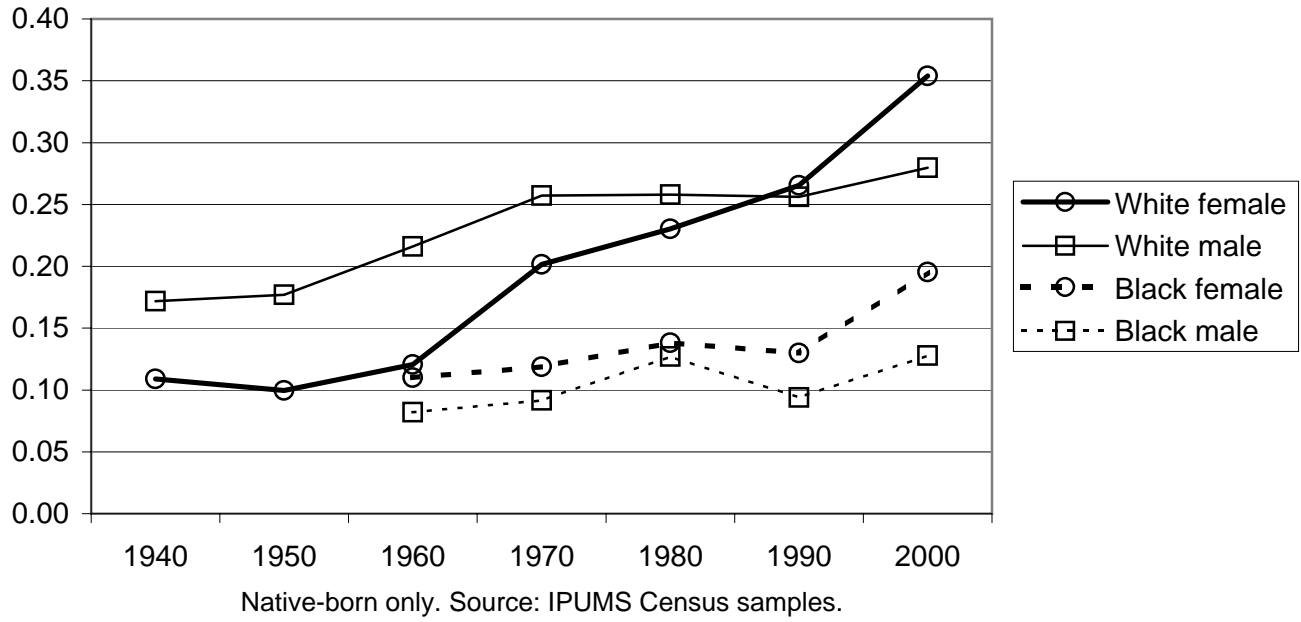


Figure 5
Percent female, Tertiary 5A degrees
and tertiary enrollment, c. 2000

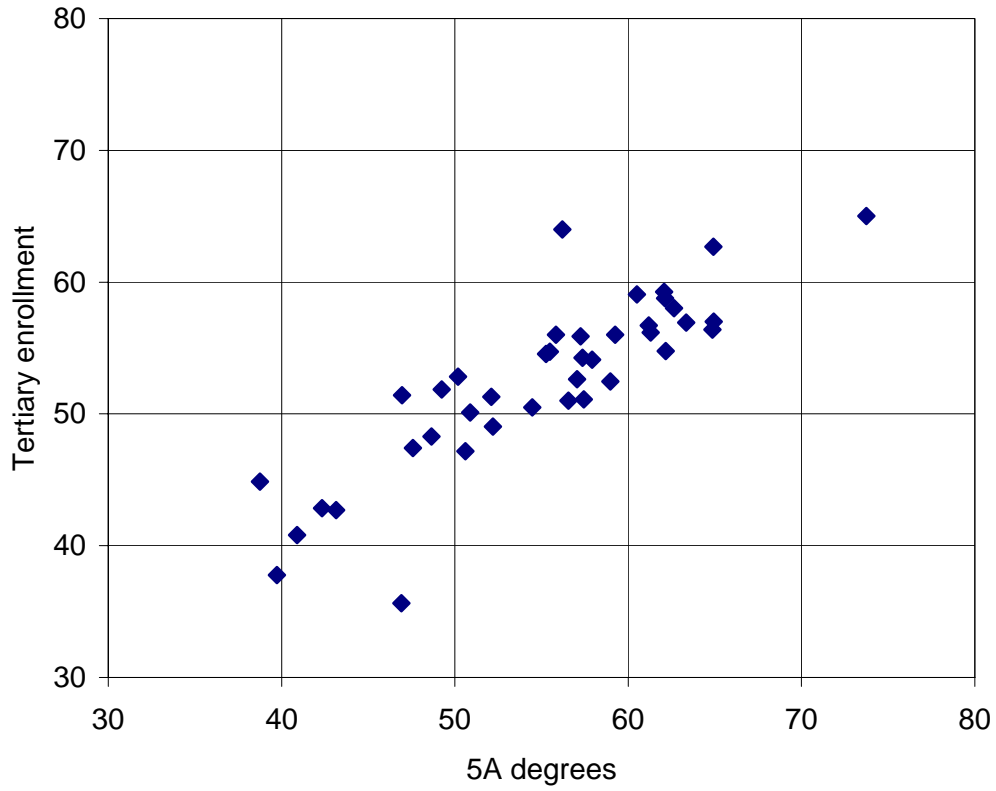


Figure 6
Trends in percentage female in tertiary enrollment, 1950-2000,
27-country median and interquartile range

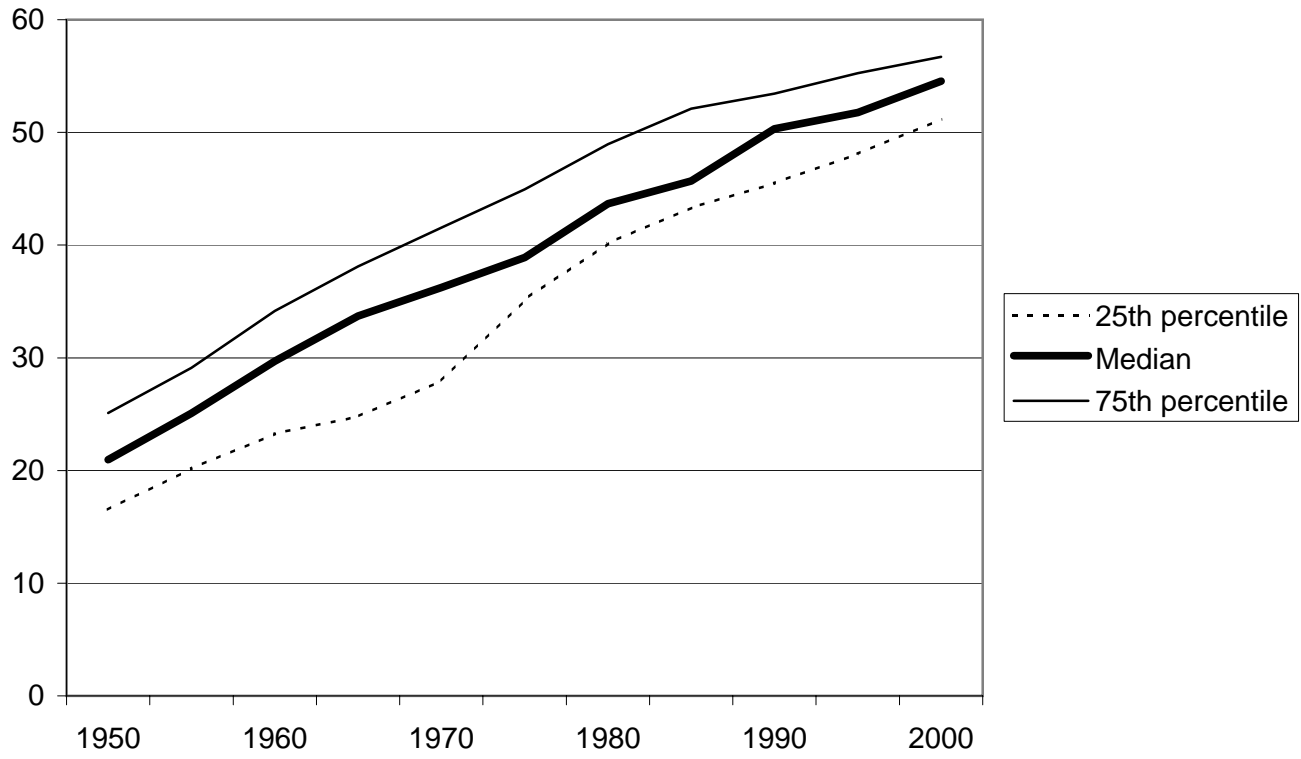


Figure 7
Cross-country scatter of tertiary enrollment rates, OECD countries,
1970 and 2000 (per thousand)

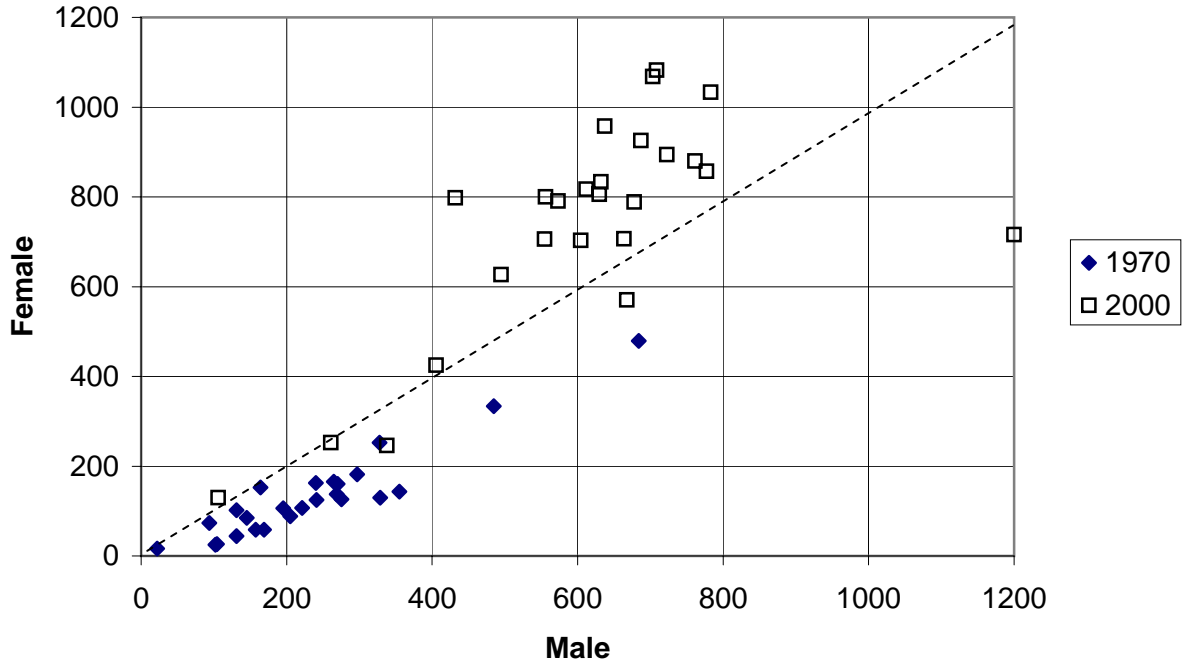


Figure 8
Cross-country scatter of tertiary enrollment rates, Non-OECD countries, 1970 and 2000 (per thousand)

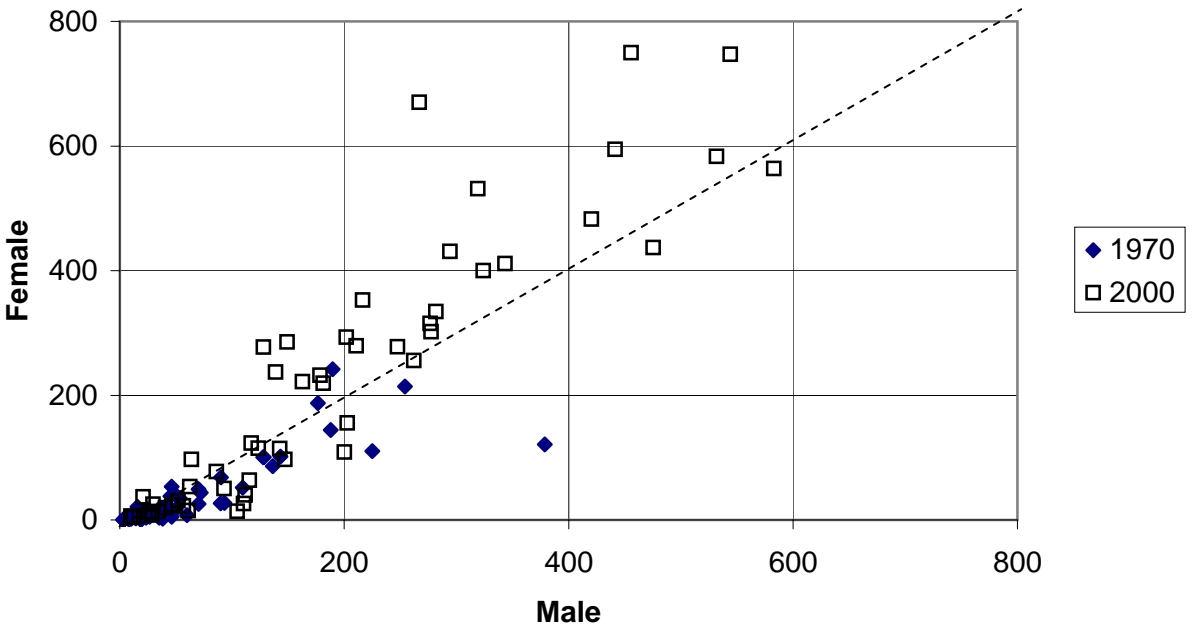


Figure 9
Tertiary enrollment rate, median of 21 OECD countries

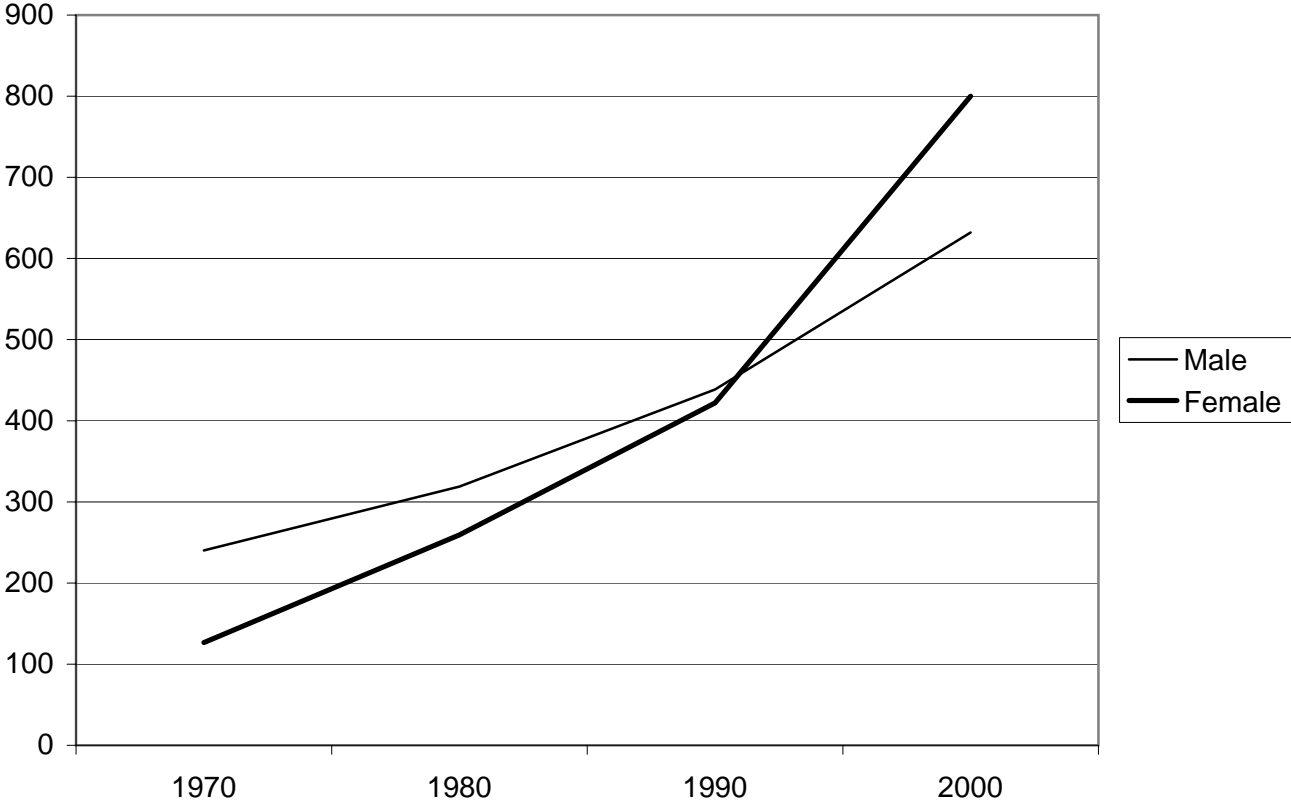


Figure 10
Tertiary enrollment rate, median of 32 non-OECD countries

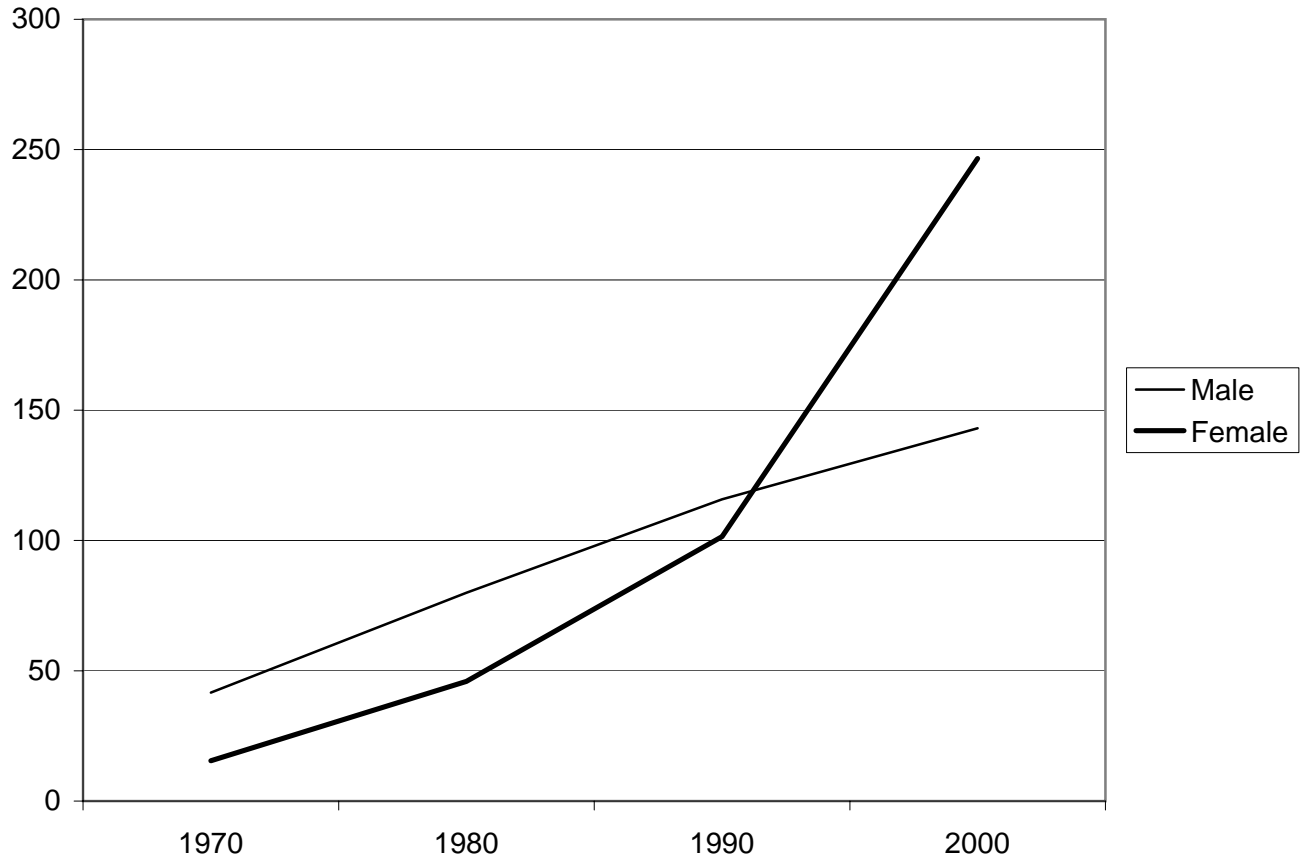


Figure 11
College earnings premium by age, women

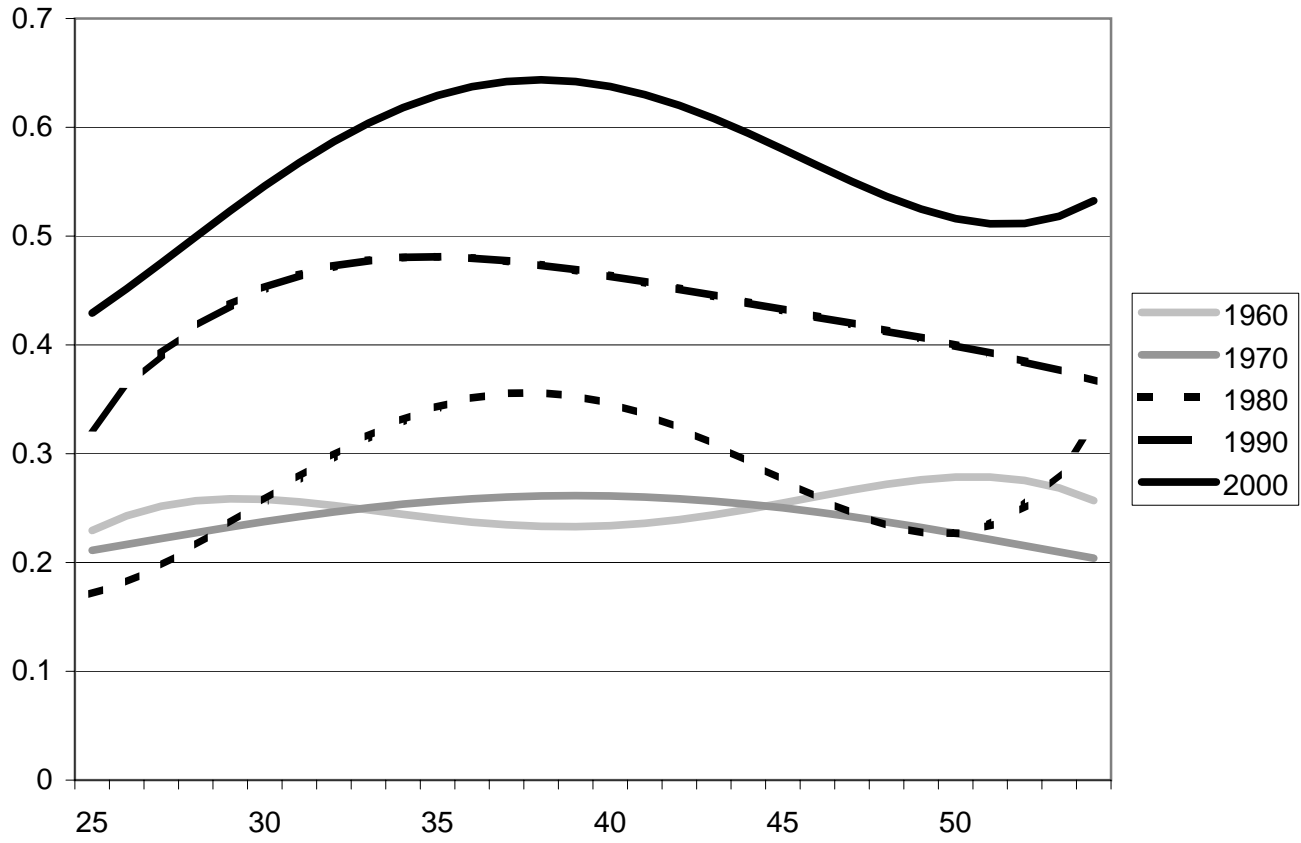


Figure 12
College earnings premium by age, men

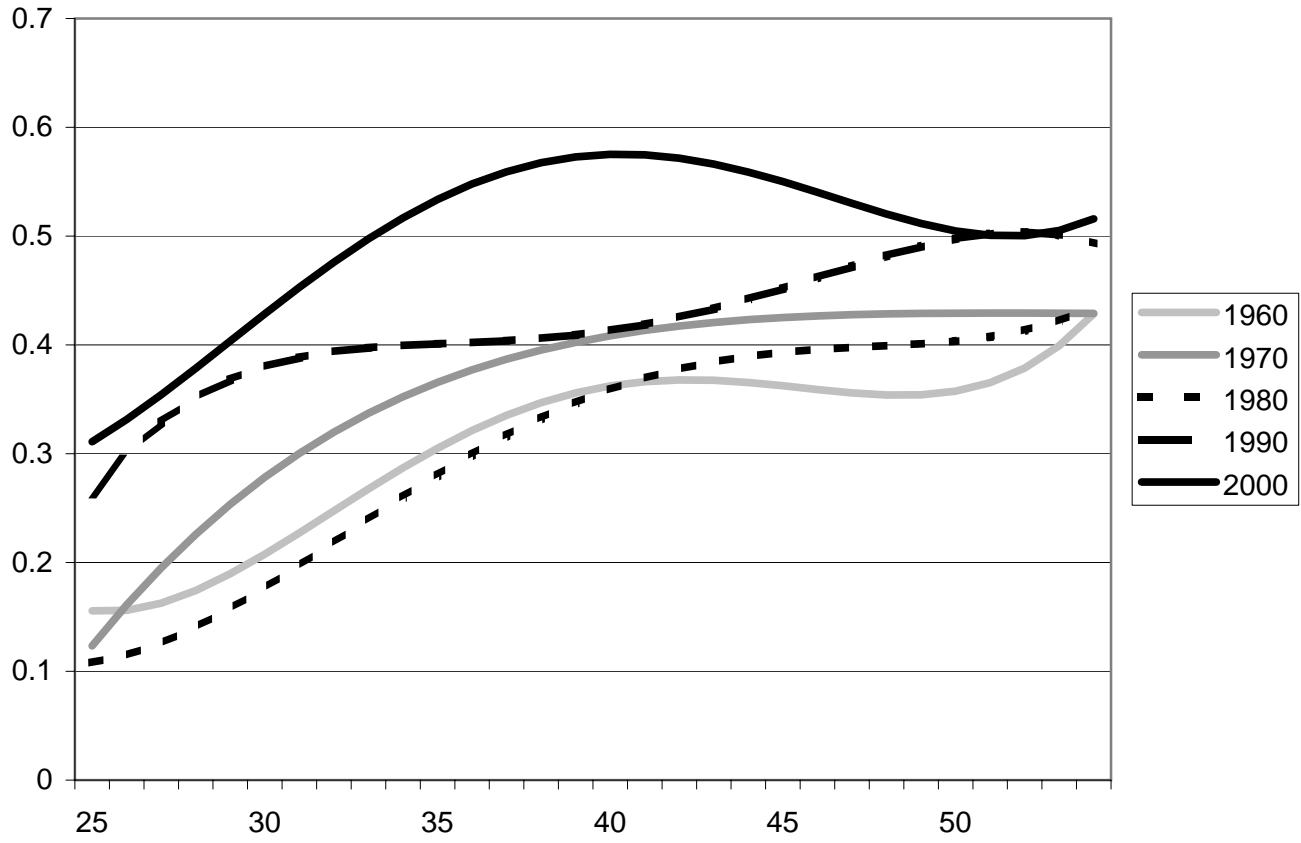


Figure 13
Female-male difference in estimated college premium by age,
whites, sample selection correction for females,
1960-2000 census data

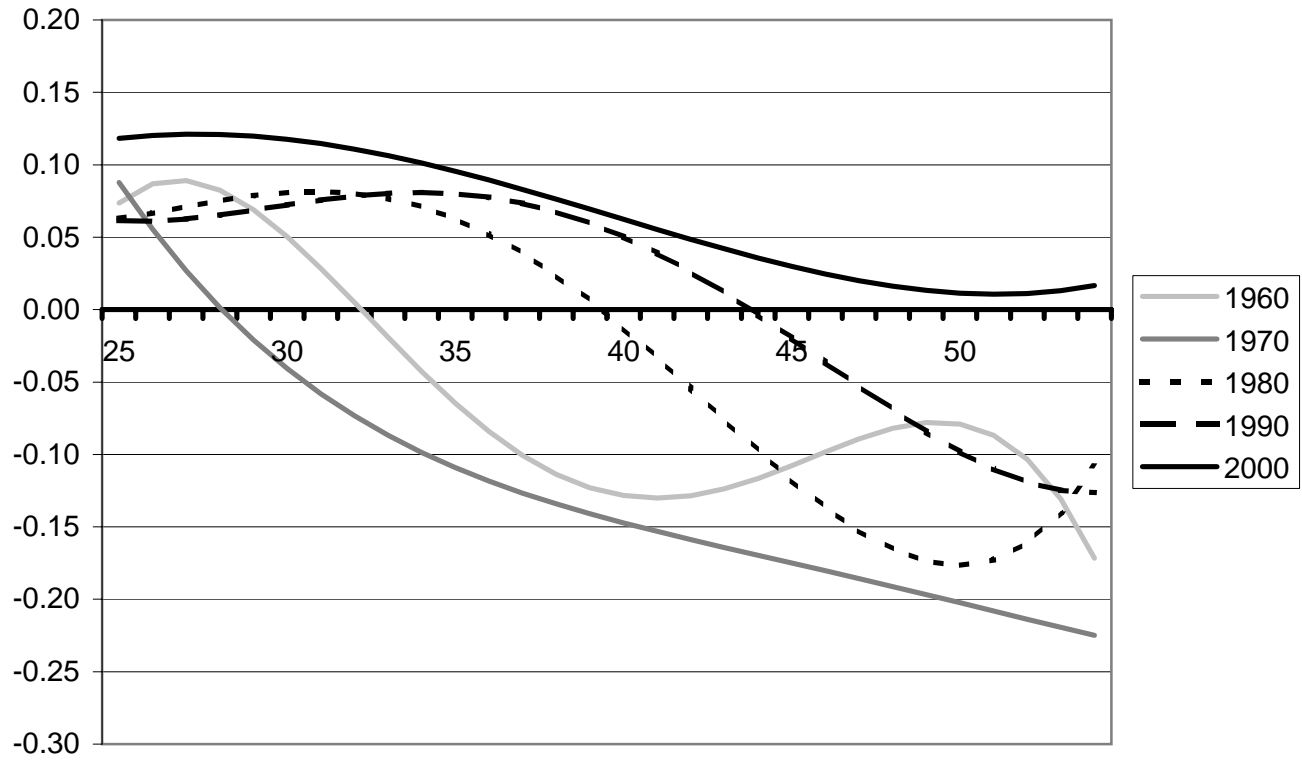


Figure 14
Female-male difference in estimated college premium by age,
whites, hours adjusted

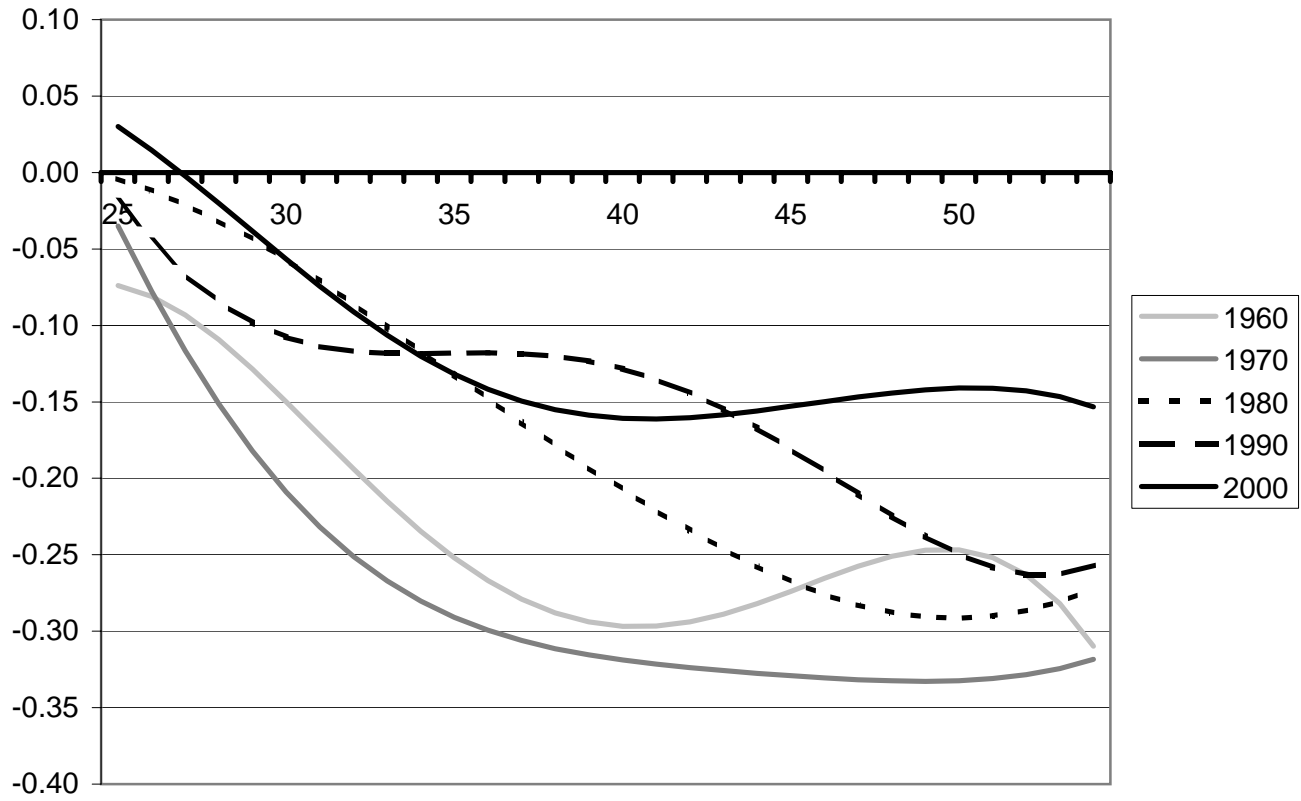


Figure 15
Residual standard errors from log earnings equations for
college grads (quartic in age with region controls)

