Gender Differences in Completed Schooling*

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Abstract

This paper summarizes the dramatic changes in relative male-females educational attainment over the past three decades. Stock measures measuring education among the entire adult population show rising attainment levels for both men and women, with men enjoying an advantage in schooling levels throughout this interval. Cohort specific analysis reveals that these stock measures mask two interesting patterns: (a) gender difference at the cohort level had vanished by the early 1950 birth cohort and reversed sign ever since; (b) for several cohorts, attainment rates were flat women and flat and falling for men. This last is puzzling in the face of the large college premia that these cohorts observed when making their schooling choices. We reject the proposition that increased schooling among women crowded men out of college. We present a simple demand-side model showing how the anticipated dispersion of future wages should affect educational investment and find that a model which includes measures of future log earnings dispersion fits the data for relative schooling patterns quite well.

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1. Introduction

In the large and active literature on investment in education, two questions which have received virtually no attention is how and why levels of completed schooling among adult American men and women have changed in the past three decades.[1] This paper summarizes changes in relative male-female schooling attainment in recent decades and attempts to offer an explanation for these patterns.

We are interested in schooling attainment among the population of Americans whose schooling activity can reasonably be expected to have ended. As such, we focus of levels of completed schooling among people we term mature adults – those above age 25 – and eschew the use of enrollment rates in the late teens or early 20's as a measure of the schooling which people ultimately complete by the time that they are adults. After all, people enrolled in one year may drop out in the next, or people might delay the age at which they initially enroll.[2] Our view is that measuring people's schooling at age 25 is a much better indicator of the schooling they will possess for the majority of their working life.

Using a *stock* measure of educational attainment –schooling among all adults aged 25 or older- we find that levels of completed schooling have risen consistently over the past thirty years for both men and women. And, in every year since the early 1960's, the population of adult men has been more highly educated than the population of adult women. But, these trends in the stock of education mask several interesting facts about education *flows*. One fact is that for men and women there was a noticeable slowdown in schooling for cohorts born between 1950 and 1964. For men, there was actually an absolute reduction after the 1948 birth cohort.

[1] Card and Lmieux (2000), who study the slowdown in college enrollment rates in the 1970's is an important exception. In addition to other differences, their work does not focus on gender differences.
[2] Many other writers such as Kane (1994) and Card and Lemieux (2000) have used the enrollment rate to measure schooling attainment.

Another fact is that for successive generations of American men and women born since the early 1940's, educational attainment for men has been decreasing relative to that of women. Indeed, ever since the 1953 birth year cohort women have been consistently more educated than men, reversing the historical schooling attainment advantage enjoyed by men.

The remainder of the paper attempts to account for these patterns. Theoretical models of educational outcomes are centered on the demand side. (See Becker (1967), Mincer (1974), Rosen and Willis (1979)). It is implicit in such models that variations in education attainment for a population arise mainly from changes in the desire to obtain schooling among that population, with this desire in turn determined by the opportunity costs of time, direct costs of education such as tuition, discount rates, and the education premium – the degree to which earnings may be expected to rise as a result of greater schooling. Nearly all empirical work on the determinants of education outcomes has particularly emphasized the role of the education premium as a key explanatory variable. But this standard approach, with its focus on the education premium, cannot by itself account for the patterns we document.

During the years that they were making decisions whether to attend college, recent generations of men and women confronted a situation where the education premium *among people older than they* was rising.[3] There are many reasons the education premium among mature adults at any time may be high, but a particularly noteworthy possibility is that the premium is high because education is synonymous with skills with a high marginal valuation in the labor market. If there is any persistence in this high valuation, large premia at any point in

[3] Many authors have documented recent increases in the education premium. See Juhn, Murphy, and Pierce (1993) for example, and Katz and Autor (1999) for a survey.

time suggest that premia will be high in the future.[4] For both men and women, but especially for men, this most basic prediction of the basic human capital investment model is not, at first blush, borne out in the data.

We assess the two most obvious explanations for this apparent puzzle. The first is that, for these cohorts, schooling attainment may be heavily influenced by supply-side factors. Specifically, the desire for more advanced schooling translates into greater observed schooling attainment only if the supply of college "spaces" is elastic enough, so that colleges and universities expand to take up this increased demand. If this is not true, then increased demand for college-level schooling by women could have "crowded" men out of college, lowering their schooling attainment irrespective of what was happening at the same time to their desire to obtain more schooling. We present suggestive (but we believe convincing) evidence that, despite the large increase in college attainment among women, it is highly unlikely that men born since the early 1940's could have been crowded-out of college.

In the final part of the paper, we re-assess the demand side explanation – particularly the paradoxically wrong-signed relationship between the education premium and schooling attainment among the cohorts we study. We argue that the standard approach in the empirical literature, which relates the college premium to schooling outcomes, misses an important aspect of the investment decision – namely that it is choice between two *gambles*. The college premium that potential students expect to receive from college investment merely summarizes the difference in the expected payoff between the different educational gambles they could take.

[4] Among a group of mature adults at any point in time, the education premium could be high either because of supply and demand factors, or because the packet of skills possessed by educated mature people generates a high marginal revenue product in the market. Young people who use observations of the premium to estimate what premium they themselves might receive in the future cannot perfectly distinguish between these two effects, and so must suppose that a high premium indicates to some extent how the market values education now and, hopefully, in the future. The failure to increase their own education in the face of high premia is therefore a puzzle.

But risk averse students should care as well about the inherent relative *riskiness* of these different gambles when choosing between them. We present a simple model of college investment in which both the premium and the anticipated dispersion of future wages affect schooling decisions. Our model suggests that a possible explanation for the relative male-female education patterns we present could be the fact that anticipated future earnings inequality has evolved over time very differently for the two sexes..

The final section of the paper estimates cohort-level relative male-female college attainment regressions. The main explanatory variables, as suggested by the theoretical discussion, are male-female differences in the anticipated college premium; in the anticipated dispersion of log earnings of people without college training; and in the anticipated dispersion of log earnings those with college a college education. We find that this parsimonious, human capital investment model does an excellent job of summarizing relative schooling patterns.

In the next section, we describe schooling attainment among the population of adult men and women since the early 1960's. Next we present cohort-specific schooling attainment numbers using both individual and institutional numbers, and focusing on all levels of schooling. In section 3 we discuss the possible role of crowd-out. Section 4 lays out the model of education choice, and section 5 presents an empirical test of that model. Section 6 concludes

2. Completed Schooling Among Adult Men and Women

2a. Average Education Over Time

We focus on completed schooling among the "mature adult" population of persons at least 25 years of age.[5] Our main source of information on schooling patterns are the 37 March Current Population Surveys (C.P.S.) conducted between 1962 and 1998., but we supplement this individual-level data with information with institutional data at various points. Each of the C.P.S. surveys is a random sample of the American working-age population, consisting of approximately 50,000 observations. In each survey, information is elicited about a respondent's age and level of completed schooling.

Figure 1 depicts mean years of completed schooling among persons aged 25-65 between the years 1962 and 1998, using the C.P.S numbers. The figure reveals several interesting things. First, for both men and women, average education among mature adults is high, and has been high for many years. Today, average education among both men and women over age 25 is substantially above 12 years (the level of education synonymous with only a high-school education) and has been so ever since at least the late 1970's. Second, for both adult men and women, mean years of schooling have increased steadily since the early 1960's. For adult women, the year-to-year increase over the past 30 years has occurred at essentially a constant rate. Third, average education among adult men has exceeded that of women in each of the past 30 years, though the gap falls substantially between the mid-1970's and mid-1990's..

[5] Using data from the The *National Center for Education Statistics*, we estimate that most people who complete undergraduate college training by 6 years after high school graduation. Thus, even allowing for the fact that some may follow non-traditional education trajectories, either stretching out the number of years over which they attend college, or starting their advanced schooling later than their late teens, age 25 seems a reasonable, if arbitrary, entry age into the mature adult pool. We also use completed schooling by age 30, and the results are virtually identical in instances where they are comparable.

Figure 2 repeats the exercise depicted in Figure 1, but narrows the age range to the population of mature adults aged 30-65. The pattern is quite similar to that shown for ages 25-65. Completed schooling levels are larger (predictably) than the younger sample, but only marginally so. From these figures it appears that, as we had hoped, little additional schooling occurs in the late 20's.

Figures 3 sorts the mature adult population in different years into distinct education categories. Figure 3a shows a steady downward trend in the proportion of adult men who have only a high school education. Whereas the number was 78% in 1962, it had fallen dramatically to slightly less than 50% by 1998. The figure shows essentially the same pattern for adult women. Indeed, the decreased incidence of only a high school education is a bit more dramatic for women, with a reduction from more than 80% to 48%.

Figure 3b shows that for much of the period between 1962 and 1985, the proportion of people with more than 1 but less than 4 years of college was the same for mature adult men and women and grew over the entire interval. The trend growth continued for both adult men and women after 1985, but the increase over the next 10 years was greater for women. Figure 3c shows the fraction of adult men and women with education levels consistent with attaining at least an undergraduate degree – at least four or more years of college training. The share of all mature adult men and women who fall into this category grew consistently between 1962 and 1998. Throughout the entire time period adult men aged 25-65 remained much more likely than similarly aged women to fall into this category, but by 1998 the advantage enjoyed by men for much of the previous three decades had narrowed considerably.

Figures 1 through 3 present a reassuring picture about education attainment in the U.S. in the sense that there has been a marked tendency towards ever-higher average levels of completed schooling for both adult men and women. The figures also show that mature adult men have

enjoyed an education advantage over mature adult women. But these trends, defined over the entire population of adults at a point in time, may mask changes in educational attainment *across different generations*.

Consider the estimate of the mean level of education in any year of adults of a given sex. In any year, t, it is the weighted average of the mean levels of education across the different birth year cohorts c who are between 25 and 65 in year t, where the weights equal the ratio of N_C, the size of the birth year cohort, to N_t, the size of the adult population in year t. That is,

$$\hat{E}_t = \frac{1}{N_t}\sum_c N_c \hat{E}_{ct}$$

where $\hat{E}_t$ is the mean education in the adult population in year t, and $\hat{E}_{ct}$ is mean education of a particular birth year cohort, c. Education of the entire mature adult population is a "stock" measure. It changes over time either because of changes in the relative sizes of the cohorts comprising the adult population, or from changes in the education choices of successive cohorts, both two "flow" measures. Directly studying the cohort-specific education rates may reveal patterns that the stock measures do not capture. And, using a flow measure of schooling likely better reveals how levels of education attainment are likely to evolve in the future. We now turn permanently to cohort-specific analysis.

2B. Education Across The Generations

We begin our analysis of education across the generations with a comparison of the relative education of men and women entering and leaving the mature adult population. Figure 4, which again uses C.P.S. individual data, presents the years of completed schooling at age 25 of cohorts

born after 1936 [6] relative to the schooling of people aged 65 when the younger cohort turned 25. Cohorts born in 1936 or later have been consistently better educated that the cohorts who were leaving the mature adult population when the younger cohort entered, so average education levels in the mature adult population have been growing, as the earlier figures show. Figure 4 also shows that the educational advantage for cohorts entering the adult labor force relative to those leaving has been falling steadily over time for both men and women.

Figures 5 depicts mean years of completed schooling as of age 25 for men and women, by birth year cohort, for the cohorts born between 1936 and 1972. This figure plots education flows into the mature adult population. The figure shows that education for women rose over across successive cohorts, though there was a noticeable flattening after the 1950 birth cohort. For men, years of completed schooling rose with each successive cohort until about the 1948 birth-year cohort and then declined absolutely for each birth year cohort until the 1963 cohort, after which it has leveled off. The combined effect of these changes is that whereas men were once more educated than women of the same generation, this gender gap in completed schooling had vanished by the 1956 birth cohort and has reversed sign for cohorts born after 1960. The figure also reveals that education attainment for American men achieved a maximum with the 1948-49 birth year.

Figure 6a, 6b and 6c present the cohort-specific levels education patterns, splitting people into distinct education categories. Comparing these figures to Figures 3 shows how different the information gleaned from a "stock" level analysis of schooling outcomes is from a cohort level analysis. Figure 6a shows the fraction of men and women in each birth year cohort

[6] In the cohort level analysis, we concentrate because of data limitations on the schooling patterns for generations born after the early or mid-1940's. We include numbers for earlier generations in this descriptive section to give the reader a sense of how schooling patterns were trending for the cohorts immediately preceding those which we can formally study.

who have received no college training of any type by age 25. The figure shows that a major source of the convergence and trend reversal in years of completed for men and women across successive cohorts is what is happening at the bottom of the education distribution. Among men, the proportion with only a high school education by age 25 fell steadily from a high of just over 60% for those born in 1936 to a around 40% for the 1948 birth cohort. After the 1948 cohort, there was a reversal in the trend, so that 50% of the men born in 1966 had only a high school education. For men born after 1960, the proportion with only high school training has leveled off at slightly more than 43%. For women, the proportion with only high school training at age 25 fell from 72% for the 1936 birth year cohort to about 40% by the 1972 birth year cohort. Not only has the representation of men and women in this lowest education group converged across generations, but women actually have been less likely than men to have only a high school education since cohorts born in the mid-1950's.

Figure 6b shows the fraction of men and women who have gotten some college training, but less than the four years generally required to be a college graduate. People with 2-year Associate's level training, as from a community college, are included in these numbers. The figure shows that for both men and women, the fraction of a cohort which falls into this education category by age 25 has generally trended upwards. However, whereas the two series almost perfectly overlap up to the 1948 cohort, the growth among women across cohorts has generally outstripped that for men. Indeed, by the cohorts born in the late 1960's, there was close to a five percentage point advantage for women. Interestingly, part of the reason for the divergence was the rather noticeable flattening of the series for men born between 1948 and 1963.

Nowhere is the convergence in cohort-specific educational attainment more dramatic than at the highest levels of schooling. Figure 6c shows the proportion of every cohort who,

according to C.P.S. numbers, have completed at least four years of college level training by age 25. For men, this number was about 23% for the cohort born in 1936 - 10 percentage points higher than the rates for women born in the same year. For the next twelve cohorts, this number grew consistently for both men and women, so that by the 1948 cohort it was 33% for men and 23% for women. But then a dramatic reduction occurred for men in succeeding cohorts. By the 1961 birth year cohort, only 25 percent of men had four years of college training by age 25, and the numbers have varied only modestly around this level for later birth cohorts. Despite slow growth in the incidence of 4 years of college training among the cohorts of women born between 1948 and the early 1970's, the gender gap in this highest education category had completely vanished by the cohort born in the early 1960's. This convergence, combined with the greater propensity of women in cohorts born after 1948 to continue their education onto "some college" (but less than 4 years) appears to be is the main reasons for the convergence and cross-over in years of schooling.

All of the figures shown to this point are drawn from individual-level C.P.S. numbers. To check whether the cohort specific patterns we document using these data are consistent with other evidence on school attainment, Table 7a through 7e present institutional data on different types of degrees awarded at American universities. These data are drawn from several years of the *Digest of Education Statistics*, and cover the years 1966 to 1998. The patterns for degrees awarded provide independent verification of the accuracy of the individual level C.P.S numbers.

Comparability between the two sets of numbers is complicated by the fact that we report education from the C.P.S. in cohort-specific *rates*, whereas the institutional degrees we have is simply total degrees awarded, by year. We partially get around this problem by deflating the degree numbers by the size of the population "at risk" to receive the particular degree in the particular year. For Bachelor's and Associate's degrees, we define these at risk populations to be

people aged 20-23 in the particular year. For Masters' and professional degrees, such as the JD or MD, the relevant population consists of people aged 24-27. For the Phd degree we define at risk population to cover ages 25-30. Changing the age ranges of the different at-risk populations does not change the main features of these graphs in any way. [7]

Figures 7a-7e, which present these population-deflated numbers for the various types of degrees, reveal that the pattern of degrees awarded to different generations of Americans, as reported by institutions, is very similar to the individual-level completed schooling numbers from the C.P.S. Degrees awarded show both the patterns of gender convergence and cross-over found in the individual-level data for all degree levels less than the Phd and professional degree level. At these highest degree attainment levels, cross-over has not yet occurred but there is striking evidence of a narrowing of the difference between men and women. At the Bachelors' and Masters' level, there is a downturn and then a flattening of male degree attainment after the early and mid-1970's, respectively. Among women, notice that while Bachelors'a and Masters' attainment rates grew over the entire time period depicted, there was a definite flattening and even a slight dip in the trend between 1970 and 1982. The only series which has both convergence and cross-over, and where the series was flat or falling for men and rising throughout for women was at the Associates' degree level, such as those awarded at 2 year community colleges.[8] This suggests that limiting attention to 4 year college degree attainment misses an important source of the gender convergence in completed schooling.

What accounts for the various patterns we have presented? We turn to this analysis next.

[7] We estimate cohort size from the Natality Tables in *Vital Statistics of the United States*, 1997, Volume I.
[8] Kane (1999) have documented the growing importance of this type of college training, but does do not emphasize the gender difference.

3. Have Women Crowded Men out of College?

The most obvious explanation for the patterns of gender convergence and cross-over in schooling depicted above is that men relative to women may have, over successive cohorts, *desired* to obtain college-level training relatively less.[9] Demand-side explanations of educational outcomes are the focus of nearly all theoretical work on schooling outcomes, and empirical work has retained this focus as well. But before we turn to a demand-side analysis in this paper we discuss, for completeness, the possibility that increased college attendance by women may have crowded men out of college spaces.

Crowd-out requires that there be a limit to the number of students that colleges could serve. To see one way in which it could occur, suppose that, for whatever reason, colleges either cannot or do not expand quickly enough to offer admission to all of the individuals who want to attend them – the college applicant pool. As the applicant pool grows, competition among potential students becomes more intense, and the probability of admission falls for each of them. There need be nothing sex-specific about this effect; it follows mechanically for all persons in a growing applicant pool irrespective of the identity of the people whose addition to the pool causes it to grow, and as long as colleges offer spaces along a rising supply schedule.[10] [11]

We know that there has been a dramatic increase in the number of women in colleges' applicant pools over the last several decades. If colleges offer admission based on "ability", this

[9] Henceforth, we focus on variation in post-secondary school attainment over time, as it is this variation which accounts for much of the fluctuation in years of completed schooling.

[10] This is the effect that Card and Lemiux (2000) have in mind when they argue that large cohort sizes may have accounted for the flattening in college enrollments in the 1970s among men and women.

[11] Crowd-out could also come about because of various direct cost pressures. For a large fraction of college students, the direct costs of college are defrayed by local, state or federal government aid. An increase in the number of students of a particular type (say women) wishing to obtain higher educations, could lower the fraction of students of another type able to receive aid This type of crowd-out is the focus on Hoxby's (1998) work assessing whether immigrants crowded low income natives out of spaces in California universities and colleges.

increase in the size of the applicant pool should have lowered the probability of admission for all men and women who belonged to the pool previously, *unless* the new women added to the pool were of lower ability than the least able person in the pool previously. More likely, given how low college attendance rates were for women historically, some of the women added to the pool would have been of relatively high ability. And, the few women who belonged to the applicant pool previously were probably, on average, of higher quality than the many men there. Given these things, if colleges either did not or could not expand their capacity to accommodate greater desire college training, the addition of women to colleges' applicant pools, should have lowered the admission probably for all men and women previously there, and should have done so particularly for men.

Inasmuch as crowd-out requires that the be a binding capacity constraint, we believe that the most straightforward way to test for crowd-out it to look at factors which either directly measure college capacity, or which are affected in predictable ways by capacity constraints.

One very simple measure of capacity is the number of colleges and universities accredited to offer different types of degrees. Table 1 summarizes data from several years of the *Digest of Education Statistics*. We exclude data for two year private institutions for two reasons. First, these colleges have never accounted for more than 3% of the total enrollment of undergraduates in U.S. institutions. Second, for these institutions, the *Digest of Education Statistics* reports that large changes from year to year in the number of institutions may have arisen from changes in accreditation standards. No such problem is reported for the three other types of colleges. The numbers we present end at 1984-85 because after that year, there was a change in data collection which allowed separate branches of one institution to report as individual institutions. That the series ends in 1984-1985 is not much of a problem as most of the

cohorts we study would have attended college by that time. Further, much of the same basic pattern is evident in the later, non-comparable data, particularly among public institutions.

The table shows that across five year intervals, there was a steady increase in the number of accredited colleges in the U.S. from 1950 to the mid-1980's. Over the entire 35 years, the number of accredited 4-year public, 4-year private, and 2-year public institutions increased by 117, 467, and 571, percent respectively. From 1960 to the mid-1970's there was a particularly large increase in the number of accredited public colleges of both the 4 and 2 year variety. These would have been precisely the years that people born before and just after WWII would have been attending college. If we make the assumption that colleges' capacity to serve the students who desire a college education is directly related to the number of colleges there are, this table strongly suggests that the cohorts we study likely faced no capacity constraint, and that crowd-out by women of men was quite unlikely. Indeed, given these large increases in capacity, it not obvious how even increases in cohort size could cause potential students to face a capacity constraint as argued by Card and Lemieux (2000).

Next, we argue that if there were truly any type of capacity constraint in college spaces, the total number of students enrolled in colleges and universities should show evidence of reaching a plateau at the time that the capacity constraint "bites: Figure 8a shows that since the end of WWII, total undergraduate enrollments in colleges has risen rather steadily. The rate of growth slows down somewhat in the mid-1970's, exactly at the time that male enrollments plateau, but since total enrollments continue to *grow* it is difficult to argue that the male slowdown is due to crowd-out. In Figures 8b-8e, we present total enrollment levels, and the fraction of the total that is female for different types of colleges for the years 1966-1996. We do not have earlier data for earlier years dis-aggregated by sex and college type. Assuming that cohort attend college 20-25 years after the year of their birth, the flattening in education patterns

we observe for men born just after the mid-1940's is not matched by total enrollments at any of the four types of schools reaching a plateau. From 1965-1980 total enrollments at each type of college grew, and grew is a way quite similar to the growth prior to that point. Only for 2-year private institutions does it seem as if a clear plateau in enrollment is reached. But this occurs in the early 1990's, which is simply too late to support a crowd-out argument for the cohorts whose schooling outcomes we find puzzling. Moreover, 2-year private institutions are a tiny fraction of overall enrollment.

The final piece of suggestive evidence against crowd-out focuses on the likely ease of expansion across the various types of college settings. Crowd-out is least likely to have occurred in schools which could or would most easily expand their capacity to serve larger applicant pools. We argue that these schools were likely to be public schools for two reasons. First, apart some very well known exceptions, the most selective colleges and universities tend to be private institutions.[12] It is at these schools where increases or improvements to the applicant pool should have the greatest impact on competition for spaces. Second, public institutions, precisely because they are public, would probably be much more responsive to public demand for greater educational access than would their private counterparts. Thus, we would expect 4-year private schools to be the least likely to expand in the face of rising applicant pools; 4-year public schools to be the next most likely to expand, and 2-year private to be the places where competition for limited spaces is least important.

Figure 9a shows the fraction of women aged 18-24 enrolled in different types of institutions from 1967-1996. Over the 30 years, women were increasingly likely to be enrolled

[12] Among universities denoted as "highly selective" in the 1999 *Peterson's College Guide*, more than 65% were private universities. This does not mean that 4-year private universities serve 65% of "highly able" students, as their enrollment levels tend to be smaller than those of their "highly selective" public counterparts.

in some type of college. Increased enrollment in private schools accounted for some of this overall growth, but the figure shows that female enrollment, as a share of total female population, grew most in the schools where crowd-out would be least expected to be a problem – 4 and 2 year public institutions. Indeed, most of the growth was at 2-year public colleges. Enrollment of women aged 18-24 grew from 11 percent in 1966 to 23 in 1997 at 4 year public colleges, and from 5 to 26% at 2-year public schools.

By similar reasoning to that presented above, we would expect crowd-out to have its largest effect at men in 4-year private schools. If comparable reductions are observed in men's attendance patterns across schools with different levels of "ease of expansion", crowd-out should be less likely to be suspected as the culprit. Figure 9b shows the fraction of men aged 18-24 enrolled in different types of institutions from 1966-1996 The figure shows that nearly all of the modest increase in enrollments for young men over time has occurred in 2 and 4 year public colleges. More importantly, the figure shows that despite the increase in the share of all young women who enroll in 4 year private schools, the share of all young men who enrolled in those schools between 1966 and 1997 was virtually unchanged. Yet, if there had been crowd-out at these selective schools of men *who previously would have been offered admission to them,* we would expect to see this series trend downwards.[13]

[13] The fact that the share of young men who attend selective schools has not changed over time does not allow us to reject the idea that there may have been men who: (a) did not previously attend selective schools; (b) desire now to attend those schools; and (c) would have been offered admission at the schools but for greater competition from women.

4 A The Demand-Side Explanation for Gender Convergence and Cross-Over in Completed Schooling

4a. Schooling as a Gamble

In the previous section, we argued that the patterns in college attendance we find for men and women are unlikely to be the result of any crowd-out by women of men from college spaces. Henceforth, we will operate under the assumption that variation in college attendance over the time period and cohorts we study comes from variation in the desire to attend college. Are the patterns we present at all consistent with this idea? We present a model of schooling choice by age 25 which builds on the standard human capital investment models..

Consider a model in which people born in year c choose whether or not to attend college during the years $c+18$ to $c+24$, when they are between 18 and 24 and during what might be called their "advanced schooling years". Let e_{ic} be the education choice that person i makes during these years, with $e_{ic}=a$ indicating the choice to get no college training and $e_{ic}=B$ indicating that college training is chosen. Suppose there are no costs incurred with the decision $e_{ic}=a$, but let there be three types of costs associated with choosing to attend college. One of these is the direct costs of college training, T_c, paid by every person in a cohort who chooses to get a college education. The main direct cost is, of course, tuition and other fees. Next are opportunity costs of college education, O_c. The main opportunity cost are the earnings foregone during the years someone spends as a college student. We suppose, for simplicity, that they are constant for all people of a given sex within cohort. Finally, there are psychic costs of schooling, κ_i. These are the various frustrations and irritations associated with college-level learning. We suppose that these costs are distributed Standard Normal among men and women in every cohort.

Suppose that between ages 25 and 55[14] (over the calendar years $c+25$ to $c+55$) an individual born in cohort c, who has chosen education level e_i, receives present value of log weekly wages equal to y_{ic}^e, drawn from a Normal distribution with mean μ_{ec} and variance σ_{ec}^2. Suppose that people have utility functions $U\left(y_{ic}^e\right)$, where $U'(.)>0$ and $U''(.)<0.$ Taking a linear approximation of the utility function, we may write that

$$U\left(y_{ic}^e\right)\approx U\left(E\left(y_{ic}^e\right)\right)+U'\left(E\left(y_{ic}^e\right)\right)\left(y_{ic}^e-E\left(y_{ic}^e\right)\right)+U''\left(E\left(y_{ic}^e\right)\right)\left(y_{ic}^e-E\left(y_{ic}^e\right)\right)^2. \quad (1)$$

It follows that the expected utility from a "draw" from a future draw from one of the two log which will prevail in the future is

$$\begin{aligned} EU\left(y_{ic}^e\right) &= U\left(E\left(y_{ic}^e\right)\right)+U'\left(E\left(y_{ic}^e\right)\right)E\left(y_{ic}^e-E\left(y_{ic}^e\right)\right)+U''\left(E\left(y_{ic}^e\right)\right)E\left(y_{ic}^e-E\left(y_{ic}^e\right)\right)^2 \\ &= U\left(\mu_{ec}\right)+U''(\mu_{ec})\sigma_{ec}^2 \end{aligned} \quad (2)$$

The net utility return that an individual from cohort c expects to receive from college training is

$$U\left(\mu_{Bc}\right)-U\left(\mu_{ac}\right)+U''(\mu_{Bc})\sigma_{Bc}^2-U''(\mu_{ac})\sigma_{ac}^2 - U\left(O_c+T_c+\kappa_i\right) \quad (3)$$

Momentarily ignoring the various costs of college, an individual's expected return from getting college training depends on $P_c=\mu_{Bc}-\mu_{ac}$, the difference between the *average* future college log wages and the *average* of future "no college" log wages. But the expected return also depends on the two future variances of the "college" and "no college" distributions - σ_{ac}^2 and σ_{Bc}^2.

If a person does not get college training during his schooling years, he takes a "no college" *gamble*, in the sense that future earnings as a mature adult will be a draw from the

[14] We ignore the earnings years from age 55 to age 65 that immediately precede retirement. This assumption is innocuous.

distribution of "no college" log earnings which prevails when he is a mature adult. Alternatively, he can pay a fee (the various costs of college training) to take the "college" gamble as a mature adult instead. Basic expected utility theory tells us that the agent's willingness to pay this fee should depend on the relative average payoffs of the two gambles (P_c) and the *riskiness* of the two gambles, as measured by σ_{ac}^2 and σ_{Bc}^2. Yet, in virtually all of the previous work examining education choice, researchers have used only the college premium, P_c, as a summary measure of the utility value of the expected earnings returns from college. Indeed, we have been unable to locate any previous work which relates college decisions to the anticipated dispersion in the "college" and "no college" earnings distributions.

Continuing with the model, we have from (3) that, in any cohort and for both men and women, the marginal college attendant is that person whose psychic costs of schooling are given implicitly by

$$0 \equiv U(\mu_{Bc}) - U(\mu_{ac}) + U''(\mu_{Bc})\sigma_{Bc}^2 - U''(\mu_{ac})\sigma_{ac}^2 - U(O_c + T_c + \kappa_{ic}^*), \tag{4}$$

and the fraction of individuals who choose to obtain college level education is

$$E_c = 1 - \Phi(\kappa_{ic}^*) \tag{5}$$

where Φ is the cumulative density of the Standard Normal distribution. As κ_{ic}^* rises the proportion of people in a cohort who obtain college level training falls, since $\delta\Phi(x)/\delta(x) = \phi(x) > 0$, where ϕ is the marginal density of the Standard Normal distribution,.

We know that κ_{ic}^* may be written as the implicit function

$$\kappa_{ic}^* = \kappa_{ic}^*(P_c, \sigma_{ac}^2, \sigma_{Bc}^2, O_c, T_c). \tag{6}$$

Applying the implicit function theorem, we can show that share of people in a cohort who get college level training is falling in the direct and opportunity cost of such training. But the partial derivatives of greatest interest in this paper are

$$\frac{\partial \kappa_{ic}^{*}}{\partial P_{c}} < 0; \frac{\partial \kappa_{ic}^{*}}{\partial \sigma_{ac}^{2}} < 0; \text{ and } \frac{\partial \kappa_{ic}^{*}}{\partial \sigma_{Bc}^{2}} < 0. \tag{7}$$

From the first derivative in (7), the college attainment rate rises among any sub-population in a cohort the larger the college premium the members of that subpopulation expect to receive as mature adults. The second result is that more people choose college in a cohort the more variable the earnings of "no college" mature adults are expected to be. As the riskiness of the "no college" gamble increases, risk averse agents should be ever more willing to choose the "college" gamble instead. By similar logic, the third partial derivative says that college attendance rates should fall as the variance of the earnings that college-educated mature adults are expected receive in the future goes up.

The basic intuition of the model is summarized in Graph 1. B and B' are two alternative distributions from which future "college" log weekly earnings can be drawn, and a and a' represent two possible future "no college" weekly earnings distributions. The college premium is the difference at the means between the "college" and "no college" distributions. Under the naïve approach in which the anticipated premium is the only labor market factor determining whether people will choose to go to college, an agent would be indifferent between any pair of "college" and "no college" gambles presented in the Graph. But we know that if an individual with a concave utility function can take either the gamble a, or can pay a fee to take either gamble B or B', he will be more willing to pay the fee if the gamble is B. Similarly if know that he pays a fee to take the B, he is more likely have forgone the gamble a' than the gamble a.

One obvious modification of the model recognizes that young people may be better informed about their prospects in the future "no college" distribution than in the future "college" distribution. Between the ages of 18 and 24, young people who work (in the summers for example) do so as young "no college" workers, and will obtain information about how their suitability for work in this segment of the market. Indeed, they might learn exactly what they would earn as mature "no college" workers, in which case the choice between *gamble* a on the one hand and *gamble* B that we have been discussing collapses down to a choice between a *point* drawn from the distribution a on one hand and the gamble B on the other. It is easy to see that in this case only the anticipated future variance of the "college" log weekly earnings distribution would affect college attainment choices; the observed variance in mature "no college" earnings would be irrelevant..

Below, we summarize the trends in the various factors which the simple demand-side model suggests should affect educational outcomes by age 25 across cohorts.

4b. Trends in Factors Likely to Affect Schooling Choice

Our model suggests that the college attainment rates by age 25 among men and women in a cohort , E_c^m and E_c^f , are functions of $P_c, \sigma_{ac}^2, \sigma_{Bc}^2, O_c$ and T_c. Of course, we do not observe the first three variables directly. We therefore assume that persons born in year c during their schooling years expect that the moments of the log wage distributions which will prevail during their mature adult years $c+25$ to $c+55$, are the moments of the log wage distributions among mature adults of the same sex during the years $c+18$ to $c+24$. So, for example, for people born in 1950, the college premium and variances they expect will prevail during the between the time they are 25 and the time they are 55 is what they observe about the earnings of people between 25 and 55 during the years 1968 and 1974.

The anticipated average log premia for men and women born from 1945 on are depicted in Figures 10a and 10b. These premia are calculated using C.P.S. data as the difference in mean log weekly wages between people with at least 2 years of college training and people with no college training aged 25-55 over the years $c+18$ to $c+24$.[15] For men, the anticipated log weekly earnings premium was declined slightly between the 1945 and 1954 birth cohorts. It was flat for the next three cohorts and then rose dramatically by 50% between the 1956 and 1969 birth cohorts. Yet, it was for this last set of men for whom college attainment rates were flat. For women, the anticipated log weekly earnings premium was showed the same pattern of a decline and then a dramatic increase. Again, a large part of this increase occurred when attainment rates for women grew only modestly, or were flat. At first blush, the trends in the education premium combined with that for schooling attainment is not consistent with the most basic prediction of the demand-side model.[16]

Of course, other factors matter for college choice in the human capital investment model. Figures 11a and 11b depict the opportunity cost of college attendance for men and women born since 1945, estimated from C.P.S. data. This summary measure of the labor market earnings that people forego by being in school is calculated as the mean log weekly wage of men or women ages 18-24 with only a high school education or less during the years $c+18$ to $c+24$. The figures show that this opportunity cost has been moving in such a fashion as to make greater college attendance more attractive for both men and women born after the mid-1950's. Figure

[15] We also measure the anticipated premium using the difference in log weekly earnings between people with 4 years of college and people with no college training. The patters are virtually identical to those in the Figure, but the premium not shown is obviously slightly larger.

[16] While there is likely some regional variation in the college premium, the mobility of educated workers suggests that they belong to a national labor market, lowering concern about the use of the national C.P.S. numbers.

11c depicts tuition costs for each cohort.[17] Tuition costs rose consistently across the cohort studied, with marginal effects that presumably apply similarly to men and women. Of these two series, only the trend in tuition costs seems a likely candidate to explain the schooling patterns. But even for this variable, there is the question why rising tuition should not have affect male and female schooling patterns with the same *sign*, if not magnitude.

Figures 12a and 12b show the dispersion of the "no college" and "college" log earnings distributions of people aged 25-55 with and without college level education during the years $c+18$ to $c+24$. In the language of the model, these figures show the riskiness of the two gambles for cohort c. We present three measures of dispersion of the distributions: the difference between the 90th and 10th percentile; the difference between the 80th and 20th percentile; and the standard deviation. Figure 12a shows that the anticipated dispersion of log weekly earnings in both the "college" and "no college" distributions rose for men between the 1945 ad 1972 birth cohorts according to all of the measures of dispersion. But the graph also shows that what we have called the anticipated riskiness of the "no college" gamble rose much more dramatically than did the riskiness of the "college" gamble. According to the 80th-20th measure, for example, anticipated future dispersion of log weekly "college" wages rose by 24% (from 0.75 to 0.93) , while the comparable increase for the "no college" dispersion was 48% (from 0.63 to 0.93). Indeed, a difference in anticipated dispersion of 0.11 between the two distributions for the 1945 birth cohort had virtually disappeared by the 1972 cohort.

[17] Tuition costs measure the weighted average of tuition payments at the 4 types of colleges and universities, where the weights equal the institutions share of total undergraduate enrollment during t he years $c+18$ to $c+24$ for birth cohort c. The tuition numbers are drawn from the *Digest of Education Statistics* 1997, Table 312: Average undergraduate tuition and feespaid by students in institutions of higher education, by type and control of institution.

Figure 12b presents a very different picture of anticipated future dispersion among women. All three measures a decrease in the dispersion of the "college" distribution across the cohorts studied. For the "no college" distribution, there was first a reduction in anticipated dispersion between the 1945 and 1957 birth cohorts, and then a either a flat or slightly increasing pattern afterwards, depending on the measure. According to the 80^{th}-20^{th} measure, the effect of these changes is that the anticipated future dispersion in the "no college" and "college" distributions essentially overlap until the 1957 birth cohort, after which the "no college" distribution is more dispersed than the "college" distribution. The other two measures do not show this crossing over, but both indicate a sharp reduction in the difference in dispersion after the 1957 cohort.

With the different pictures they depict about the movement in anticipated future log earnings dispersion between men and women, these two figures offer the prospect that the different education trends described earlier for men and women might be explained by a simple human capital demand model in which these variances – the summary measure of the riskiness of the different types of education gambles – are explicitly accounted for. We turn to this analysis next.

5. Empirical Test of Schooling as Gamble

5a. Empirical Set-up

To empirically implement the model we suppose that college attainment, E_{jc}, among persons of type j in birth year c, where $j = m$ for men and $j = f$ for women, may be written

$$E_{jc} = \beta_1 \tilde{P}_{jc} + \beta_2 \tilde{V}_{jc}^{B} + \beta_3 \tilde{V}_{jc}^{a} + \beta_4 X_c + \nu_c + \varepsilon_{jc}. \quad (8)$$

In (8), $\tilde{P}_{jc}$ is our measure of the anticipated average college premium for persons of type j. $\tilde{V}_{jc}^{B}$ and $\tilde{V}_{jc}^{a}$ are the measures of the anticipated future dispersion of log wages for people with and without advanced education, among persons of type j, which have typically been excluded from college attainment regressions such as (8) in the existing literature.

The vector X_c are various observable factors which vary across cohorts but not among different types of persons within a cohort. It includes things such as the size of a birth cohort,[18] and the average tuition charged by colleges during the year that a cohort is enrolled in college. The variable v_c summarizes unobserved factors which vary across cohorts. For example, across different birth cohorts, changes in public sentiment about the desirability of college training, in the extent of advertising by colleges and universities, or in the availability of particular types of aid could be expected to similarly affect all persons in a cohort similarly. Finally, ε_{jc} represents random, mean-zero factors which affect schooling outcomes.

We are mainly interested in the coefficients β_1 to β_3 but, for a variety of reasons, estimating equations (8) by O.L.S. is unlikely to produce unbiased estimates of them using cohort-specific data. First, there is the problem that the various observable regressors all probably have a time component. The large resulting multi-collinearity problem in estimating (8) when all of the variation is across cohorts (that is, time series) makes it quite difficult to separately disentangle each of these variables' separate effects. Second, there might be

[18] Apart from the crowd-out idea discussed earlier, some writers such as Connelly (1986) have argued that that members of idiosyncratically large cohorts anticipate that their wage premium from advanced schooling will be depressed when many members of the cohort enter the workforce. Fewer members of such cohorts decide to get advanced training as a result. There is only weak support for this idea in the data.

correlation between the measures summarizing future wage returns and the unobserved factors v_c which vary systematically across cohorts.

Our estimation strategy exploit the fact that *within* a cohort, the *relative* levels of schooling attainment between men and women is

$$E_{mc} - E_{fc} = \beta_1 \left(\tilde{P}_{mc} - \tilde{P}_{fc} \right) + \beta_2 \left(\tilde{V}^B_{mc} - \tilde{V}^B_{fc} \right) + \beta_3 \left(\tilde{V}^a_{gc} - \tilde{V}^a_{gc} \right) + \left(\varepsilon_{mc} - \varepsilon_{fc} \right). \qquad (9)$$

In equation (9), cohort-specific factors which affect schooling attainment, whether observed or not, are differenced out, and the three remaining regressors in this difference model are orthogonal to the error by construction.

The nest section presents regression results.

5b. Results

In this section we present results of O.L.S. estimation performed on (9). These regressions relate relative male-female cohort-specific education outcomes to male-female differences in the *anticipated future* average wage premium, and different measures of anticipated future dispersion of "college" and "no college" earnings. We emphasize that the the regressions relate relative schooling outcomes for a cohort before the time they are age 25 to the premium and dispersion that cohort would have observed among people aged 25-55 when the cohort was between 18 and 25.

In all of the regressions the "college" distribution maps the log weekly wages of people with at least 2 years of college education, and the "no college" distribution maps log weekly earnings of people with no college education. We try alternative definitions of these two distributions, such as the log earnings of people with 4 or more years schooling. The results are basically the same under these alternative definitions. We present results for gender differences

in three measures of schooling attainment - the number of years of completed schooling; the fraction of people who have completed at least 1 year of college by age 25; and the fraction who have completing at least 4 years of schooling by age 25. We present results for two dispersion measures – the 80^{th}-20^{th} percentile difference in the log weekly earnings distribution; and the standard distribution of the distribution. Results for the 90^{th}-10^{th}; and the 70^{th}-30^{th} percentile differences are very similar to what we present here.

The relative schooling attainment are, of course, our preferred estimates. To illustrate the problems which arise when estimating equation (8) for men and women using cohort data, we show results from estimating (8), using total years of schooling as the outcome variable. We estimated but do not present regressions (8) for the two other educational outcomes, and with different measures of the anticipated future dispersion of the log weekly earnings distribution What is evident in Table 2 is clear in the results we do not present. - specifically, that estimating the educational outcomes separately by sex and using the cohort data yields results that, from the perspective of a human capital investment model, may be deemed nonsensical.

In table 2, the anticipated college premium comes in with the wrong sign for men and the correct sign for women when it is only regressor. The addition of controls for other factors which the human capital model says should affect schooling choice does not improve results in a sensible way. In the full regression for men, the anticipated premium has the correct sign, but larger values of the opportunity costs of time is predicted to raise schooling attainment. Neither the variance of the college or "no college" log earnings distribution has an estimated effect that this statistically different from zero. For women, the full model suggests that the premium now has the wrong sign. Greater dispersion in the "no college" distribution is predicted to make women less likely the attend college, and again there is the wrong sign for the opportunity cost of time.

Table 3 presents the results of the relative schooling attainment regerssions, (9). Panel A in the table presents results for years of completed schooling. In the first column the only regressor is the gender difference in the anticipated college premium. The estimated coefficient is of the wrong sign according to basic human capital theory. But our model suggests that this measure which has been used exclusively in the literature as a measure of the expected labor market return from more schooling is an incomplete measure of the dispersion of the distributions from which future earnings will be drawn.

When we add these anticipated dispersion measures, both their effect and that of the premium are estimated with the right sign. Moreover, the positive estimate of the premium is strongly statistically significant. The results indicate that men's total years of schooling by age 25 relative to women's is smaller, the greater the relative riskiness of the "college" gamble for men as opposed to women. This effect is strongly statistically significant, and is very consistent with our education as a gamble model. And the results indicate that the riskier the "no college" gamble is expected to be for men as opposed to women, the higher will be men's years of completed schooling relative to women. Unfortunately, this estimate is not statistically significant.

The other education outcomes in panels B and C of the table show essentially the same results as Panel A. The college premium's effect is positive and statically significant; the anticipated future dispersion of the "college" distribution has a negative and statistically significant effect on schooling outcomes; and the anticipated future dispersion of the "no college" distribution has a positive estimated effect on schooling outcomes, though the effect is always statistically insignificant. Why might this last estimated effect be statistically no different from 0? Recall from the discussion in Section 4a, that if people have relatively better information about their likely draw from the "no college" earnings distribution in the future than

they do about a draw from the "college" distribution, the dispersion in the latter distribution should affect much more. These results offer support for this idea.

To show the quality of the fit from our very parsimonious human capital investment model, with education modeled as a choice among gambles, we conclude with Figures 13 which show actual values of the three educational outcomes, and predicted values of these variables from the regressions reported in Table 3. These figures indicate that the model fit the data very well. Empirical investigation of the human capital model which do not account for the riskiness of the gamble that the choosing agent undertakes may sometimes produce curious estimates of the effect of the average expected return, or premium, on the propensity to invest.[19] to produce odd estu

6 Conclusion

In this paper, we have summarized the dramatic changes in relative male-females educational attainment over the past three decades. Stock measures measuring education among the entire adult population show rising attainment levels for both men and women, with men enjoying an advantage in schooling levels throughout this interval. Cohort specific analysis reveals that these stock measures mask two interesting patterns: (a) gender difference at the cohort level had vanished by the early 1950 birth cohort and reversed sign ever since; (b) for several cohorts, attainment rates were flat women and flat and falling for men . This last is puzzling in the face of the large college premia that these cohorts observed when making their schooling decisions. The addition of the other variables suggested by the standard human capital investment model does little to improve the fit between that model and the data.

[19] See, for example, Averett and Burton (1996), for another investigation of schooling demand in which the premium has either no effect, or the opposite of that suggested by the theory.

Using various bits of suggestive evidence, the paper shows that it is very unlikely that supply-side - or crowding - stories can account for the patterns we document. This means that there must ultimately be a demand-side explanation for these patterns, even though the poor performance of the variables used to date in the literature to explain education choice is not encouraging.

We argue that existing empirical literature has failed to incorporate the idea that education is choice between different gambles, in which both the difference in the expected payoff across gambles (the college premium) and the relative riskiness of the gambles (the anticipated future dispersion of future earnings) matter in risk averse agents' willingness to choose one education level over another. We present a simple model showing the theoretical impact of these anticipated variances. The data indicate that these anticipated future dispersions have evolved over time very differently for men and women,. We estimate various relative male-female schooling models at the cohort level which include measures of future log earnings dispersion, and find that this extension of the basic human capital model fits the data for relative schooling patterns quite well.

Our results suggest an interesting and to this point unexplored consequence of labor market inequality. Policy makers have lamented growing earnings dispersion because of its presumed ill effects on the population who actually experience it at any point in time. Our work suggests that growing inequality within education group, and particularly among the educated, may have effects which affect other generations as well, as the education choices of younger generations could be adversely affected by inequality they in the earnings of older workers today.

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Figure 1. Years of Completed Schooling Among Adults Aged 25-64, by Year and Sex

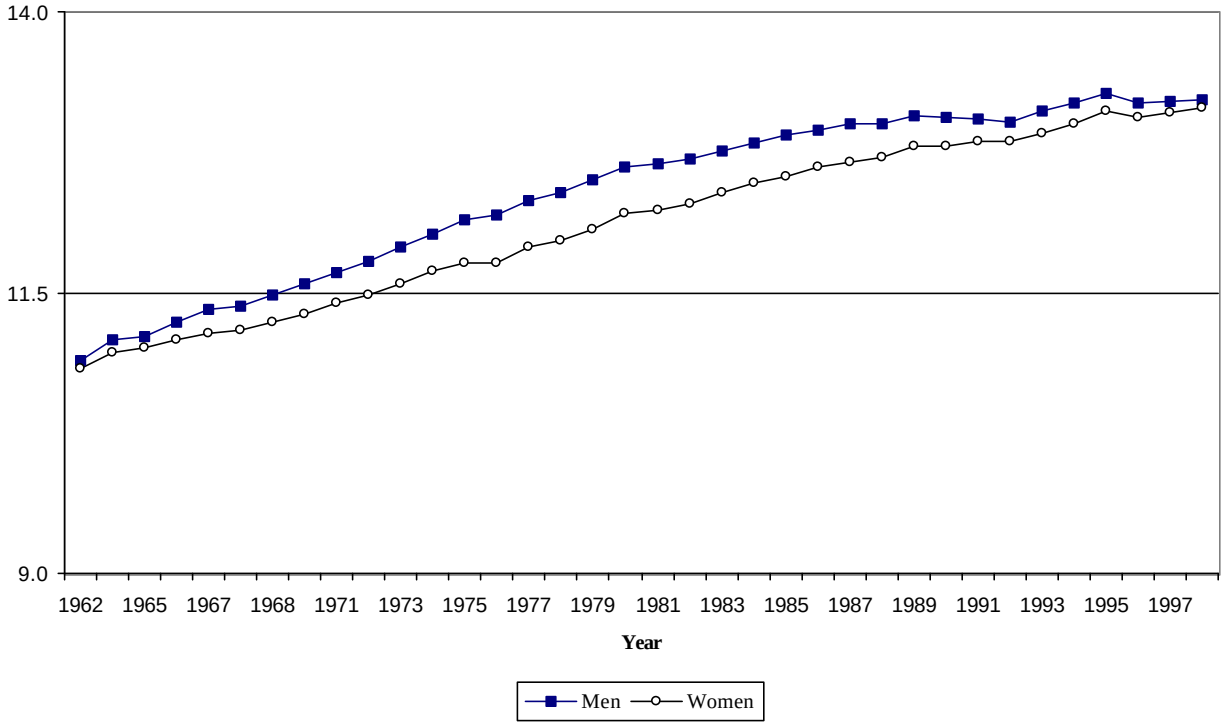


Figure 2. Completed Schooling Among Adults Aged 30-64, by Year and Sex

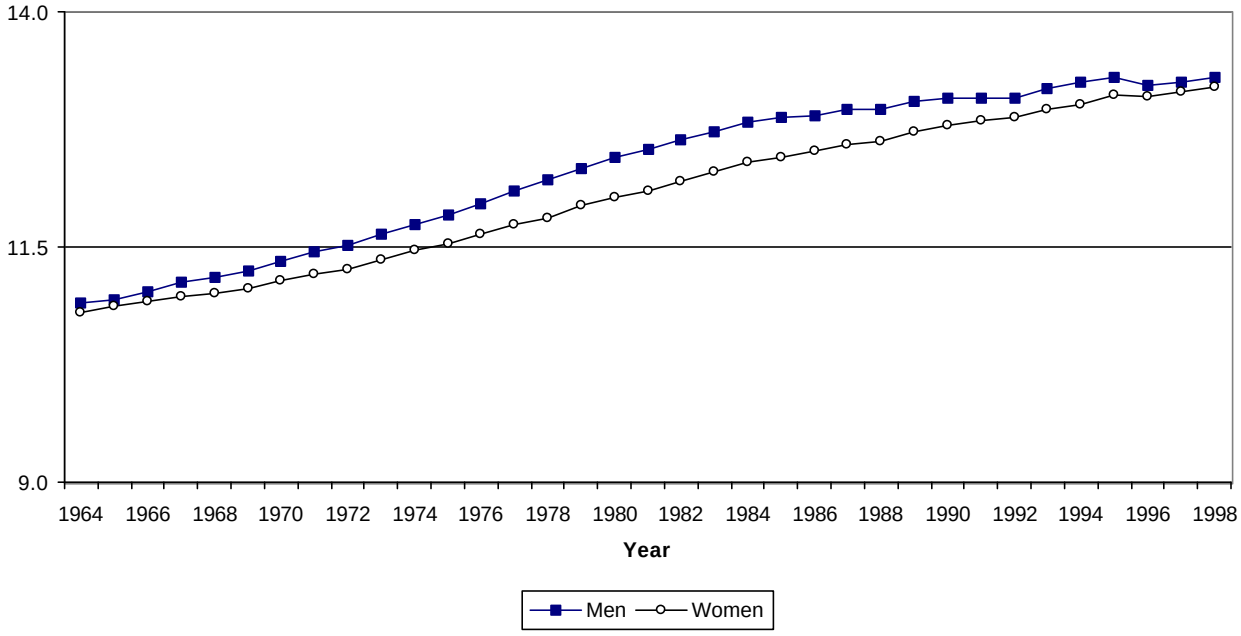


Figure 3a. Fraction of Men and Women 25-65 with Only a High School Education by Age 25

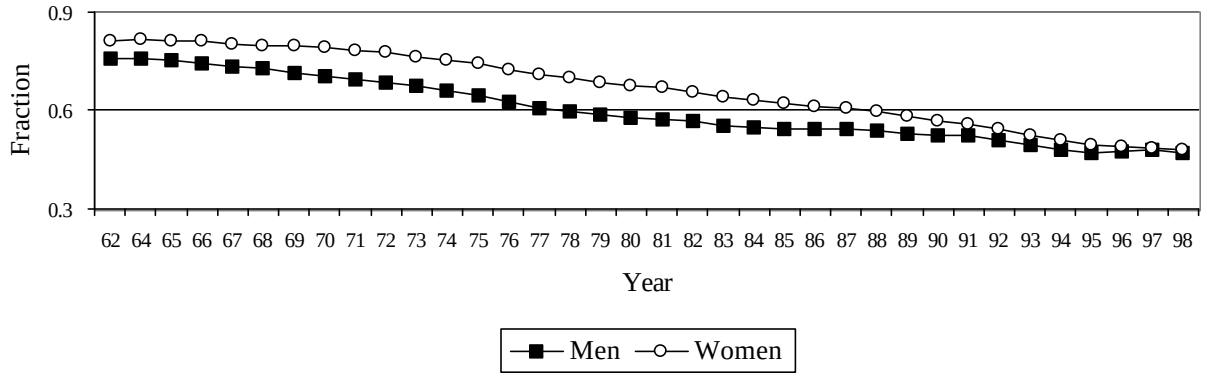


Figure 3b. Fraction of Men and Women Aged 25-65 With More then 1 But Less than 4 Years College

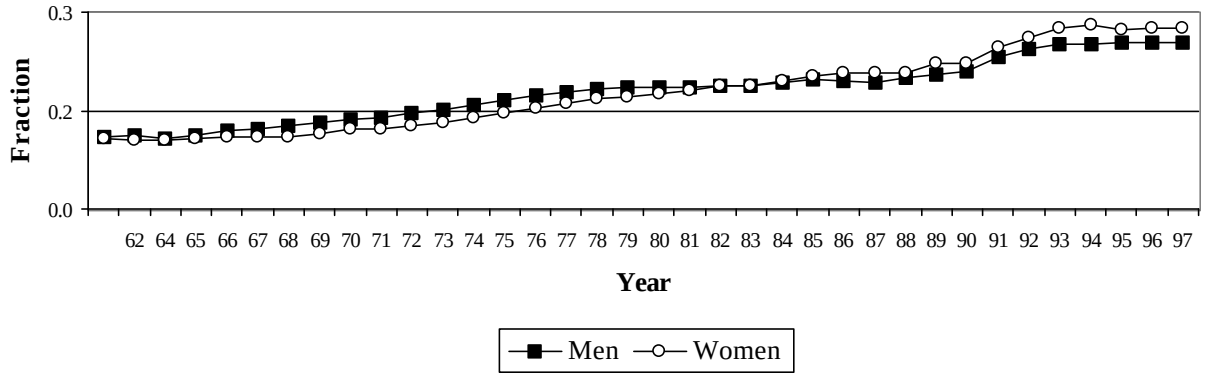


Figure 3c. Fraction of Men and Women Aged 25-65 With at Least 4 Years College

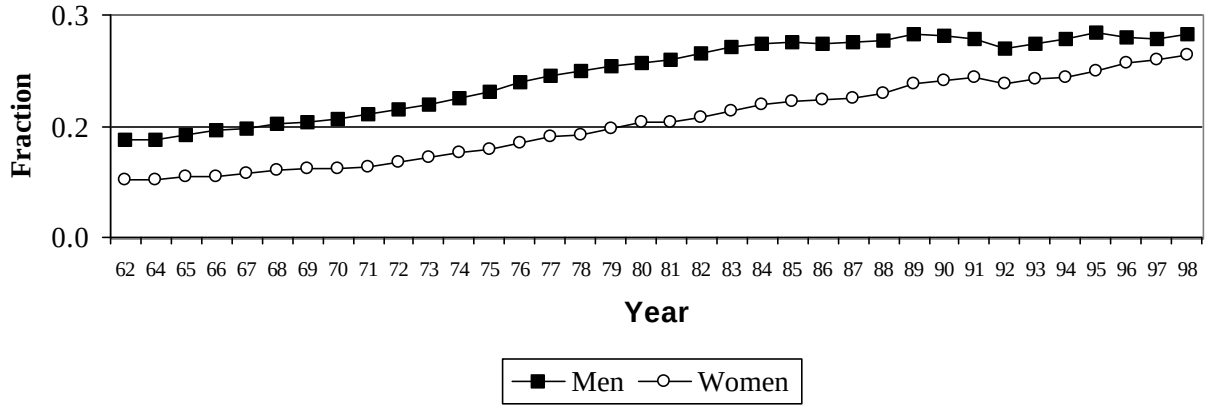


Figure 4. Years of Schooling of Cohort at Age 25, Relative to Schooling of Persons Aged 65 in Same Year

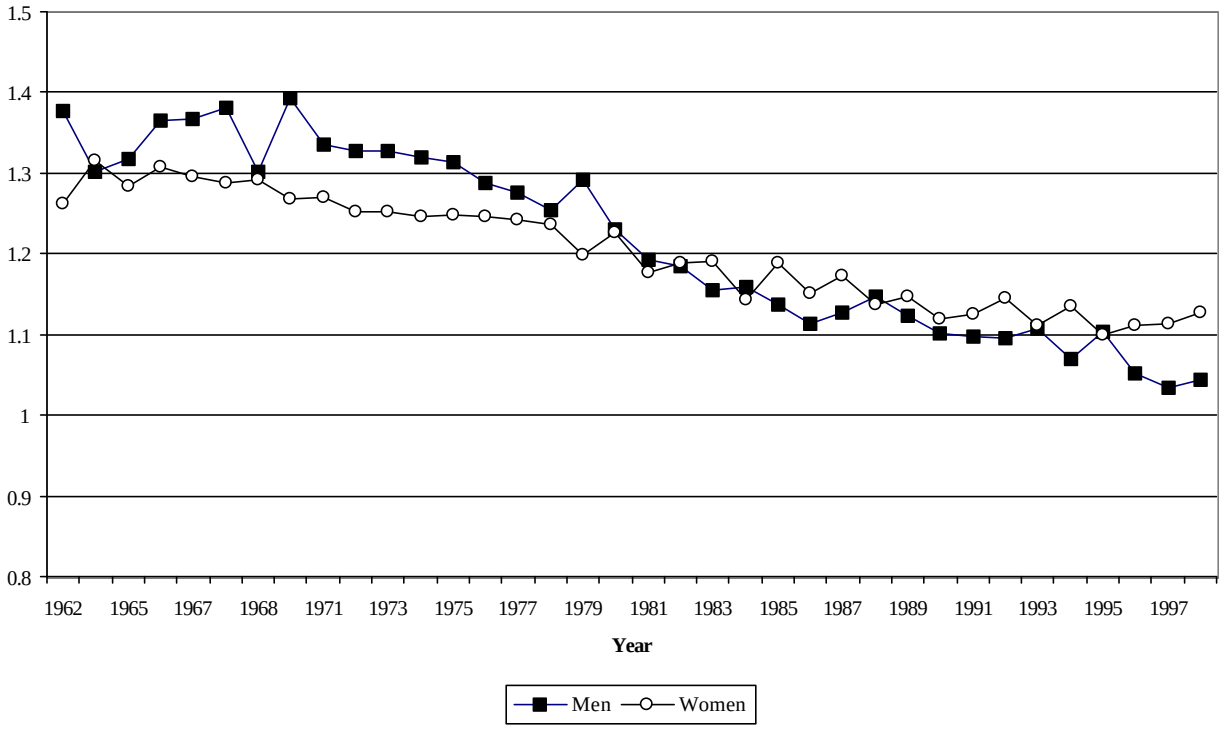


Figure 5. Years of Completed Years at Age 25, By Birth Cohort and Sex

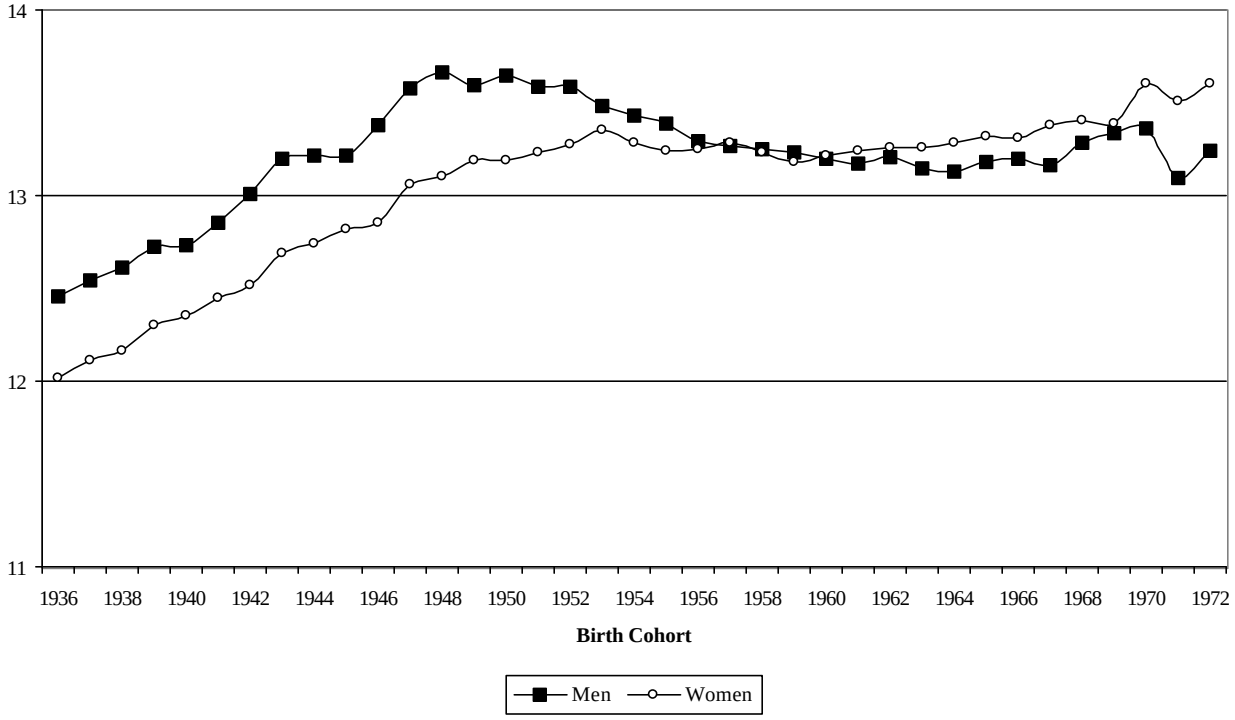


Figure 6a. Percentage of Men and Women With Only High School Education by Age 25, by Birth Year Cohort

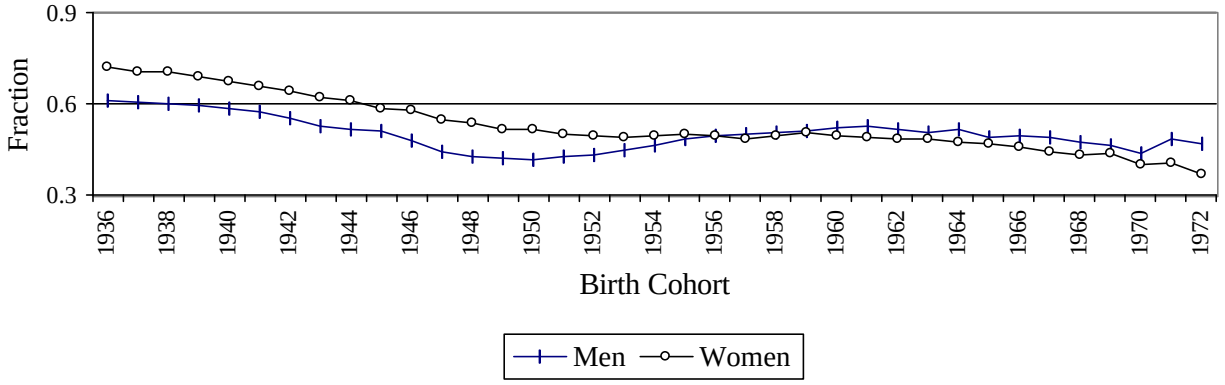


Figure 6b. Percentage of Men and Women with More than 1 but less than 4 Years College by Age 25, by Birth Year Cohort

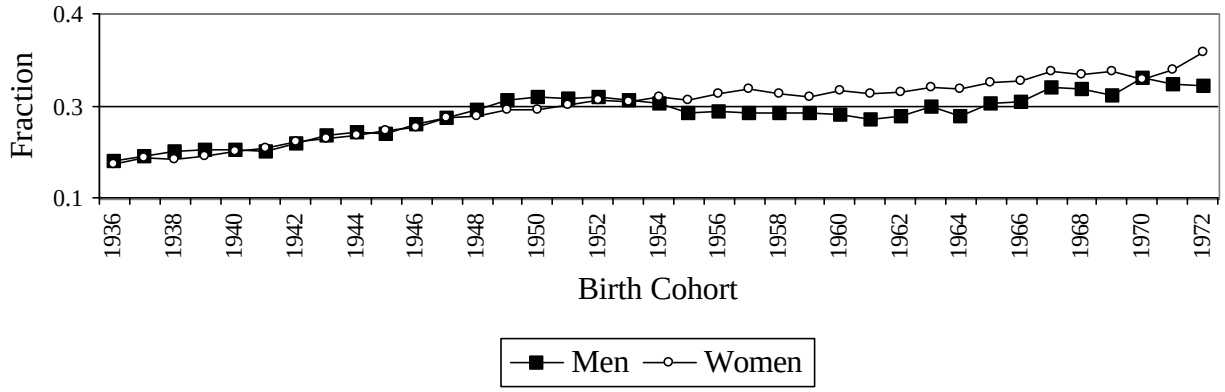


Figure 6c. Percentage of Men and Women with at Least 4 Years College by Age 25, by Birth Year Cohort

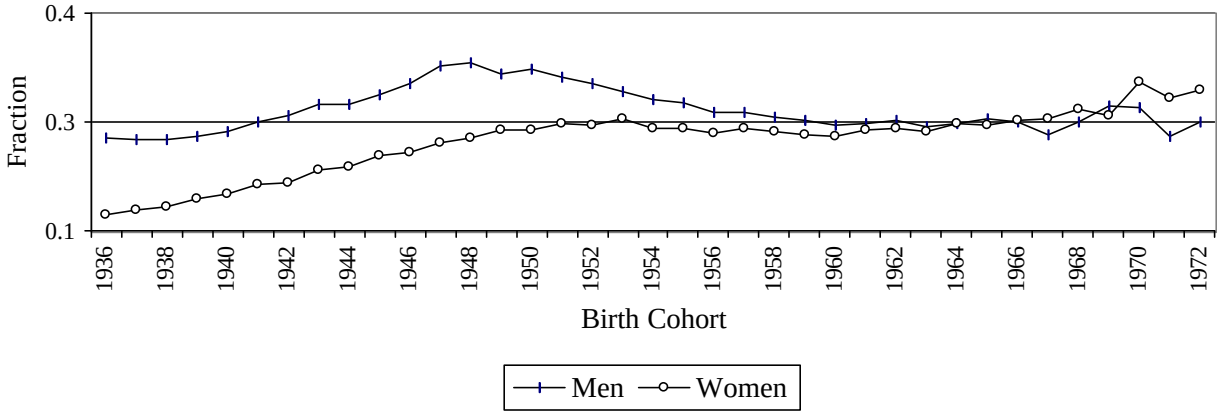


Figure 7a. Number of Associate's Degrees Awarded by U.S Institutions / Size of Population Aged 20-23, by Sex and Academic Year

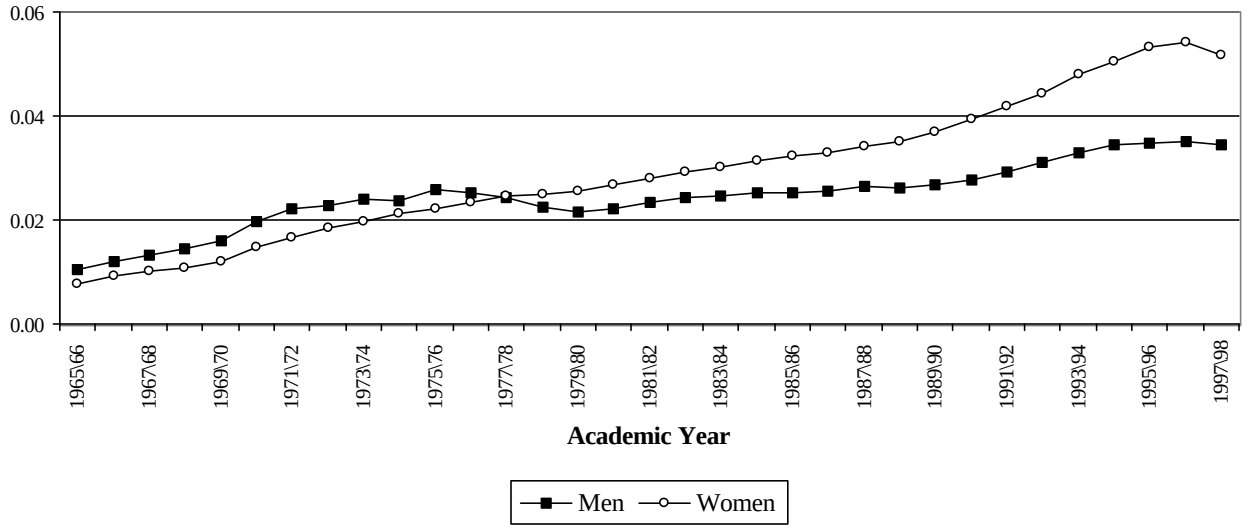


Figure 7b. Number of Bachelor's Degrees Awarded by U.S. Institutions / Size of Population Aged 20-23, by Sex and Academic Year

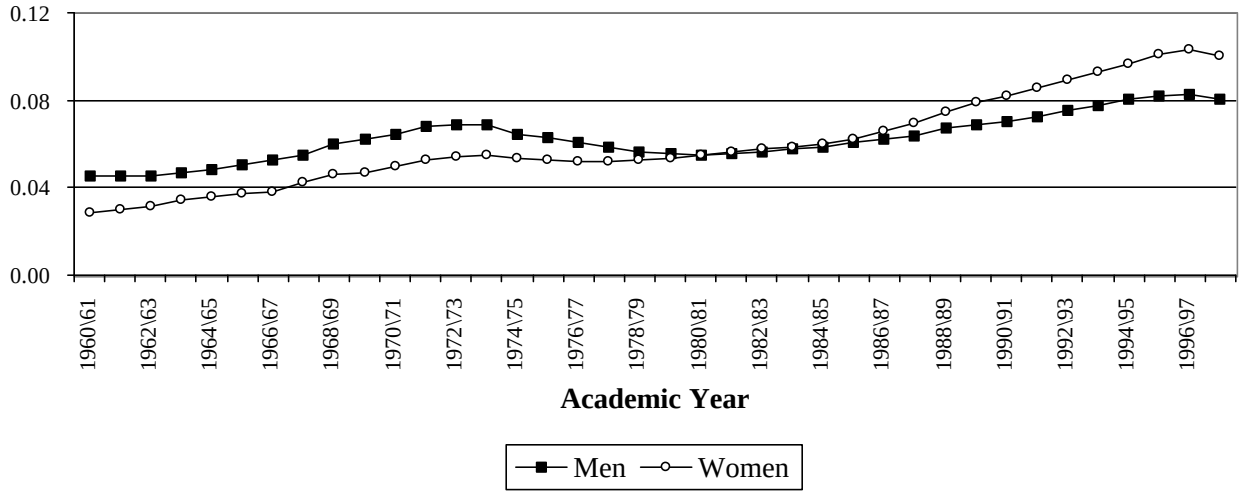


Figure 7c. Number of Masters' Degrees Awarded by U.S. Institutions / Size of Population Aged 24-27 by Sex and Academic Year

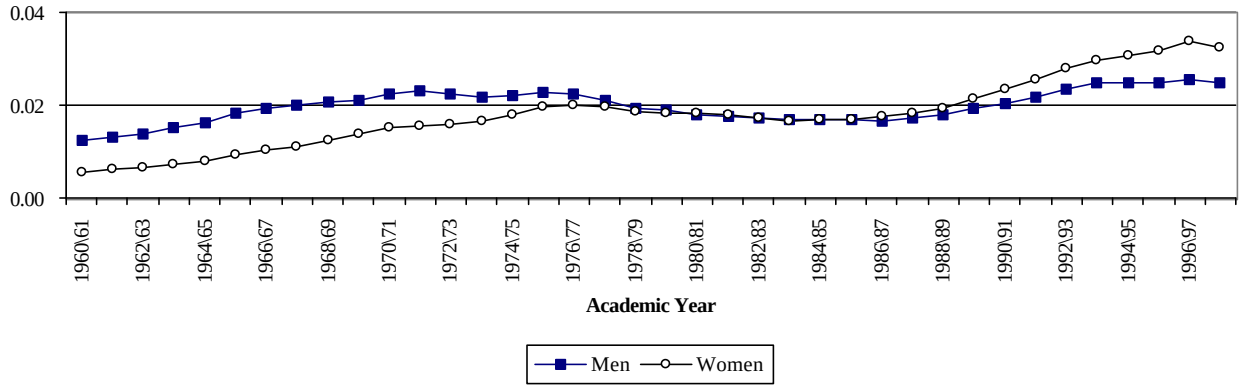


Figure 7d. Professional Degrees Awared by U.S. Institutions / Size of Population Aged 24-27, by Sex and Academic Year

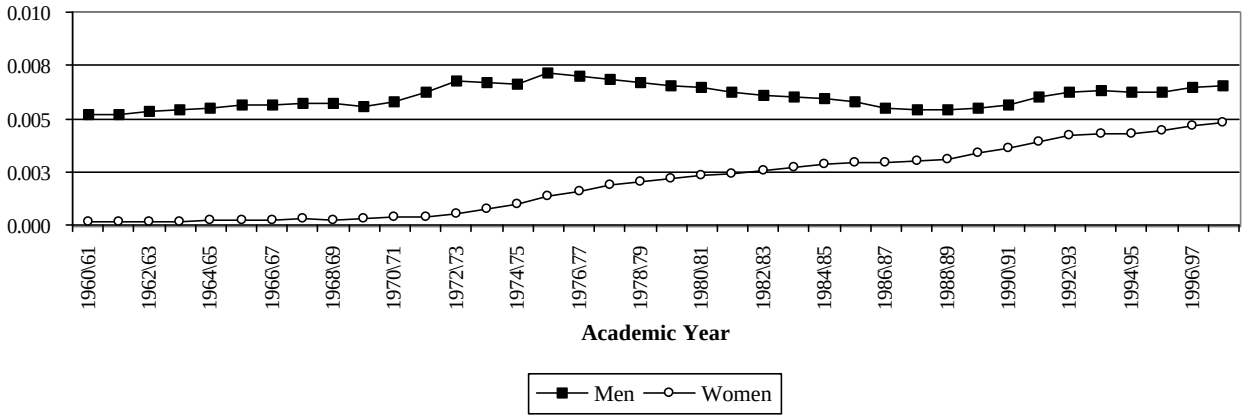


Figure 7e. Number of Doctorate Degrees Awarded by U.S. Institutions / Size of Population Aged 26-30 by Sex And Academic Year

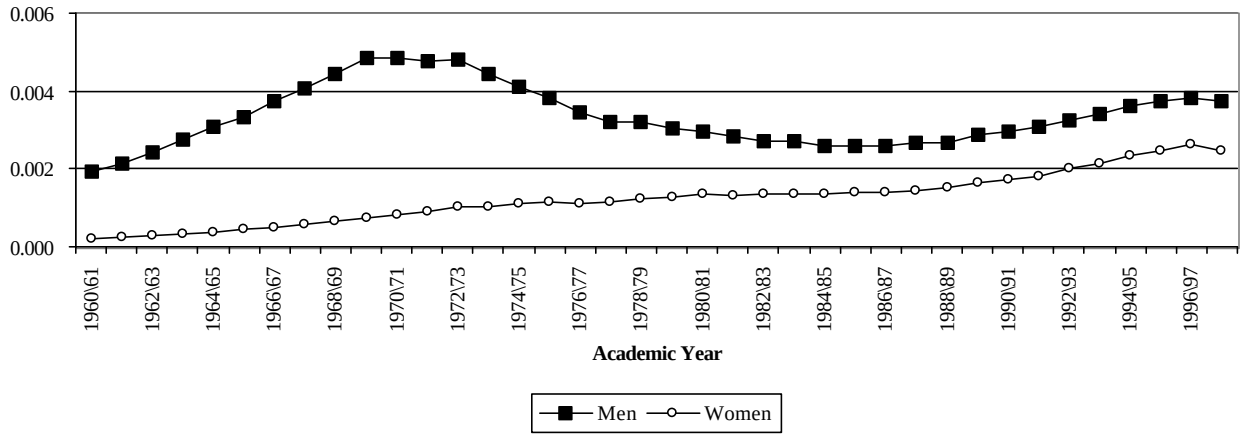


Table 1. Number of Colleges and Universities, by Control and Type of institution:1949-50 to 1984-85

	Academic Year									
	1949-50	1954-55	1959-60	1960-61	1964-65	1969-70	1974-75	1979-80	1984-85	
4-Year Public Institutions										
Total	344	353	367	368	393	426	447	464	461	
Change From 5 Yrs		**9**	**14**	**1**	**25**	**33**	**21**	**17**	**-3**	
Change From 1949\50-										**117**
4-Year Private Institutions										
Total	983	980	1,055	1,063	1,128	1,213	1,297	1,399	1,450	
Change From 5 Yrs		**-3**	**75**	**8**	**65**	**85**	**84**	**102**	**51**	
Change From 1949\50-										**467**
2-Year Public Institutions										
Total	297	295	328	332	406	634	767	846	868	
Change From 5 Yrs		**-2**	**33**	**4**	**74**	**228**	**133**	**79**	**22**	
Change From 1949\50-										**571**

Data from Digest of Education Statistics, 1997, U.S. Department of Education. (1997)
The table excludes data from 2-Year Private Institutions and years after 1985, as these data are not strictly comparable to the numbers presented.

Figure 8a. Total, Male and Female Undergraduate Enrollment in Colleges and Universities, 1945-1995

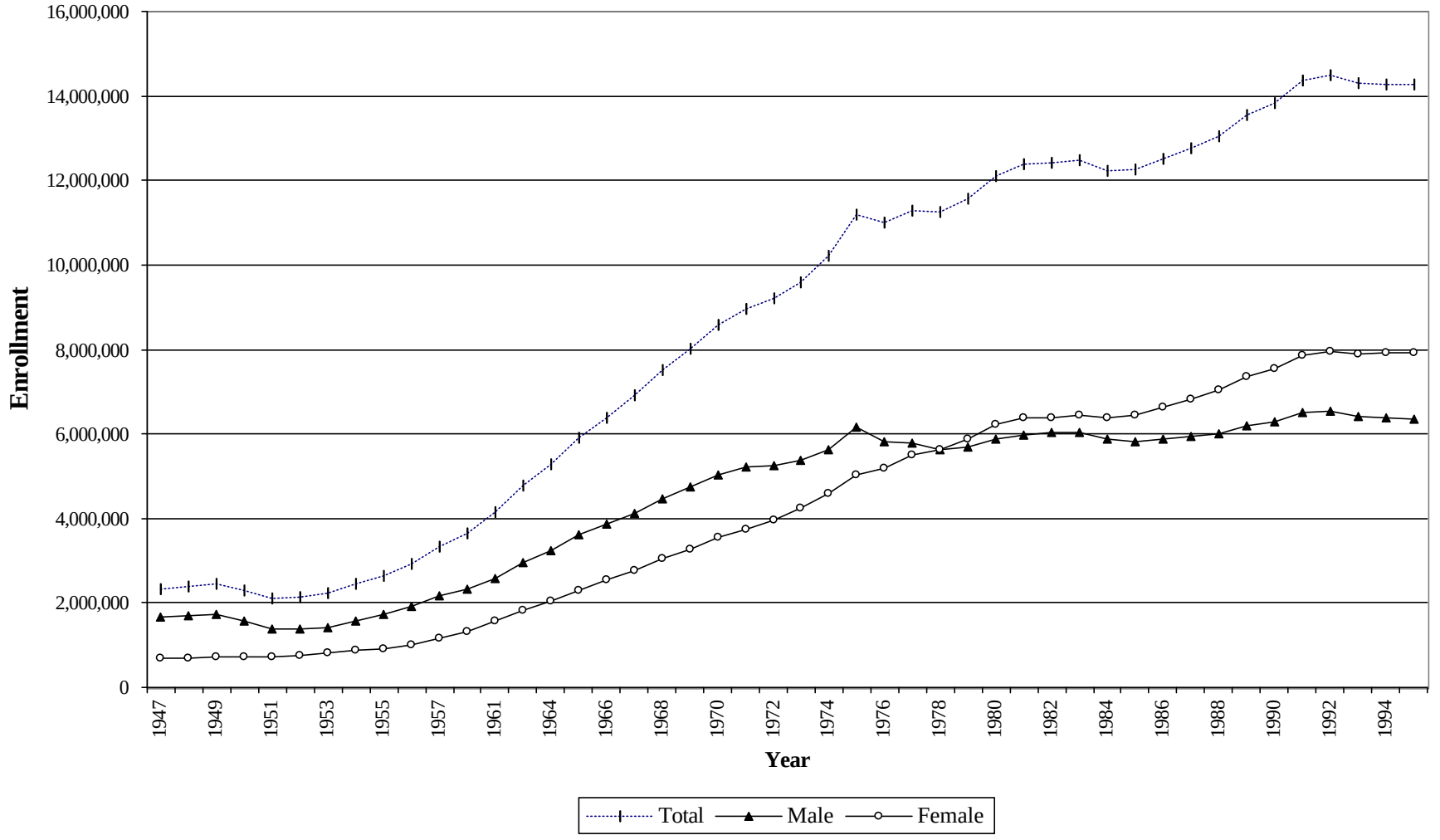


Figure 8b. Total Enrollments in 4-Yr Public Institutions and Fraction Female of

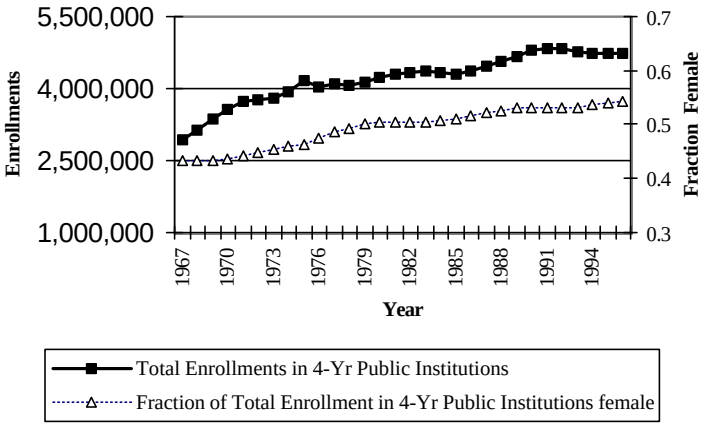


Figure 8c. Total Enrollments in 2-Yr Public Institutions and Fraction Female of

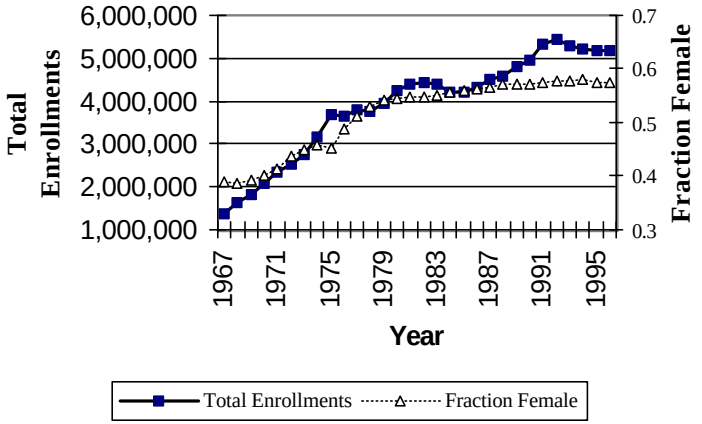


Figure 8d. Total Enrollment in 4-Yr Private Institutions and Fraction Female of Total

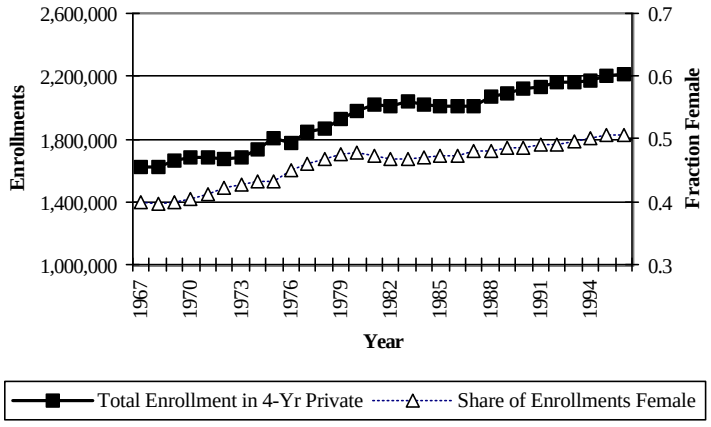


Figure 8e. Total Enrollments in 2-Yr Private and Fraction of Enrollments Female

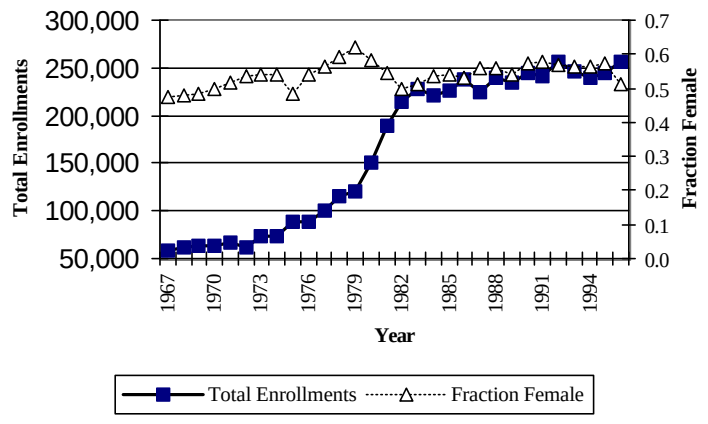


Figure 9a. Fraction of Women Aged 18-24 Enrolled in 2-Yr Public, in 2-Yr Private, in 4-Yr Public and 4-Yr Private Colleges

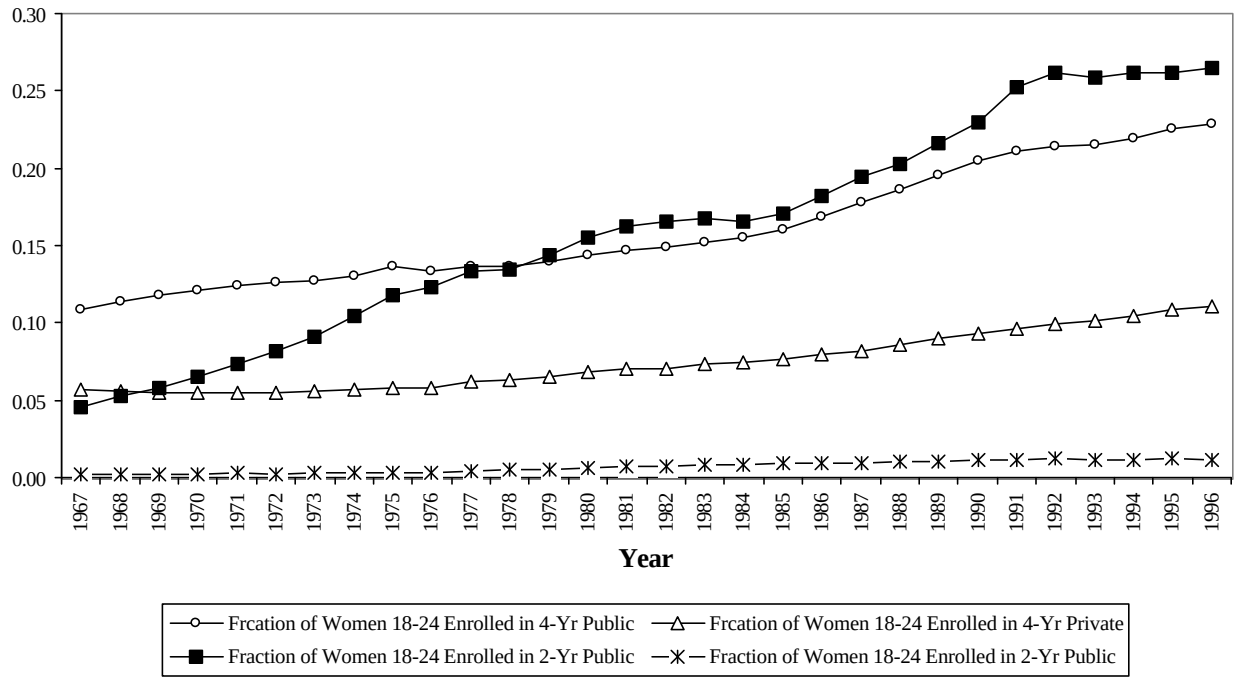
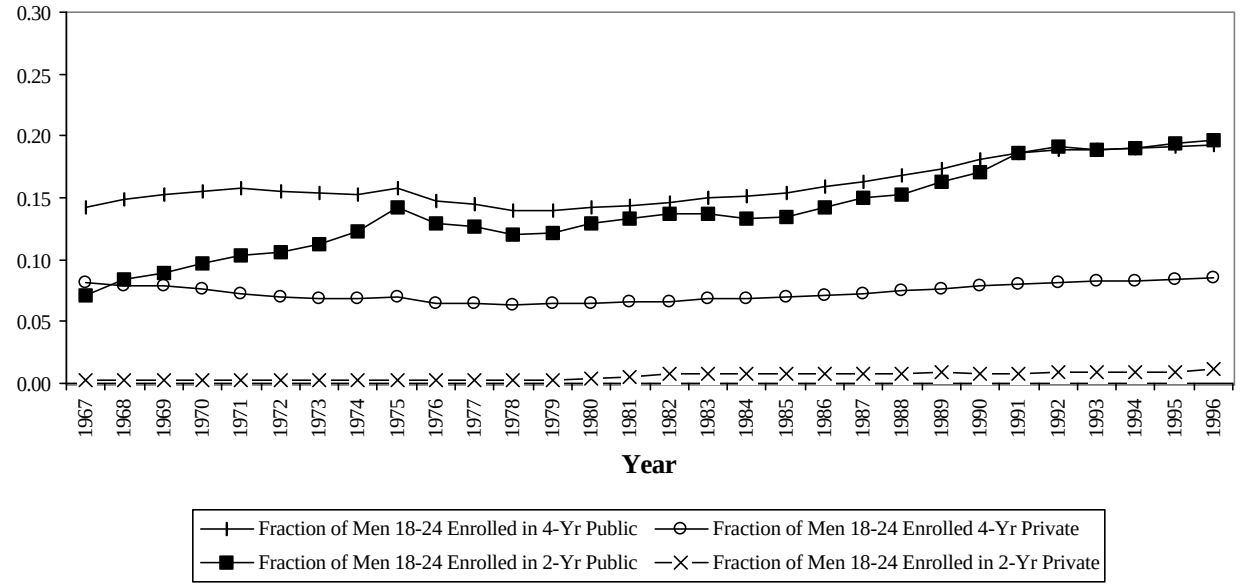
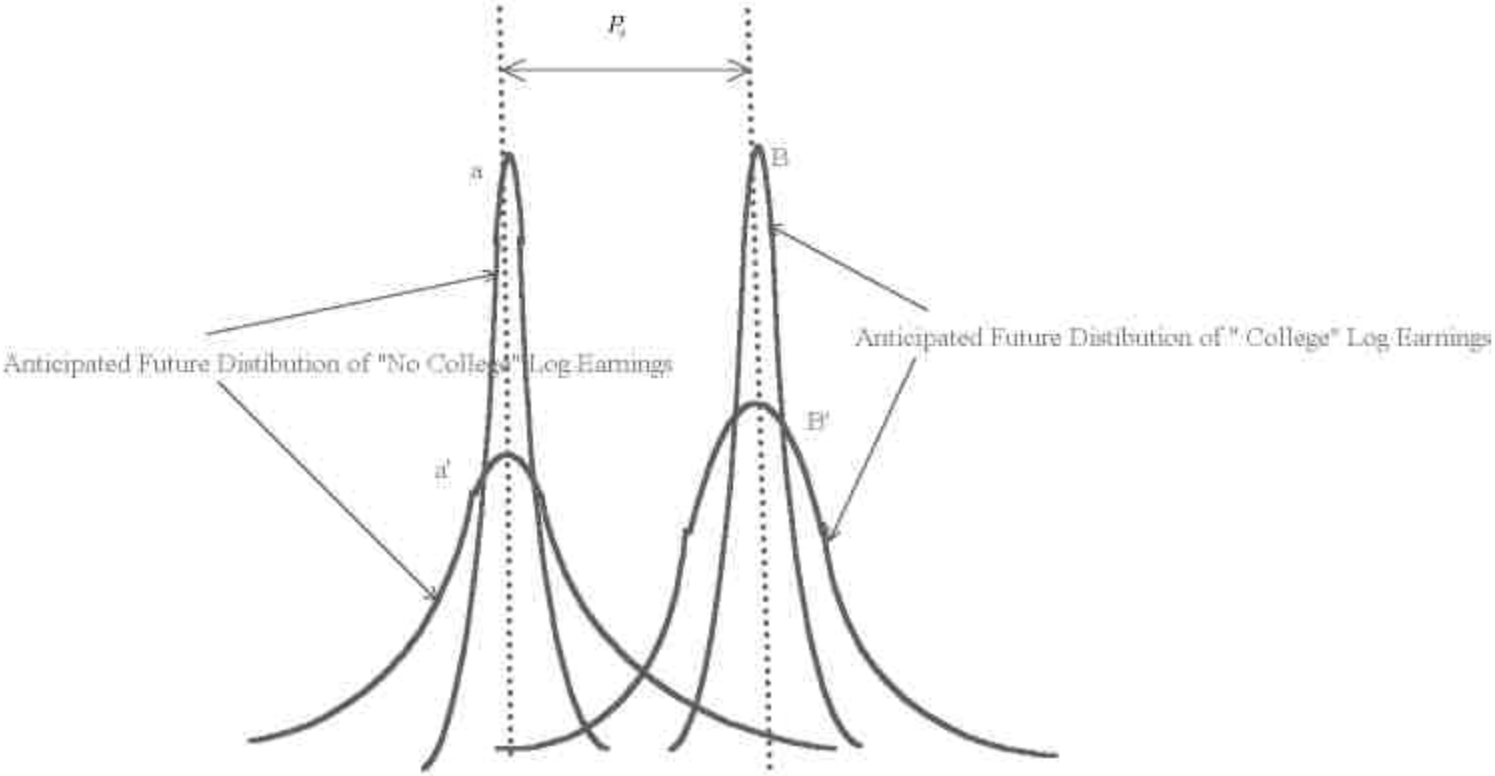


Figure 9b. Fraction of Men Aged 18-24 Enrolled in No College, in 2-Yr Public, in 2-Yr Private, in 4-Yr Public and 4-Yr Private Colleges





Graph1. The Education Gamble: Anticipated Average Return, and "Riskiness" of Alternative Education Choice

Figure 10a. Mean log (Weekly Wage) of College-Educated Women Aged 25-64 - Mean log(Weekly Wage) Of Non-College Educated Women Aged 25-64 Between Years Birth Cohort is Aged 18-24

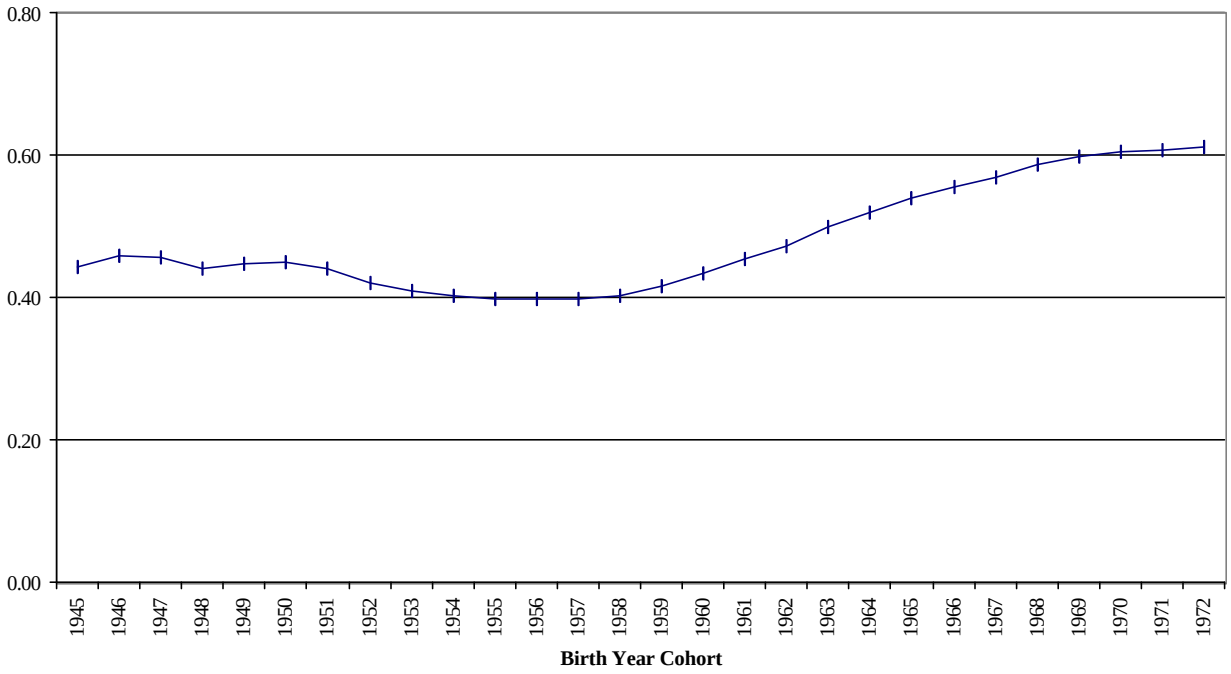


Figure 10b. Mean log (Weekly Wage) of College-Educated Men Aged 25-64 - Mean log(Weekly Wage) Of Non-College Educated Men Aged 25-64 Between Years Birth Cohort is Aged 18-24

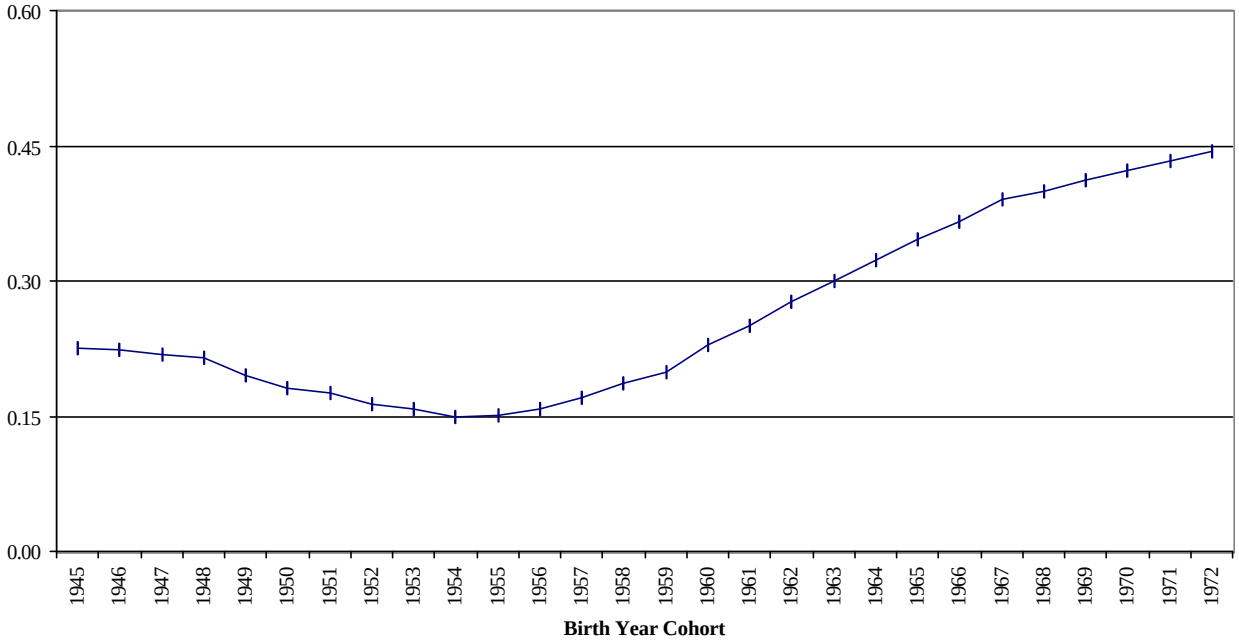


Figure 11a. Average Log Weekly Earnings Forgone if Attend College for 4 years, by Sex and Birth Year Cohort

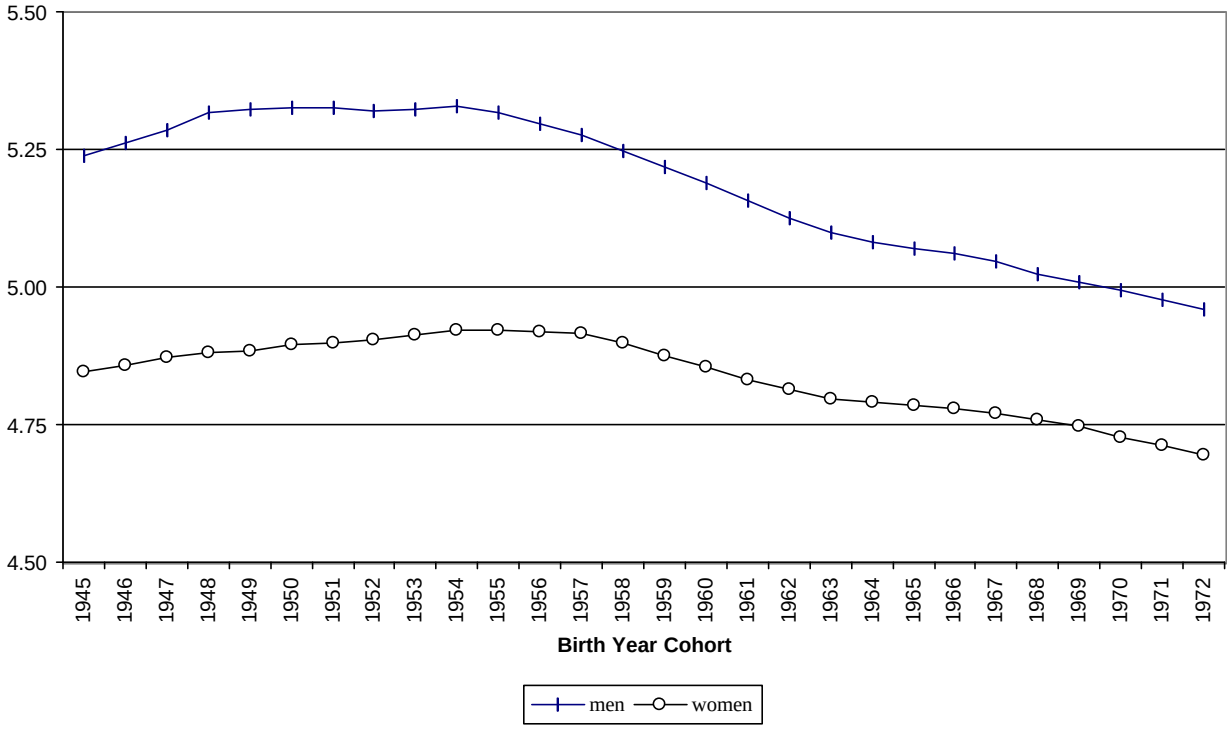


Figure 11b. Weighted Average of Log (Tuition and Fees) at Private and Public College During Schooling Years, by Birth Year Cohort

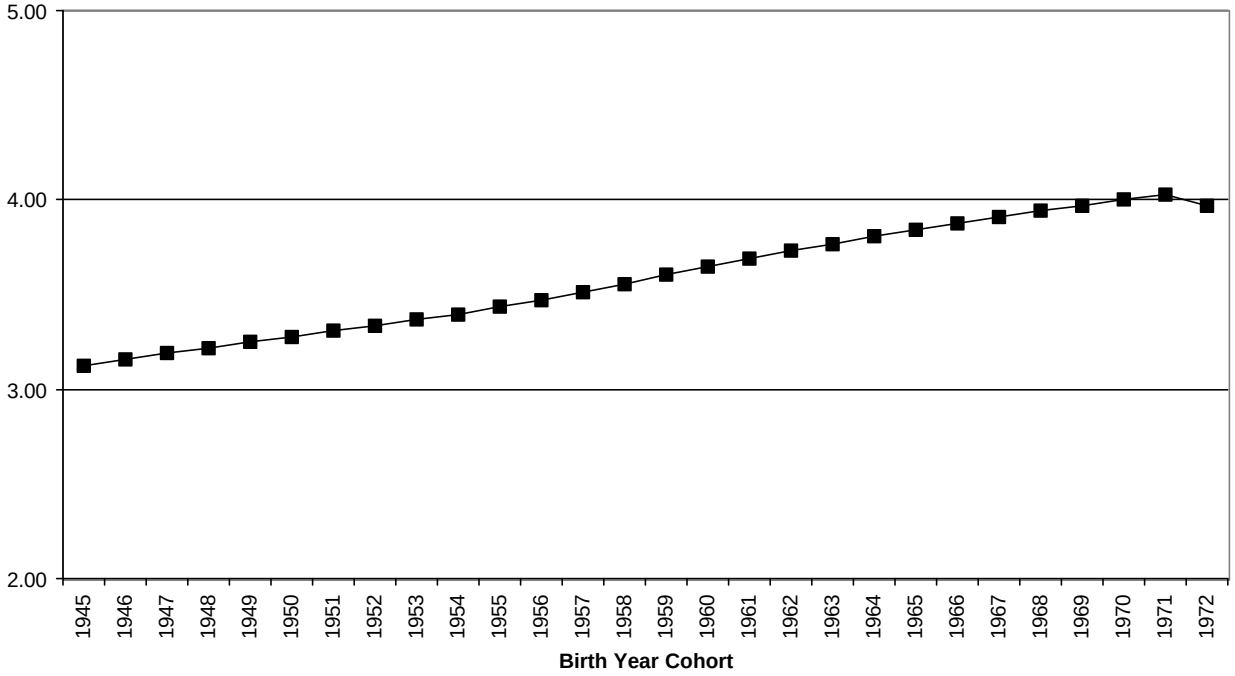


Table 12a. Anticipated Future Dispersion of log Weekly "Mature Adult" Male Earnings for Different Education Choices, by Birth Year Cohort

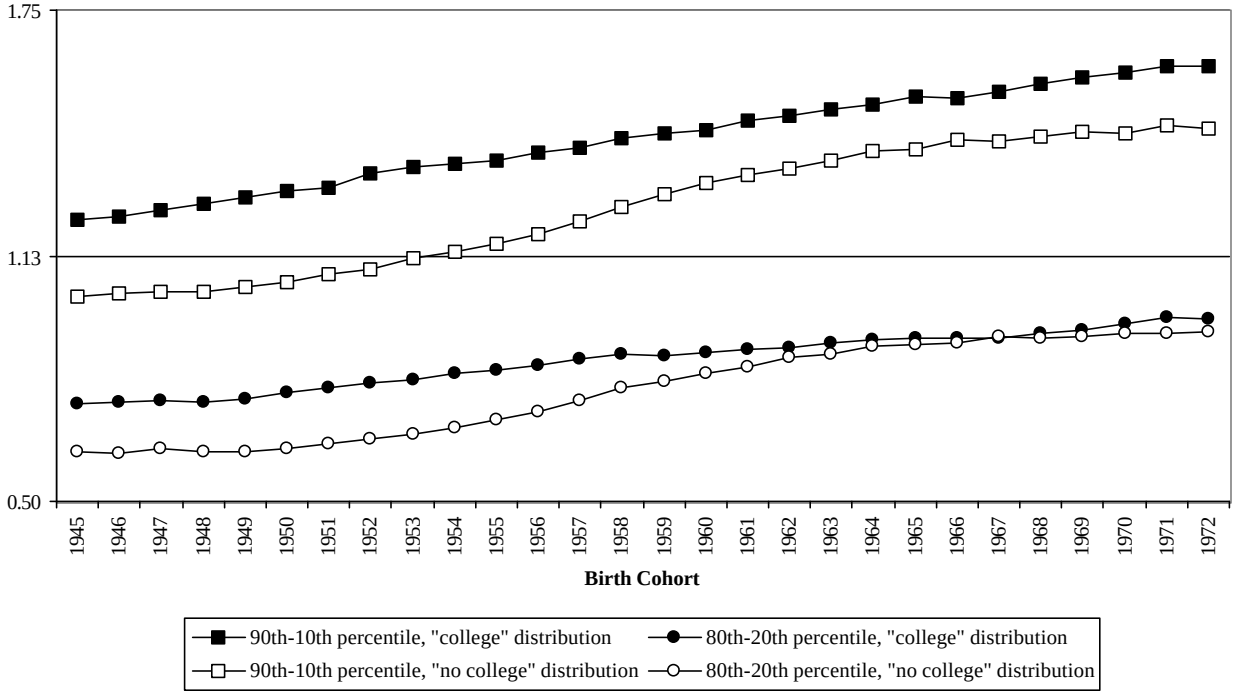


Table 12b. Anticipated Future Dispersion of log Weekly "Mature Adult" Female Earnings for Different Education Choices, by Birth Year Cohort

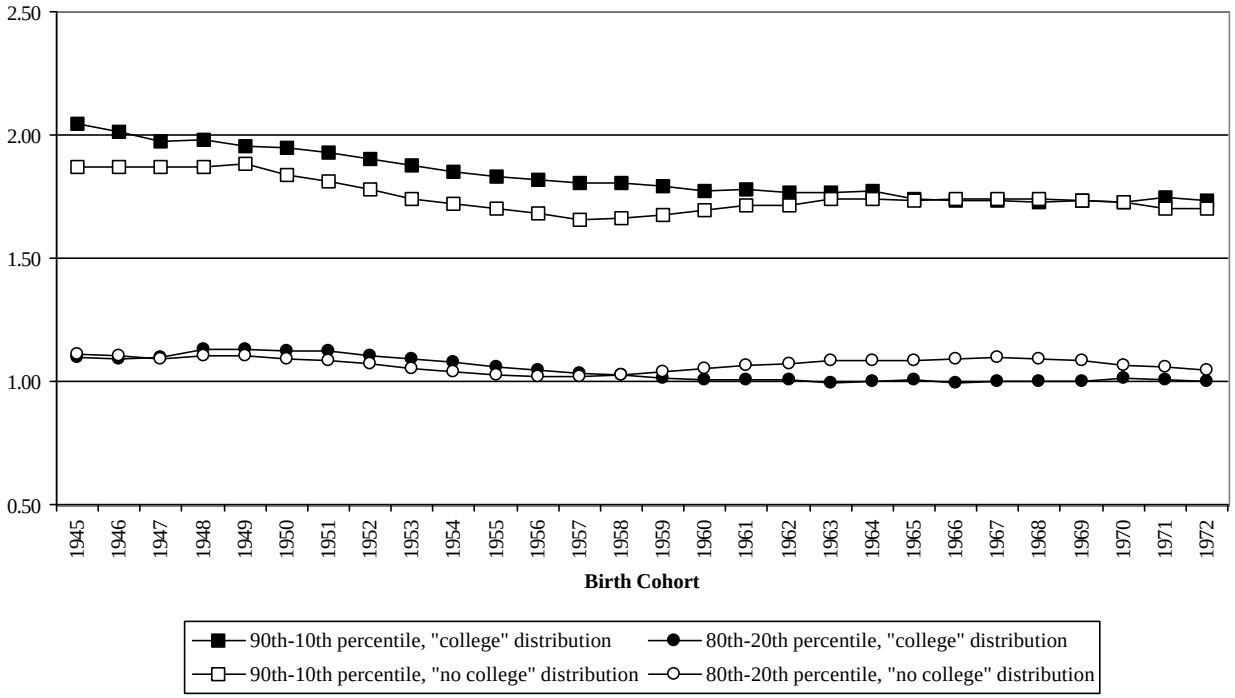


Table 2. O.L.S. Estimates of Effect of Various Factors on Years of Schooling by Age 25 by Cohort, Men and Women Estimated Separately* (Standard Errors in Parentheses).

	Women			**Men**		
	(I)	(II)	(III)	(I)	(II)	(III)
Constant	12.6 (0.21)	-13.4 (8.69)	-13.4 (6.67)	13.6 (0.12)	-13.2 (4.27)	-6.45 (7.99)
Anticipated Premium: mean log "college" weekly earnings – mean log "no college " weekly earnings	1.32 (0.44)	2.9 (1.4)	-2.46 (1.78)	-0.87 (0.34)	4.7 (0.75)	4.09 (1.17)
log (Mean National) Tuition		0.88 (0.27)	0.002 (0.002)		-0.06 (0.27)	-0.0003 (0.002)
Foregone Labor Earnings: Log weekly earnings of persons 18-24 with only high school education		4.01 (1.15)	3.05 (0.79)		3.9 (0.44)	2.48 (1.45)
Cohort Size		0.52 (0.79)	1.25 (0.54)		0.74 (0.56)	1.25 (0.54)
80th percentile - 20th percentile of "no college" log weekly earnings distribution			5.18 (2.22)			-1.97 (2.61)
80th percentile - 20th percentile of "college" log weekly earnings distribution			-0.29 (1.98)			-1.77 (2.59)
R-Squared	0.26	0.82	0.93	0.2	0.88	0.91

* See text for a description of the variables in these regressions. Labor market data are from several years March C.P.S.

Table 3. O.L.S. Estimates of Effects of Characteristics of the log weekly earnings on Male-Female Education Difference

A: Male/Female Difference in Years of Completed Schooling by Age 25

Gender Difference in:	**Estimate**	**Std. Error**	**Estimate**	**Std. Error**	**Estimate**	**Std. Error**
Anticipated College Premium						
mean log "college" weekly earnings – mean log "no college " weekly earnings	-0.99	0.38	2.82	1.39	6.96	0.77
Anticipated Future Dispersion of Log Weekly Earnings						
80th percentile - 20th percentile of "no college" distribution			1.27	1.28		
80th percentile - 20th percentile of "college" distribution			-4.15	1.13		
Standard deviation of "no college" distribution					2.79	2.18
Standard deviation of "college" distribution					-8.83	2.41
R-Squared	0.19		0.79		0.72	

B: Male/Female Difference in Fraction of People with at Least 1 Year College by age 25

Gender Difference in:	**Estimate**	**Std. Error**	**Estimate**	**Std. Error**	**Estimate**	**Std. Error**
Anticipated College Premium						
mean log "college" weekly earnings – mean log "no college " weekly earnings	-0.164	0.088	0.865	0.268	1.65	0.16
Anticipated Future Dispersion of Log Weekly Earnings						
80th percentile - 20th percentile of "no college" distribution			0.15	0.24		
80th percentile - 20th percentile of "college" distribution			-0.83	0.22		
Standard deviation of "no college" distribution					0.17	0.46
Standard deviation of "college" distribution					-1.53	0.51
R-Squared	0.11		0.81		0.8	

C: Male/Female Difference in Fraction of People with at Least 4 Years College by age 25

Gender Difference in:	**Estimate**	**Std. Error**	**Estimate**	**Std. Error**	**Estimate**	**Std. Error**
Anticipated College Premium						
mean log "college" weekly earnings – mean log "no college " weekly earnings	-0.28	0.06	0.29	0.25	0.84	0.13
Anticipated Future Dispersion of Log Weekly Earnings						
80th percentile - 20th percentile of "no college" distribution			0.15	0.23		
80th percentile - 20th percentile of "college" distribution			-0.56	0.2		
Standard deviation of "no college" distribution					0.43	0.36
Standard deviation of "college" distribution					-1.28	0.4
R-Squared	0.41		0.79		0.77	

All regressions have a constant term, and the difference in opportunity cost of time. Data are from the Current Population Survey. See text for variable descriptions, and summary of how constructed..

Figure 13. Assessing the Fit of Model of Education as a Choice Between Gambles

