319-75

INSTITUTE FOR RESEARCH ON POVERTY DISCUSSION PAPERS

CAN ADULTS BE HOOKED ON COLLEGE? SOME DETERMINANTS OF ADULT COLLEGE ATTENDANCE

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December 1975

The authors are respectively a Research Associate at the Institute for Research on Poverty and doctoral student in Higher Education Administration, University of Wisconsin. They are indebted to Charles Goff for computational assistance. The research reported here was supported by a Sloan foundation grant to support a joint student faculty study of higher education finance, by funds from the National Institute of Education grant, NIE-G-74-0100, and by funds granted to the Institute for Research on Poverty at the University of Wisconsin-Madison by the Department of Health, Education, and Welfare pursuant to the provisions of the Economic Opportunity Act of 1964. The opinions expressed are those of the authors.

ABSTRACT

This study examines institutional and individual determinants of adult participation in higher education. Using linear regression, we predicted the 1970 degree-credit college enrollment of a sample of 57,689 married men and women 25 or older living in metropolitan areas. Being a Vietnam veteran tripled the likelihood of a male's attending college. Establishing a new two-year college where none had existed before or lowering the tuition from $400 to zero doubled the college attendance rate of local adults. None of the characteristics of local four-year public colleges was found to have a significant effect on adult college attendance. These results were corroborated by a logit analysis.

CAN ADULTS BE HOOKED ON COLLEGE? SOME DETERMINANTS OF ADULT COLLEGE ATTENDANCE

Adult education is a major element in the nation's overall educational effort. In October 1972, adult students (those aged 25 and over) constituted 20 percent of undergraduate degree-credit enrollment [19, p. 20]. Many other adults are enrolled in noncredit courses or graduate degree programs, making the total number of adult students much larger. According to the May 1972 Current Population survey, over 12 million adults, 7 million of whom were over age 35, engaged in part-time study of some kind at some time during the 1971-1972 academic year [9, 11]. Of the 12 million, 4.39 million took at least one course at a four-year college. Total opening fall enrollment--for degree and nondegree credit--at these institutions was 8.95 million. Moreover, whereas degree-credit enrollment of students aged 18-24 (the so-called traditional students) remained approximately constant between 1970 and 1973, degree-credit enrollment of adults aged 25-34 grew by 35 percent [18, p. 2]. Hence adults comprise a large and growing segment of higher education's clientele.

The rising participation of adults in higher education has been attributed to a number of factors: increased numbers of conveniently located colleges offering courses tailored to meet the special needs of adults, the need to learn new skills as old ones become obsolescent due to technological progress, and the increasing desire of men and women to obtain training that will make possible professional advancement. The last few years in particular have witnessed an increasing emphasis on making higher education more accessible to

people throughout their entire life span (the "lifelong learning" or "continuing education" or "open education" movement). Generally, philosophical reasons have been given for supporting this movement, which is intended to meet the needs of a pluralistic population as it moves toward becoming a learning society [1, p. 122]. Recently the American Council on Education Committee on Higher Adult Education and the Commission on Non-Traditional Study have strongly endorsed continuing education and have recommended a number of ways to implement it [12, 6].

The heightened interest in adult students is also a pragmatic response to the hope that in the 1980s nontraditional students will fill the classrooms that are emptied by the contraction of the 18-24 age cohort. Whereas the 18-24 age group comprised over 80 percent of higher education's enrollment in 1970, this proportion is projected to drop to roughly 78 percent by 1980 and 74 percent by 1990, even without an increased emphasis on adult education [1, p. 122]. The Carnegie Commission in its final report expresses the hope that the addition of "nontraditional" students will fill the gap [5]. The conclusion is inescapable:

> Higher education will no longer be a growth industry unless an entirely new constituency can be attracted to its institutions, and unless continuing education becomes an accepted pattern in our society [9, p. 6].

Will adult participation in higher education continue to grow? One way to pose this question is to ask whether the nation as a whole can achieve the rates of adult college attendance that currently

prevail in California. In 1970, the rate of degree-credit enrollment of males aged 30-34 with 12 or 13 years of schooling living in urban areas was .087 in California and .037 in the nation. The corresponding attendance rates for women were .050 and .022. Contrasts between metropolitan areas were even larger: The college attendance rate of males aged 30-34 with 12 or 13 years of schooling was .101 in Orange County, California, but only .009 in Wilkes Barre, Pennsylvania. What makes California's adult attendance rates so much higher? Is it the zero tuition, the open-door admissions policy, or the large number of conveniently located two-year colleges? Or are Californians unique in some other way? The relative importance of these factors is unknown.

Very little is known about the effectiveness of public policies designed to stimulate adult college attendance. What proportion of the veterans now attending college would not have enrolled without financial aid provided by the GI Bill? What is the effect of the presence or absence of a two-year college on adult enrollment in a given area? Will the presence of a four-year college have the same impact? Does the location of a college affect the attendance rate? How important are individual characteristics, such as age, sex, income, occupation, or number of children, in determining adult enrollment? As Freeman and Holloman observed in a recent article, "Our knowledge of enrollment decisions of older people is currently limited" [8, p. 27].

Clearly, extensive and up-to-date information about the determinants of adult college attendance is needed. The purpose of this study was to provide some of this information. The determinants upon which we focused are those under public control: tuition, location, the GI Bill, and admissions policies (selectivity) of public two-year and

four-year colleges. In addition, we examined the effect of individual characteristics on enrollment. Sections I and II describe the methodology of and results from our analysis of data on 57,689 individuals. As a check on the results obtained from individual data, variations in the average attendance rate for 25 to 35-year-olds across metropolitan areas were also analyzed. The results of this supplementary analysis are presented in Section III. Implications for projections of future enrollments and for the debate over the appropriate level of tuition are discussed in Section IV.

I. Data and Methodology

The population studied comprised the bulk of the pool of potential adult students in 1970: the 46 million people aged 25 and over with a high school degree but less than two years of college. Our sample was drawn from the 1970 Census and consisted of one-third of one percent of the people with 12 or 13 years of schooling who were married and living with spouse and lived in one of the 88 largest northern and western Standard Metropolitan Statistical Areas (SMSAs). Southern metropolitan areas, except those in Texas, were excluded from the sample.[1] Smaller metropolitan areas and nonmetropolitan areas were also excluded because they were not separately identified on the County Group Public Use Census Tapes that were available. Persons for whom it was not possible to identify state of residence were also excluded. This sampling procedure yielded 57,689 individuals.

The objective of low tuition at public colleges is not to shuffle students from one institution or SMSA to another, but to increase the total number of participants in higher education. We attempted to measure the impact of college availability on aggregate attendance,

not on the choice of where to attend. Married adults ordinarily have responsibilities--jobs and families--that prevent them from moving to a different area because of the price and quality of the available colleges or universities. Thus limiting our sample to married people aged 25 and older allows us to interpret our results as changes in aggregate college attendance. Our methodology would be inappropriate for predicting graduate school attendance of adults or college attendance of persons aged 18-24, for in these cases migration decisions are often made at the same time as college-attendance decisions.

To determine if an individual was attending college, the census asked "Since February 1, 1970, has this person attended regular school or college at any time? Count...schooling which leads to... [a] college degree." Note that reported enrollment was either part time or full time, in a specific two-month period during the second semester, and involved working towards a degree. The only additional information available from the census data on the character of the school attended was whether it was publicly or privately supported.

We worked with data on individuals.[2] The dependent variable was given a value of one if the individual was attending college, zero if not. Both attendance at any college and attendance at a public college were predicted, enabling us to judge the impact of low-cost two-year colleges on the distribution of adult students between the private and public institutions. Using ordinary least squares on the individual data, we regressed college attendance on the person's own characteristics and on variables defining the college availability environment of the SMSA of residence.

Data on the characteristics of public two-year and four-year colleges in the SMSAs sampled were obtained from standard reference sources [3, 8, 11]. The dimensions for which measures were available were (a) tuition, (b) admissions requirements, (c) distance from central business district, and (d) size of the geographic area served by the typical college. Where more than one college served an area and tuition levels or admission policies varied, an unweighted average was used for that SMSA.[3] The distance variable was defined as the number of miles from the central business district to the closest college campus. Size of the area served by the college was calculated as the total number of square miles in the urban area divided by the number of two-year college campuses. Our measures of location within the SMSA--distance to the central business district and size of the service area--were imperfect indicators of proximity. Consequently, the explanatory power and statistical significance of these location variables was not expected to be high.

In order to compare the responsiveness of men and women, the sample was divided into (1) husbands living with spouse and (2) wives living with spouse. The individual characteristics that were held constant were race, Spanish American background, Jewish extraction, veteran status, marital status, number of children, presence of children under six, occupation, age, and age squared. The census tape used provided measures of these characteristics for each member of the sample. By controlling for these personal characteristics, we avoided attributing their effects to instruments of public policy such as tuition or admissions standards.

It is not possible, however, to measure all the determinants of college attendance. A bias will result if an unmeasured determinant is correlated with one of the variables included in the model. If adults with an unmeasured characteristic that increases their likelihood of attending college tend to live in metropolitan areas with high tuitions or without two-year colleges, we will underestimate the impact of such educational policies. On the other hand, if adults with such an unmeasured characteristic tend to live in areas that have two-year colleges with low tuitions, we will overestimate the impact of such policies.

If the political process that sets policy for higher education responds to these unmeasured local taste differences, there is a potential problem of simultaneity. In some localities a strong local taste for higher education may have resulted in the jurisdiction following a relatively restrictive policy.[4] People may have feared that establishing a system of low-tuition, two-year colleges would result in a flood of students, forced tax increases and hurt the private colleges and four-year public colleges. In other localities an unmeasured taste for higher education may have had the opposite effect, contributing to the early establishment of two-year colleges and keeping their tuitions low. Thus, the results reported in section II carry a caveat. They are unbiased estimates of the true impacts of educational policies only if in our sample of SMSAs, public policy was determined exogenously or if the counteracting effects on policy of unmeasured taste factors described above on average canceled each other out. This assumption, however, is not unreasonable.[5]

II. Results Based on Individual Data

At any given time only a small proportion (less than 2 percent) of the adults in the United States with a high school degree or one year of college are taking degree-credit college courses. Because this proportion is so small, we will borrow a reporting technique that is commonly used for health statistics. All attendance rates and changes in attendance rates are reported as the number per 10,000 eligible. The typical SMSA of 100,000 has approximately 20,000 adults eligible for attendance in either the freshman or sophomore year of college. Thus, if the eligibles are equally divided between the sexes and if unmarried adults respond the same way as the married adults in our sample, the numbers reported approximate enrollments and enrollment changes expected in the typical SMSA of 100,000. In Spring 1970 the census reported college attendance rates of 181 per 10,000 eligibles for husbands and 76 per 10,000 eligibles for wives. The college attendance rates of minority group members were higher: 217 per 10,000 for husbands and 123 per 10,000 for wives. A substantial proportion of these married adult students--85 percent of the husbands and 24 percent of the wives--were employed full time outside the home.

A. Institutional Characteristics as Determinants of Attendance

A linear regression was fitted to the data described above. For each variable we tested the hypothesis that when the other variables

were controlled this variable had no effect on college attendance. A variable is reported below as statistically significant if this hypothesis was rejected at the .05 level.[6] (See Appendix Tables 1 and 2.) The results obtained were then checked using a logit specification on a reduced number of observations.[7] The results obtained using the logit model were similar and confirmed the findings of the regression analysis (see Appendix Table 3) although because of the smaller sample size they did not obtain the same degree of statistical significance. Results reported below are based upon linear regressions because of the larger number of observations it was possible to include in the analysis.

The only characteristics of local colleges that consistently had statistically significant effects on adult attendance were the existence of at least one two-year college within commuting distance and the tuition level of that college. The absence of a two-year college was associated with a substantial reduction in adult college attendance. Our regressions predicted that if a two-year college charging $200 annual tuition were established where none had existed before, attendance of married men would rise by 104 per 10,000 and attendance of married women would rise by 56 per 10,000 (see Table 1). This occurred despite the fact that all the SMSAs without two-year colleges had public four-year colleges within commuting distance.

Where there was a local two-year college, lowering its annual tuition from $400 to zero doubled the number of husbands and wives attending college. For husbands the number attending rose from 156 to 289 per 10,000; for wives it rose from 52 to 130. As tuition at the two-year college approached zero, the impact of further reductions

Table 1. Expected Degree-Credit Freshman and Sophomore Enrollment of Adults over Age 25 Per 10,000 Eligibles by Whether a Local Two-Year College Exists and Its Tuition Level

Two-Year College Policy	Based on Linear Regression Model[a]			Based on Logit Model Using Indiv. Data[b]	Based on Logit Model Using SMSA Averages[c]	
	Married Adults Age 25-65			Married Non-Minority Age 25-55	Married and Unmarried Age 25-29 and Age 30-34	
	Public Colleges	Private Colleges	All Colleges	All Colleges	All Colleges	All Colleges
Males						
Tuition=0	268	21	289	283	1133	722
Tuition=$200	151	40	191	191	782	442
Tuition=$400	101	55	156	174	699	414
Tuition=$600	--	--	--	158	624	388
No Local Two-Year College	55	32	87	115	525	384
Females						
Tuition=0	127	3	130	114	533	404
Tuition=$200	66	15	81	81	288	247
Tuition=$400	39	13	52	59	227	202
Tuition=$600	--	--	--	43	180	165
No Local Two-Year College	16	9	25	44	178	153

[a] These are approximately the numbers of adult degree-credit students an SMSA of 100,000 could expect. These predictions are based on a linear probability model of college attendance in the second semester of the 1969-1970 academic year that was estimated with ordinary least squares. Personal characteristics that were controlled were marital status, sex, number of children, occupation, minority status, Jewish background, age, and veteran status. If family income minus own earnings had been controlled the results would not have changed in any important respect. The regression equations' prediction was evaluated at the mean of all variables except those explicitly changed.

Table 1. (continued)

[illegible] p [illegible] [illegible] at the mean

[b]The equations presented in Appendix Table 3 were used to derive these enrollment responses. It was assumed that at a tuition of $200 the enrollment rate would be the same as or equal to the enrollment rate predicted by the linear regression model. The effect of changes in policy on the logit were calculated and these changes in the logit were translated into probability effects by use of tables.

[c]The equations presented in Appendix Table 4 are the bases of these predictions. The attendance rate for a metropolitan area with a two-year college with a tuition of $200 was assumed to be the actual college attendance rate of the age and sex group in the urban U. S.

increased. For husbands, for example, a reduction in tuition from $400 to $300 increased college attendance by 10 per 10,000, whereas a reduction from $100 to zero increased attendance by 56 per 10,000. The greater responsiveness to tuition in the below $200 range was confirmed by the logit models (columns 4, 5, and 6 of Table 1). An examination of Appendix Table 4 reveals that the coefficient on tuition above $200 was not significantly different from zero.

The tuition level of the two-year college also altered the distribution of adult students between public and private institutions. In SMSAs with free public two-year colleges enrollment rate in private colleges was between one-half and one-third of the enrollment rate in SMSAs where two-year colleges charged $400 in tuition. The private sector is very small, however, so the students lost by the private sector were only a small part (one-fifth) of the overall enrollment gain by the public sector's when tuition was reduced.

Distance from the central business district and size of area served were never statistically significant. We had hypothesized that a smaller attendance area and a location closer to the central city would increase college attendance. The results obtained did not support these hypotheses.

About half of the people in our sample lived in SMSAs with an open-door local two-year college (defined as an institution that accepted at least 97 percent of all applicants). For wives this factor raised college attendance by a statistically significant 46 per 10,000. It also raised the attendance rate of husbands (by 29 per 10,000), but that effect was not significant at the .05 level.

Despite the fact that almost every SMSA had a local public four-year college or university, none of the characteristics of these

colleges (tuition, selectivity, proximity) had a statistically significant impact on aggregate college attendance. This was not unexpected for 73 percent of 25-34 year old students in the first two years of college attend two-year institutions [18]. Two-year colleges almost invariably have lower tuition and easier admission policies, so to the extent that it is the cheapest colleges' characteristics that determine aggregate attendance, it is the two-year colleges' characteristics that matter.

B. Personal Characteristics as Determinants of Attendance

The individual's age and the presence of children in the family had a strong impact on college attendance. The older the individual the less likely he or she was to take degree-credit courses. The presence of children in the family reduced college attendance of both the husband and wife. Apparently the time required for parenting and the pressures of immediate financial responsibilities made it difficult for mothers and fathers to attend college. For wives, the factor with the strongest negative effect was the presence of children under the age of six. For husbands, children of any age had a negative effect.

The family income variable was defined as total family income minus the individual's earnings.[8] For wives, an increase of $5000 in spouse's earnings or unearned income raised the attendance rate 35 per 10,000. For husbands, the effect was larger still: A $5000 increase in spouse's earnings or unearned income raised attendance by 138 per 10,000.

Minority status did not have a consistent effect on attendance. Attendance rates were slightly but not significantly higher for black women and Spanish Americans. Holding other things constant, black men had attendance rates that were lower than those of non-Spanish white men by a statistically significant 130 per 10,000. If other factors had remained constant, attendance rates of minority males would have been lower than attendance rates of nonminority males.

They turned out to be higher (217 versus 181 per 10,000) because the minority males in our sample tended to live in metropolitan areas where tuitions were low (such as California, New York, and Chicago), and this substantially raised their attendance rates.

Almost one-third of the women in our sample had not worked for pay in the last ten years. Holding age and all other factors constant, attendance rates for these women were lower than those for women who had worked outside of the home by 145 per 10,000. This suggests that job-related aspirations were an important part of women's reasons for returning to college to work for a degree.

Government employees and professional technical workers were substantially more likely to be attending college. This was as expected, for promotion and salary in such occupations are often explicitly conditioned upon academic course work, and employers frequently pay the tuition costs of attending college.[9] The increment to the college attendance rate from being a government employee was 235 per 10,000 for men and 50 per 10,000 for women. Attendance rates of professional/technical workers were higher than those of other white-collar workers by 285 per 10,000 for men and 153 per 10,000 for women. Attendance rates of female teachers were 370 per 10,000 higher than those of other professional women.

The veterans in our sample who had been discharged after 1955 were eligible for GI Bill education benefits. In January 1970 married full-time students could receive between $155 and $175 per month, depending on the number of dependents. These subsidies seem to have had a substantial effect, for the attendance rate of Vietnam veterans in our sample was 321 per 10,000 higher than the attendance rate of nonveterans their age. Men currently in the armed forces were much

less likely to be attending college. This is as expected. They were already undergoing on-the-job training, and the free correspondence schools (USAFE) that were available to them do not fit the census definition of school attendance.

III. Supplementary Analysis Using SMSA Averages

Variations across SMSAs in average college attendance rates of 25 to 34 year olds (married and single) with 12 or 13 years of schooling were also analyzed. Data for other age groups and for married only were not available. Using the same 88 SMSAs, the logit of the average attendance rate was regressed on the characteristics of local two-year colleges and measures of SMSAs economic and social environment (Appendix Table 4). When an event is highly unlikely, using the logit of its probability, $\ln(p/1-p)$, as the dependent variable implies that the determinants of college attendance operate multiplicatively.

The logit model confirmed that the most important determinants of a locality's adult college attendance rate are the existence of a local two-year college and its tuition. Together with the local unemployment rate these two variables explain one-half of the variation of enrollment rates among cities. The effects of the level of two-year college tuition on expected enrollment rates predicted by the logit model are presented in columns 5 and 6 of Table 1. The results obtained are consistent with the predictions obtained from the linear regression model for all age groups. The parameter estimates imply that a decline in tuition from $400 to zero would increase the enrollment of 30-34 year old males from 414 to 722 per 10,000. Because adults under 35 are more likely to attend college, the absolute size of the impact on attendance per 10,000 was greater. Proportionately, the predicted impact of policy shifts was

similar to the responses calculated from the logit model that uses individual data and slightly smaller than the responses calculated from the linear regression.

Proxies for occupation, marital status, and unemployment experience of the eligible population (those with 12-13 years of schooling) were entered into the model to control for the influence of these variables. These proxies are not wholly satisfactory, however, for while they often refer to the age group, they are not specific to those with 12 or 13 years of schooling. Despite this problem there was a statistically significant tendency in 3 of 4 models for higher local unemployment rates to raise adult college attendance rates.

IV. Implications and Discussion

These results have implications both for projections of future adult enrollments and for policy decisions about the appropriate level of tuition to be charged adults.

A. Implications for Projections of Future Enrollments

Public efforts to encourage college attendance have included establishing colleges in cities that had none before, keeping tuition low, liberalizing admission requirements, and the GI Bill. If these efforts are largely responsible for past growth of adult enrollment, then future growth must inevitably slow, for almost all major cities now have public two-year colleges and tuition charges are not likely to fall in real terms in the future. To the extent that the strong demand for employees with college training that existed during the 1960s was responsible for the increases in adult participation, we must

now expect declines, for we are entering a period in which college graduates are in relative surplus. If, however, the enrollment increase was caused by changes in adult tastes for education, the trend might fairly be projected to continue.

Of the public policy efforts, the GI Bill seems to have been the most influential in increasing adult enrollment, at least for men. If veterans had had the attendance rate of nonveterans, our male sample's college attendance rate would have dropped from 181 per 10,000 to 106 per 10,000. Thus if all of the effect of being a veteran is attributable to the GI Bill, the GI Bill is responsible for over 40 percent of all male adult enrollment and 27 percent of combined adult enrollment of both sexes.[10]

The Vietnam War GI Bill is responsible for a major component of the growth of male adult enrollment during the 1960s. Until 1966 veterans discharged after 1955 were not eligible for educational benefits. The GI Bill has also contributed to the growth that has occurred since 1970. Veterans are more likely to make use of the GI Bill educational benefits if they are available immediately after discharge. Not only have discharges increased the stock of veterans, benefit levels have been increased from the $155 of January 1970 to $321 per month now.

The second major contribution of public policy to recent enrollment growth has been the establishment of new two-year colleges. Our regressions predict a doubling of adult enrollment when a two-year college with tuition of $180 is established in an SMSA that formerly had none. In 1955, many major metropolitan areas did not have even one low-tuition community college.[11] California was the only state with free open-door community colleges in every city of appreciable size, and this resulted in California's having 52 percent of the nation's

two-year college students. Since 1955, however, the number of public two-year institutions in the United States has risen from 275 to 671, and nearly every major metropolitan area now has a low-cost public two-year college. California's policies are still more liberal than those of any other state, but its share of two-year college enrollment has dropped to 28 percent as other states have adopted California's pattern.

Our regressions indicate that, if the SMSAs without two-year colleges in 1955 had not established such colleges, our sample's college attendance rate for males would have been 138 per 10,000 instead of 181 per 10,000 and the rate for females would have been 51 per 10,000 instead of 76 per 10,000.[12] Total adult enrollment would have been roughly 30 percent lower.

The only aspect of public policy that has tended to depress enrollment is the rise of tuition. In constant 1970 prices, the average of two-year college tuitions rose from $102 in 1956-1957 to $178 in 1969-1970. Our regressions indicate that, if tuition had averaged $102 in 1969-1970, adult enrollment would have been roughly 15 percent higher. Thus the net effect of public policy shifts of the last twenty years has been to encourage adult college enrollment.

If we were willing to make some strong assumptions and if we knew adult enrollment rates for 1955, it would be possible to decompose the growth of adult enrollment into a policy-induced component and an exogenous-demand component. Unfortunately, the earliest year for which enrollment data on adults over the age of 35 are available is 1968, so no such decomposition is feasible. We do know that degree-credit college attendance rates of males and females aged 30-34 with

12 or 13 years of schooling were two and one-half times higher in 1970 than in 1960. This growth rate is so high that public policy shifts outlined above can be responsible for only a portion of it.[13]

The residual must be attributed to changes in either the economic climate or the cultural climate (tastes). The relative wages of college graduates were improving during the period; however, cross-section work has failed to identify a relationship between adult college attendance and relative wages.[14] Further evidence against an economic climate explanation of the adult enrollment growth has been the continuation of that growth in the face of the bust of the labor market for college graduates that has occurred since 1969. The explanation based on cultural climate includes such developments as the women's movement and the lifelong learning movement. It cannot be tested in our data, but by a process of elimination this is the likely explanation of the residual. This explanation is consistent with the fact that female attendance rates were rising faster than male attendance rates (especially when one subtracts out the effect of the GI Bill).

What does this analysis of the past tell us about the future? Without major new public initiatives, we expect the rise of adult college enrollment rates to slow and for males a decline is in prospect.
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Enrollment rates for adult males may decline, because most Vietnam War veterans will soon exhaust their eligibility. The rise in female attendance rates should slow because almost all metropolitan areas now have a public two-year college. Further major improvements in accessibility do not seem to be in the cards.

We have no way of predicting whether changes in tastes will continue to stimulate enrollment growth. However, since we assign shifts in the cultural climate a major role in past developments and it is the only one of the three that is consistent with a continuously increasing adult enrollment rate, many will consider our look into the future an optimistic one. A further source of future growth in enrollment is the upward trend in the number of adults who have started but not completed college. An adult with one year of college is seven times more likely to be enrolled in a degree-credit program than an adult with only a high school degree. Adult enrollment rates will continue to increase, however, only so long as tuitions are kept low. Setting the tuition for adults at a close-to-self-supporting level would cause a precipitous drop in adult enrollment.

B. Implications for Tuition and Financial Aid Policy

Adult students are more responsive to tuition levels than are recent high school graduates. In economics the standard measure of demand responsiveness to the price of a product is its price elasticity--the percentage decrease in enrollment per percentage point of increase in the price. At the mean tuition of $180 per year, tuition elasticity was -.44 for husbands, -.58 for wives. Cross-section studies generally find the demand of younger students to be substantially less elastic than this. Hopkins [14] obtained a public college tuition elasticity of .10 for aggregate enrollment. At public college tuitions of $200, the regressions in Corazzini et al. [7] imply an elasticity of aggregate enrollment to a simultaneous change of all public college tuitions of -.20.[15] The tuition elasticities estimated

by Bishop [2] for male high school juniors in 1960 ranged from -.39 for recent high school graduates from poverty backgrounds to -.08 for those with high-income parents. While interactions between family income and tuition elasticity were clearly evident for recent high school graduates, such interactions were not discernable for adults.

The high elasticity of demand for adults means that for a given governmental budget, tuition reductions will have a larger impact on adult college enrollment than on enrollment of high school graduates. Table 2 tabulates the cost in lost tuition revenue of inducing one more full-time equivalent adult student to attend college by making small reductions in tuition. The higher the tuition elasticity, the lower this cost is. The comparable cost in 1970 prices of recruiting 18 and 21 year olds is in the neighborhood of $3,000.[16] Only in the logit models and for adult males in the high tuition range (above $200) does the cost for adults go above $1,000. If a million dollars were "spent" lowering public college tuition for adults and providing the staff to teach them, the equivalent of between 486 to 601 new full-time students would be produced.[17] If we assume equal costs of instruction, the same million dollars applied to lowering tuition and hiring staff for recent high school graduates would produce about 227 new students. Most adults attend two-year colleges, and instructional costs per full-time equivalent are generally lower at these institutions ($1437 as opposed to $2526 at four-year colleges in 1969-1970.)

The current fee structure of many colleges frequently discriminates against part-time students by forcing them to pay higher per course charges than full-time students. Since most adults go part-time, and since they are more responsive to costs than young students, it may be desirable to

Table 2. Cost of Inducing One More Adult Student to Attend College Full Time at Specific Tuition Level*

Level of Tuition	Sex	Adjusted for Flows from Private Colleges[b]	No Adjustment for Flows from Private Colleges[b]			
			Model and Sample			
		Linear Regressions 25-65 yrs. old Married	Linear Regressions 25-65 yrs. old Married	Logit Using Indiv. Data 25-54 yrs. old Married	Logit of SMSA Avgs. 25-29 yrs. old Marr. & Single	Logit of SMSA Avgs. 30-34 yrs. old Marr. & Single
$100	Male	$577	$378	$420	$484	$326
	Female	772	317	520	235	319
	Average[a]	655	354	450	373	323
$300	Male	$582	$627	$1870	$1670	$2837
	Female	- 34	135	318	865	698
	Average[a]	263	372	906	1160	1389

*The marginal subsidy cost of one more student can be obtained by adding the marginal costs of instruction to the negatives of the marginal revenue given above.

[a]Averages are calculated using the formulae $[(-MR_m)\ dp_m/dT + R_w(-MR_w)\ dP_w/dT] \div (dp_m/dT + R_w\ dp_w/dT)$ where R_w is the ratio of eligible women to eligible men in the sample (1.309), p_m is the proportion of men attending at the given tuition level, and MR_m is the marginal revenue.

[b]The first column is calculated in the manner described in footnote 15. All the other columns assume that a grant program lowers costs in all colleges simultaneously and that all additional students enter public institutions. Private college enrollments remain constant. The formulae is $MR_m = T - p_m\ dT/dp_m$ for linear regression models and equivalently $MR_m = T - 1/\alpha(1-p_m)$ for logit models where α is the logit coefficient on tuition.

redesign tuition structures so as to equalize per course fees between part-time and full-time students. Another suggestion would be to turn the Basic Opportunity Grants program into an entitlement program by allowing students eligible for financial aid when they are 18 but who choose not to go to college immediately to use the aid at any later point in life they choose.

These policy suggestions are put forward tentatively, however, for for there are a number of other important and relevant issues to be examined. Is full-time study more effective per credit hour than part-time study? Are learning and socialization processes more efficient when the individual is young? Are the public benefits of a year of college less for adults than for younger students? The answers to the first two questions are not known. The only thing that can be said with certainty about public benefits of adult education is that such benefits are received over a shorter period of time. Thus if the public benefits of college occur equally in each year of a person's life, the fact that a 40-year-old has fewer years to live lowers the present value of the public benefits he produces to 78 percent of the corresponding present value for a 20-year-old.[18]

Another argument against lowering tuition for adults is as follows: Schooling should be priced according to ability to pay, and adults (especially when studying part-time) have higher incomes and, therefore, can afford to pay more. If being able to afford something means that one will buy it regardless of price, our results demonstrate that the premise of the value judgment is wrong.

On the other hand "afford" may be another way of saying "ability to pay." The practice of awarding financial aid to students may seem

to provide a precedent for tuition charges adjusted to one's ability to pay. Student financial aid, however, is presently based primarily on the parents' ability to pay. The social objective served is that of making every youth's opportunity for higher education independant of the socioeconomic level of his or her family.

The current financial aid system, in which subsidies vary with parental income, is consistent with this objective of equality of intergenerational opportunity. An aid system with eligibility based on the current income of the student would be inconsistent with this objective, because anyone could become eligible for aid merely by stopping full-time work to become a student. Thus, arguing that prices charged to different age groups should be based on the average ability to pay of people in the age group is not the application of an old principle but the introduction of a new one.

It is unclear what the results would be if age groups were compared by ability to pay. While adults have higher incomes, they usually have considerably greater financial responsibilities (spouses and children) and typically do not have parents willing and able to help pay for college.

IV. Summary

Colleges and universities facing "steady state" or declining enrollments in the 1970s have looked with increasing interest at the advent of the lifelong learning movement with its emphasis on the adult student. But little is known about what determines the proportion of adults that attend college.

This study examined institutional and individual determinants of adult participation in higher education. A sample of 57,689 individuals living in SMSAs was selected from the 1970 Public Use Census Tapes. The degree-credit college enrollment of married men and women aged 25 and older was predicted by an ordinary least squares regression. Age, sex, number of children, income and occupation played important roles in predicting adult attendance. Being a Vietnam veteran tripled the likelihood of a male's attending college.

Out regression equation enabled us to predict the effect of alternative tuition levels on total adult enrollment. Lowering tuition from $400 to zero doubled the local college attendance rate of adults. Establishing a new two-year college in an SMSA without one also doubled adult enrollment. None of the characteristics of local public four-year institutions was found to have a significant effect on adult enrollment. A supplementary logit analysis of variations of the average attendance across SMSAs confirmed the findings of the regression analysis.

Between 1955 and 1970 the proportion of our sample living in SMSAs with local two-year colleges rose from .45 to .90. The GI Bill was extended and liberalized. These changes in public policy are responsible for an important part of the past growth of adult enrollment. Enrollment growth due to cultural changes (the lifelong learning movement and the women's movement) may continue. But, except for lowering tuition, there is little public policy can do to further stimulate the growth of adult enrollment. Therefore, past rates of adult enrollment growth are not likely to continue.

Despite the fact that they usually attend part time and have incomes that are large relative to tuition, adults are more responsive than recent high school graduates to the level of tuition. This means that a reduction in tuition for adults would result in more students per dollar of government expenditure than a similar reduction in tuition for students of traditional college age.

Appendix Table 1

The Effect of Two-Year College Policy on the Percentage of Eligibles Attending First Two Years of College: Husbands Over 25*

	Attendance at any College		Attendance at Public College	
	Regression coefficient	t	Regression coefficient	t
Tuition at two-year college ($100's)	-.641	-3.67	-.755	-4.87
Tuition squared ($100's)	.077	2.46	.0845	3.04
Distance to central business district (miles)	-.028	-1.34	-.011	-.59
No two-year colleges within 40 miles	-.914	1.25	-.283	-.41
Percentage accepted at two-year college	+.0034	-.49	.012	1.84
Two-year college is open-door	.288	1.02	.177	.71
Size of attendance area (square root of area)	.054	1.99	.026	1.09
No local two-year college within SMSA	-1.422	-1.90	-.966	-1.46
Vietnam veteran	2.514	6.21	1.695	4.51
Veteran	.692	3.19	.492	2.55
Negro	-1.305	3.54	-1.196	-3.65
Spanish American	.401	.83	.651	1.51
Child under 6 (0-1)	-.272	-1.04	-.205	-.88
Number children under 18	-.145	-1.93	-.079	-1.18
Professional/technical	2.85	8.39	2.16	7.15
Government worker	2.35	8.77	2.36	9.91
In armed forces	-4.66	-5.99	-3.73	-5.40
On welfare	3.48	4.14	2.76	3.73
$\bar{R}^2$	.038		.033	
Mean of dependent variable	1.811		1.419	
Number of Observations	20,652		20,652	

Appendix Table 1 (continued)

Note: All coefficients are multiplied by 100 so they can be interpreted as changes in the percentage attending. Variables controlled but not shown were age, age squared, Jewish, teacher, blue-collar,worker, farmer, self-employed, and not working for pay.

*While R^2 are reported, they are not a useful criterion for comparing models. With a zero-one dependent variable, R^2's inevitably fall as the mean of the dependent variable approaches either zero or one. The appropriate criterion for judging success is the substantive importance of the effects estimated and their statistical significance. When the dependent variable is the average attendance rate for each SMSA, R^2's between .5 and .7 are obtained. This approach, however, involves sacrificing the ability to estimate the impact of personal characteristics--veteran status, occupation, family income and children--on college attendance.

Appendix Table 2

The Effect of Two-Year College Policy on the Percentage of Eligibles Attending First Two Years of College: Wives Over 25*

	Attendance at any College		Attendance at Public College	
	Regression	t	Regression	t
Tuition at two-year college ($100's)	-.297	-2.93	-.389	-4.23
Tuition squared ($100's)	.0251	1.41	.0418	2.60
Distance to central business district (miles)	.017	1.43	.012	1.11
No two-year colleges within 40 miles	-.538	-1.18	-.290	-.71
Percentage accepted at two-year college	-.001	-.28	.0013	.35
Two-year college is open-door	.457	2.82	.414	2.81
No two-year college within SMSA	-.423	.67	-.495	-1.25
Number own children ever born	.057	1.16	.047	1.06
Negro	.184	.80	.180	.87
Spanish American	.250	.81	.388	1.40
Children under 6 (0-1)	-.723	-4.62	-.543	-3.84
Number children under 18	.029	.63	.003	.06
Professional/technical	1.535	6.18	1.231	5.48
Government worker	.500	2.73	.504	3.06
Teacher	3.697	5.37	2.46	3.96
On welfare	.370	.77	-.101	.23
Has not worked for pay since 1959	-1.452	5.67	-1.157	4.99
$\bar{R}^2$	.0095		.0083	
Mean of dependent variable	.758		.618	
Number of Observations	27,036		27,036	

Note: Variables controlled but not shown were age, age squared, Jewish, size of attendance area, blue-collar worker, farmer, self-employed, and in the armed forces.

Appendix Table 3

Logit Model of the Determinants of Degree Credit College Attendance of Married Non-Minority Adults Between 25 and 55 Years of Age*

	Males		Females	
	Logit Coefficient	t	Logit Coefficient	t
Tuition at two-year college ($100's)	-.196	1.14	-.163	1.16
Tuition > $200	.149	.61		
Distance to central business district (miles)	-.010	.46	.006	.18
No two-year colleges within 40 miles	-.840	1.51	-.949	1.23
Two-year college is open-door	.089	.40	.356	1.14
Four-year college tuition	.007	.10	-.026	.26
Viet Nam Veteran	.466	1.88		
Professional/technical	1.191	5.27	.417	1.48
Government worker	.664	2.74	.797	2.19
Spouse Income ($100's)	.0080	2.46	.0065	2.25
Number of children	-.043	.53		
Child under 6			-.853	2.64
Age	-.129	8.01	-.082	4.38
Local unemployment rate	.062	1.51	.130	1.30
Clerical Wage ($100's)			.005	.12
Extra Earnings of College Grad Occ. ($100's)	.0037	.22	.002	.40
Number of observations	5459		7085	
Proportion Going	.0205		.0086	
$\bar{R}^2$	.0519		.0085	
Entropy[a]	.0341		.0462	
Entropy reduction[a]	.0158		.0033	

Appendix Table 3 (continued)

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*The logit of the probability [log (p/1-p)] is the dependent variable in Table 3. Sample size is less than one-quarter of that used in the linear regressions and consequently the t ratios are generally half of those obtained with the larger sample. The sample used was obtained by taking every individual who went to college and one-tenth of those who did not go. The people who did not go were given a weight of 10 in the estimation. Since the probability of attendance is less than .03, $\ln(p) \approx \ln(p/1-p)$, the proportionate impacts of an independent variable on enrollment may be closely approximated by taking the anti-$\log_e$ of the coefficient. For instance, the anti-$\log_e$ of the male government worker coefficient (.664) is 1.94, implying that being a government worker increases a male's probability of attendance by 94 percent. The anti-log of the coefficient on age (-.129) is .88 implying that as a male gets older his probability of attending college decreases by 12 percent each year.

[a]Entropy is a measure of the uncertainty of a probability distribution that is defined as minus the expectation of the logarithm of the probability. For categorical dependent variables it is a better measure of fit than R^2. If the outcome being predicted has only two alternatives, the entropy ranges between 0 and $-\ln(.5) = .693$.

Appendix Table 4

College Attendance of 25-34 Year Olds With 12 or 13 Years of Schooling--The Logit of SMSA Attendance Rate as[d] Function of SMSA Characteristics

Independent Variable (means in parentheses)	Males		Females	
	25-29	30-34	25-29	30-34
No. 2 Yr College with 40 miles (.227)	-.771 (4.37)	-.632 (2.81)	-1.09 (6.00)	-.97 (4.72)
Tuition at 2 yr college[a] (1.65)	-.186 (2.58)	-.246 (2.73)	-.308 (4.18)	-.245 (2.78)
2 yr tuition GT $200[a] (.53)	.130 (1.19)	.213 (1.56)	.190 (1.73)	.143 (1.1)
Unemployment Rate[b] (4.61) (3.25)	.032 (2.17)	.030 (1.64)	.173 (4.11)	.150 (3.08)
Open Door 2 Yr College (.46)	.10 (.93)	.27 (2.04)	.02 (.21)	.02 (.19)
Proportion of women married and living with spouse[c] (.77) (.81)	.672 (.52)	-4.93 (2.53)		
Log pop of SMSA (1.363)	.091 (2.12)	.004 (.07)	.081 (1.77)	.009 (.17)
Proportion of employed Prof-Tech[d] (.21) (.20)	1.30 (1.55)	3.19 (3.01)	2.44 (1.74)	
Real Wage in SMSA[a,f] (79.86) (34.41)	.003 (.37)	.017 (1.77)	.029 (1.82)	.014 (.75)

Appendix Table 4. (continued)

Independent Variable (means in parentheses)	Males 25-29	Males 30-34	Females 25-29	Females 30-34
Tuition at 4 yr[a] (3.88)	-.037 (1.32)	-.009 (.25)	.004 (.14)	-.011 (.33)
Proportion of women who are married and have child < 6 (.53) (.55)			-.486 (.35)	-2.98 (1.71)
Unemployment Rate of Prof-Tech Males (1.60)			-.165 (2.03)	-.112 (1.17)
$\bar{R}^2$	.537	.510	.660	.541
Probability corresponding to mean logit	.0693	.0370	.0235	.0205
$\bar{R}^2$ model with V1 to V4 only	.501	.450	.601	.519

Since the probability of attendance is close to zero the coefficients are approximately equal to those that would be obtained from a semi-log specification $\ln Y = \beta X$. t values are in parentheses below the coefficient.

[a]All dollar figures are deflated by a local price index and are in hundreds of dollars.

[b]The unemployment rate for males is the rate for male operatives: the mean of which is 4.61. For females it is the female clerical rate; the mean of which is 3.25 (Table 86 and 88 of 1970 Census Detailed Characteristics.

[c]The proportion of women married is highly correlated with the proportion of men married. It was separately calculated for the 25 to 29 and 30-34 age groups (Table 152 of 1970 Census Detailed Characteristics PC(1),-D). It applies to all levels of education.

Appendix Table 4 (continued)

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[d]This variable is defined separately for each sex as the proportion of the employees 30-34 years of age that are Professional or Technical workers. (Table 174 of 1970 Census Detailed Characteristics PC(1)-D). It is not limited to those with 12 or 13 years of schooling.

[e]Proportion of women married with children under 6 is the age specific marriage rate defined above times the proportion of husband wife families (head 25-34) with children under 6. (Table 156 of 1970 Census Detailed Characteristics PC(1)-D).

[f]For females the wage level variable is mean income of those 25-34 years old who have 12 years of schooling. For males the wage level is average yearly earnings of male operatives.

Notes

[1]Southern metropolitan areas were excluded because our inability to control for regional differences in educational climate, racial recruitment patterns, and costs of living might confound comparisons between the South and the rest of the country.

[2]There are a number of advantages to a methodology that uses data on individuals rather than SMSA averages. First, the Census Bureau publishes college enrollment tabulations only for people under age 35, so the enrollment of older people can be studied only by using the Public Use Tapes. Personal characteristics such as age, veteran status, marital status, and number of children are important determinants of college attendance. SMSA averages of these variables for people with 12 or 13 years of schooling aged 25-35 are not generally available. Even if SMSA averages of the appropriate individual-characteristic control variables were available, they would tend to be collinear with the measures of college availability; the independent effects of each would be difficult to disentangle. The disadvantage of using ordinary least squares on individual data is the heteroskedasticity of the error term. While this does not bias our coefficients, it does exaggerate their statistical reliability to some extent.

[3]In 82 SMSAs the values of these variables assigned each person who lived in the SMSA were the same throughout the SMSA. In a few of the very large SMSAs--Baltimore, Boston, Chicago, New York, Philadelphia, Pittsburg, St. Louis, and Washington--separate measures of availability were defined for the central city and for different parts of the suburban ring.

[4]New York City provides an illustration. On a priori grounds one would expect New York City with its heavily Jewish population to have a stronger taste for higher education than any other city in the nation. Yet it was not until 1959 that the first two-year college with degree-credit programs was established. New York City also lagged behind much of the rest of the nation in adopting open admissions, and the city's suburbs have not adopted it yet. One would expect the taste for higher education to be stronger in the suburbs. Some suburbs (for example, those of New York and Chicago) have substantially higher tuitions and more restrictive admissions policies than the central city, while others have lower (for example, those of Detroit and Washington, D.C.).

[5]Exogeneity of public policy is a standard assumption in studies of the demand for higher education. Evidence in favor of this assumption is provided by the fact that, when SMSA-specific attendance rates of persons aged 25-34 were predicted, adding measures of the educational climate to the regression equation did not appreciably change the coefficients on tuition or on the dummy variable for existence of a local two-year college. The measures of educational climate (real per-pupil expenditure at the K-12 level and the proportion of household heads with a high school degree or more) were statistically insignificant, and per-pupil expenditure had the wrong (negative) sign. Simultaneous equation methods are not available because (a) each individual is an observation and the simultaneity is at the SMSA or state level, (b) two of the potentially simultaneous variables are zero-one dummies, and (c) three variables are potentially simultaneous so the three exogenous predictors of them would be needed and three such exogenous variables do not exist.

[6]A two-tailed t-test with a critical value of 1.96 was used to test each hypothesis. When a hypothesis referred to the combined effect of two or more variables, as with tuition and tuition squared, the test was conducted by performing an F-test on the increment in R^2 when these two variables were added to the model.

[7]The iterative maximum likelihood program that must be used to estimate a logit model is quite costly to run on large numbers of observations. A sample size equal to that used in the linear regression would have cost over $200 a model. It was these costs that necessitated the smaller sample.

[8]Our measure of family income was defined to exclude the individual's own earnings in order to avoid a feedback or simultaneity bias in our estimates. Attending school takes ~~time, and often this time must come~~ at the expense of time spent working. Thus, deciding to attend school will often cause a reduction in one's earnings. Causation runs both ways, so entering own earnings would contaminate estimates of the effects of other variables. The family income variable includes spouse's earnings and unearned income--interest, rent, dividends, pensions, Social Security, and public assistance. Because it has an income effect only, we expected it to have a positive impact on the probability of college attendance. It is also possible that a husband's withdrawal from the labor market in order to attend college may induce the wife to increase her hours of work. Here again husband's attendance and wife's earnings are simultaneously cause and effect. Because of this danger, all other results reported in this paper are from a regression that did not include a family income variable as a control variable.

[9]In addition, the fact that an individual with only 12 or 13 years of schooling entered a professional technical occupation may reflect a pre-existing aspiration to start or complete college work. If the aspiration was not already there, it may have been induced by contact with college graduates on the job.

[10]It is unlikely that the difference between veterans and non-veterans is wholly attributable to past and present GI Bills. One can think of other reasons why veterans might be more likely to attend college: They might have had their schooling plans involuntarily interrupted by army service, or they might have entered the armed forces partly because of the educational benefits they would become eligible for upon discharge. The armed forces reject men who score below a certain level on the AFQT. Therefore, relative to the rest of our sample, veterans may have high academic aptitude.

[11]For example, in 1955 the following cities did not have a local public two-year college that offered degree-credit course work: New York, Louisville, Memphis, Miami, Jacksonville, Atlanta, St. Louis, Cleveland, Cincinnati, Toledo, Philadelphia, Pittsburgh, Newark, Buffalo, Albany, Milwaukee, Hartford, Wilmington, and Portland. The residents of Washington, D.C., and Detroit faced high tuitions and restrictive admissions policies if they chose to attend the two-year institutions located in and controlled by suburban jurisdictions.

[12]Forty-five percent of our sample lived in SMSAs that had established their two-year college system after 1955. Some of the large SMSAs that fall into this category are New York, Philadelphia, Pittsburgh, Newark, Cincinnati, Cleveland, Minneapolis, St. Louis, Dallas, Houston,

and Portland. There were two junior colleges in the New York SMSA in 1955, but they offered only terminal vocational programs. Our estimate of the effect of establishing new two-year colleges assumes that tuitions at the new two-year colleges averaged $180 and that the full enrollment impact of new two-year colleges is achieved within a few years. In fact, there seems to be a long lag before the full enrollment impact occurs, so our estimate overstates the size of the short-term response.

[13]Further evidence for the proposition that public policy shifts are only part of the story comes from the fact that between 1960 and 1970 enrollment rates of persons aged 25-34 were rising almost as fast in California as in the nation as a whole despite the fact that California's community college policies remained unchanged.

[14]In the logit models reported in Appendix Table 4, variables designed to measure the local labor market's economic payoff to completing college were tried out as independent variables. They never were statistically significant and often had the wrong sign. This is by no means conclusive evidence, but it suggests that the improvements in the relative wages of college graduates that occurred in the 1950s and 1960s were not contributors to the rising rates of adult college attendance.

[15]Time series studies of enrollment demand by Cambell and Siegel, and Hight obtain substantially higher tuition elasticities of demand. Their tuition elasticities are biased upward, however, by the lack of a variable measuring the return to schooling. For a more extensive review of the literature, see Jackson and Weathersby (1975).

[16] When tuition is lowered by one dollar, the increase in total public subsidy=(the change in public college enrollment)·(instructional cost-tuition) + (the number already enrolled)·(one dollar). Dividing this cost figure by the change in total enrollment produces an estimate of the marginal subsidy cost of the equivalent of one more adult full-time student. This calculation assumes that adult tuition is lowered at both four-year and two-year colleges, and takes account of student flows from private to public colleges when tuition is lowered. For example, for men: [(.004686)($1400 - 180) + (1.6073)($1)] ÷ .0038272 - $1914.

[17] In the period around 1960, the marginal subsidy cost of an extra freshman obtained by a general reduction in tuition was $1595 plus the cost of instruction [2]. This estimate is low because it does not account for shifts between the public and private sectors, which tend to increase the marginal subsidy cost. Prices, incomes, and attendance all have risen since then, increasing the marginal subsidy cost even more. A conservative estimate of the current marginal subsidy cost of freshmen and sophomores of the traditional age would be $4400 ($3000 plus the cost of instruction).

[18] It is discounted benefits that are comparable with initial costs, and the discounted sum of benefits does not vary significantly for variations in age below age 40. For instance, at a 5 percent real interest rate the present value of $1 received in every year of one's life is 16.7 at age 20, 15.6 at age 30, 13.1 at age 40, and 11.6 at age 50.

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