Extensive data is presented which clarifies the number and percentage of persons who complete high school and college. Historical trends for the elementary, secondary and college levels are included. The report takes note of a number of growth and constraint factors: (1) wars, depressions, and the higher social cost of post-secondary instruction; (2) the Higher Education Facilities Act of 1963 and the Higher Education Act of 1965 and the resultant growth of community colleges; and (3) the G.I. bill. In general, elementary and secondary education are nearly universal, while the college B.A. continues to be a minority commodity. Decreasing attrition rates and increasing costs are also discussed. A quantitative model is proposed which suggests the manner in which future enrollment might be distributed by level under different policies for the growth of post-secondary instruction. Within the context of this model, two possible future states for the quantity of instruction are illustrated. (Author/TL)
I DEPAN II OF WEALTH TO EDUCATION WE ARE OFFERED EDUCATION AS A PATHWAY TO PERSONAL AND SOCIAL DEVELOPMENT. INSTITUTIONS OF LEARNING ARE IMPORTANT FOR THE FUTURE GENERATION.
This report was prepared pursuant to Contract No. OEC-1-7-071021-4429 with the Office of Education, U. S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.
INTRODUCTION

To address future alternatives for financing post-secondary instruction requires some answers to the prior questions: How much instruction? Of what kind? For what purpose? For whom? It is the first of these questions and, to some extent, the last which have been addressed in this research.

However, no policy research group can provide absolute answers to such questions. New answers will be provided in the future and are provided daily by the revealed choices of the individual members of our society and their respective agents. But, policy research groups can attempt to raise old questions in new ways, seek new alternatives, and describe possible outcomes in the hope that future social choice may be somewhat more informed than has been the case in the past. This is a report of a beginning attempt to do this in the field of post-secondary education.

Most of the analysis which has been done in the past has addressed specific components of the educational system independently without reference to the system as a whole. Because of the various components of the educational system have developed independently, this procedure has been reasonable. Indeed, there has been good reason for believing that no single homogeneous system exists which encompasses the wide variety of instruction which is offered at many different levels with many different objectives. Nevertheless, at the outset of this work, it was decided to examine the system as a whole. The purpose adopted here was to bring together available data on as many separate components of the system as might be examined within the time allowed and to discover whether understandable relationships might not
exist between them. It is hoped that future planning for education might benefit from knowledge of some of the relationships described here.

The historical analysis presented in Section I of this report describes what is possibly the most significant event of the 20th Century in the development of educational institutions in the United States. This is the development and maturation of a nearly universal system of secondary school instruction. Post-secondary institutions, however, have developed independently of this movement. Until about 1930, the quantity of post-secondary instruction produced by institutions of higher education was more than adequate to serve the needs of then current generations of young people, less than 30 per cent of whom ever completed secondary school. Since that time, however, the output of the secondary schools has persistently grown such that, sometime between 1950 and 1960, the secondary school experience of youth became an uninterrupted extension of elementary school experience. More than 80 per cent of today's generation will complete secondary school.

Partly because of wars, partly because of the economic depression of the 1930's, and partly because of the economic demand for alternative uses of the time of young people, growth in the quantity of post-secondary instruction at institutions of higher education has not kept pace with the development of secondary instruction. Although significant growth in the quantity of post-secondary instruction has occurred, and, it is safe to say, will continue to occur, the proportion of high school graduates who complete a four-year post-secondary degree, nevertheless, stands today roughly what it was about the turn of the Century.
This is now changing. But, **should our society wish to afford it**, the potential demand for post-secondary instruction created by our secondary schools today far exceeds the current capacity of our existing public and private institutions of higher education. This follows if one accepts one simple proposition: That the amount of time spent in receiving formal instruction imparts some special advantage to an individual as compared to his contemporaries of comparable abilities who have received less. It makes little difference whether one translates such advantage into purely economic terms or into non-economic terms related to the quality of the individual's life and the quality of future society. If one accepts the notion that formal instruction imparts special advantage to an individual, then growth in educational attainment and progress in the dissemination of knowledge will continue, but only to the extent that we as a society choose to allocate our limited economic resources to that end. If growth in educational attainment, as measured by the time spent in receiving instruction, and progress in the dissemination of knowledge are to continue, that growth and progress must occur largely at the post secondary level.

Section II of this report offers one kind of model within which various alternatives for the future quantity of instruction may be examined. The specific model used here was chosen because it describes sequential time processes, of which the acquisition of incremental time units of instruction is one, and because it conveniently accommodates many of the ideals regarding equality of educational opportunity which are believed to be widely shared among the citizens of the United States. The criteria of equality of opportunity adopted here are not new or original. They have been stated many times before by both governmental and non-governmental units both
here and abroad. But, what is new here is the notion that there may be certain logical and practical limits to the growth process, as it pertains to the quantity of instruction produced in the future, within which the goal of equality of educational opportunity might be realized. These suggested limits are described in quantitative terms. However, many alternative future amounts of instruction may be described within these limits.

Two specific alternative future states for the quantity of instruction are described which highlight two possible extremes for future policy. One, in which the average amount of instruction received per person prior to age 35 continuously rises for successive age cohorts, much as it has throughout the 20th Century. And a second, in which the average amount per person is stabilized at a specific level for those individuals who will complete high school within the next few years and for all subsequent generations.

The purpose in this is not to predict what will happen in the future. Rather, the purpose is to provide a quantitative frame of reference within which to analyze what kinds of future policies and what kinds of social and institutional responses to those policies might be needed in order to achieve either of the two extremes.
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ABSTRACT

The most striking accomplishment of the educational system during the 20th Century has been the growth and maturation of a nearly universal system of secondary school instruction. The proportion of school age generations completing high school has risen from about 5 per cent in 1900 to about 80 per cent today. (pp. 1-5)

Given a conflict between a desire for high standards of achievement on the one hand and a desire for universally available instruction through year 12 on the other, growth in the proportion of successive age cohorts completing year 12 may have been constrained by the learning process itself. (pp. 5-7)

Growth in the proportion of successive age cohorts completing a BA level degree also has been impressive. But growth in this proportion has been constrained by wars, depressions, and a higher social cost of post-secondary instruction. About 80 per cent of today's college age generation will not complete a BA level degree. Although post-World War II veterans' aid permitted some who would not otherwise have gone to college to do so, on net balance, the main effect of this program probably was to compensate for educational losses during the war. Following the more recent student aid legislation of 1965 and subsequent years, college completion rates rose above their long-run trend. (pp. 7-12)
Except for a time during the prosperous 1920's, the proportion of high school graduates completing a BA level degree fell from about 75 per cent in 1875 to a low of about 20 per cent during the late 1930's. Since that time this proportion has shown a gradual rise to about 30 per cent with periods of stability from 1955 to 1965. But, the proportion now stands at about the same value it had at the turn of the Century. (pp. 12-15)

Attrition within four-year degree-credit programs was gradually reduced during the first half of the 20th Century. Although attrition rates may have been increased somewhat during the 1950's, the proportion of those starting a four-year program who complete the process has been stable at about 54 per cent during the 1960's. High school to college entry rates have thus followed much the same long-run pattern as the proportion of high school graduates completing a BA level degree. It is likely that a gradual rise in entry rates has occurred in recent years. (pp. 15-21)

A marked discontinuity in completion rates between school year 8 and 9, evident at the turn of the Century, has been closed with the maturation of the secondary system. Thus, growth in the proportion of subsequent age cohorts completing 12 years of school may be expected to slow. However, a similar discontinuity between years 12 and 13 remains. In the process of reducing the discontinuity between years 8 and 9, attrition between years 9 and 12 first increased and subsequently diminished. (pp. 21-28)
The historical experience for school years 1-8, 8-12, and 13-16 is summarized. (pp. 28-32)

The Higher Education Facilities Act of 1963 and the Higher Education Act of 1965 permitted one of the most significant changes in the institutional structure of the tertiary system since the formation of the land grant colleges during the late 19th Century. This is the growth in enrollment at community colleges. Quite in addition to new forms of post-secondary instruction, these new colleges are now responsible for more than one-third of the current lower-division instruction in traditional four-year programs. During this recent period of change, attrition from year 13 to year 16 has remained unchanged and, according to survey reports from students, the prior preparation of those entering community colleges has improved relative to other institutions. (pp. 32-38)

Universities have responded to persistent and increasing pressures for more graduate level instruction. The proportion of those receiving a BA level degree who have also received an advanced degree has persistently increased since about 1920. There is no indication whether this trend might be altered in the near future. (pp. 38-41)

Constant dollar expenditures on current account per man-year of instruction have persistently increased during the 20th Century at both the elementary-secondary level and for higher education. But, reflecting differences in growth patterns, average expenditures for elementary and secondary
education have increased 11 times since the turn of the Century, while average expenditures for higher education have increased only 2.8 times. Many believe this rising expenditure pattern means that average expenditures per student will continuously rise in higher education due to continuously rising costs of professional services used. Except for relatively brief periods, technological innovation in education apparently has been used to enhance or extend the learning process rather than to reduce the amount of human resources used per student. (pp. 41-46)

Because most instruction at both post-secondary and earlier levels is produced under the auspices of state, local, and Federal governments, the future quantity of instruction will depend mainly on public policies and the social response to those policies. One kind of quantitative model, which accommodates many widely shared ideals regarding equality of educational opportunity, suggest the manner in which future enrollment might be distributed by level under different policies for growth of post-secondary instruction. The distribution is suggested by a continuous attrition function for years of instruction completed by each age cohort. The model produces reasonable implications for both degree-credit and non-degree instruction at the post-secondary level. However, the historical amount of non-degree instruction outside institutions of higher education cannot be verified. (pp. 47-59)

Within the context of this model, two possible futures states for the quantity of instruction are illustrated. One assumes that the mean
number of years of instruction completed prior to age 35 by successive age cohorts will continue to rise from one generation to the next, indefinitely. A second possibility illustrated assumes that, beginning with the generations reaching age 18 during the years 1969-1973, the mean number of years of instruction prior to age 35 would remain constant for all subsequent generations. Both cases assume that specified conditions of equality of educational opportunity would be realized. (pp. 59-63)
I. SOME HISTORY OF THE QUANTITY OF FORMAL INSTRUCTION IN THE UNITED STATES: 1870-1968

The High School Level

Chart 1 records what may be one of the most significant accomplishments of the American educational system in this century. The number of high school diplomas awarded has risen from less than 2 per cent of the number of 18-year olds in 1870 to nearly 80 per cent of this segment of the population in the Summer of 1968. [1] [2] With some qualifications regarding the changing age distribution of diploma recipients, one may take the index shown as an approximate measure of the rates at which each generation has attained the diploma. For example, this index indicates that somewhere near 20 per cent of the 1968 generation of students will live out their lives without a high school diploma, as compared to about 95 per cent of the generation of 1900.1

Omitting the depression years 1929-39 and the World War II years 1940-45, the ratio of the number of high school graduates to the number of 18-year olds has steadily increased by an average of 1.3 per cent of the number of 18-year olds annually. This growth reflects many factors. But among them, reduced opportunity costs—that is, a reduction in the

1 In general, the average age of diploma recipients was likely to be somewhat older in the earlier years than for later years. This would suggest that the slope of a curve showing the proportion of 18-year olds who even received the diploma would be less steep than that of this index.
RATIO OF THE NUMBER OF HIGH SCHOOL DIPLOMAS TO 15 YEAR OLD POPULATION

1920

1940

1960

1970

50.9%

78.7%

100%

6.3%
number of desirable alternatives to formal study—in a society with a large publicly supported school system, is surely of major importance. Of course, the ratio fell during the World War II period as some 20 percent of the high school seniors 18 years old or more at the beginning of their last school year entered the armed forces.

Some individuals may argue about the extent to which this educational achievement represents "true" or significant social progress. Such arguments are usually cast in terms of an implied reduction in the quality of the average diploma. The arguments are that the high school graduates of the mid-1800's tended to be a scholar in the classical sense. A high proportion, in fact, went on to institutions of higher education and completed at least the BA level degree.

Certainly, the average content of the high school diploma is vastly different today from what it was 100 years ago. But, the question of the extent to which growth in the proportion of each generation completing high school represents significant progress may be addressed in a different way. An appropriate question is whether a higher proportion of each generation has mastered certain fundamentals of the current corpus of knowledge. A far higher proportion of 18-year olds have a basic literacy. It would seem a safe assertion, for example, that a significantly higher proportion understand the general properties of alternative number systems, have some elementary command of a foreign language, and know more about biology than did Darwin at the time he embarked on the voyage of the Beagle.
This represents significant progress in the dissemination of knowledge. Unfortunately, we know little about what these proportions are or what the quantitative dimensions of the current fundamental corpus of knowledge might be—let alone wisdom.

The argument that the average quality of the high school diploma is probably not as high today as it might have been had this growth not occurred, whether true or not, is quite irrelevant to an objective which seeks a wide dissemination of knowledge. Within the context of this task, the fact that we have created a set of conditions under which at least 80 per cent of subsequent generations will not only be exposed to a full 12 years of formal elementary and secondary schooling but will have achieved some currently acceptable minimum level of performance, as evidenced by the granting of diplomas, is significant indeed.

The objective of a universally available system of elementary and secondary instruction nearly has been realized. Barring any significant shifts in public policies and unusual surprises, one can suggest that the percentage of each generation completing the high school diploma will reach 85 per cent in the summer of 1976 on the Nation's 200th birthday. All that is needed is continued growth in real income per person, a continued gradual diminution in more desirable alternatives for the less well schooled 17, 19, and 17-year-old population, and, of course, continued diligence in pursuing the educational task this index represents. If the proportion
of Chart 1 continued to increase in the same manner as it has in the past, it would reach 95 per cent by the year 2000.2

Some Future Options

The Nation could, of course, seek to accelerate growth in this ratio. Alternatively, it could turn its attention to other educational matters and cause growth in this ratio to halt altogether. Some of the factors in this process may be illustrated. For example, one might cause acceleration in the growth of average standards of performance which would result in a slower rate of growth in the proportion of each generation completing the diploma than would otherwise be the case. Conversely, standards of performance might be reduced. But such a step would satisfy few; it does not address the educational problem. Few would suggest, for example, that the high school diploma be awarded to all students completing the 10th or 11th grade.3

Thus, the particular amount by which the proportion of each generation completing the high school diploma has persistently increased, year after

2 The particular function used to depict this alternative future for the ratio of Chart 1 carries an explicit assumption that the amount by which the ratio increases annually will decrease as the ratio approaches 100.

3 Despite the fact that such a step would not address the educational task, it might nevertheless, work to solve what some perceive as a growing social problem: the use of the diploma to exclude individuals from occupations for which that level of formal education is unnecessary.
year, over the course of the past 70 years might be explained as the result of a compromise between two dominant, powerful and conflicting social forces. On the one hand, the educational system has been faced with a persistent social desire for universal attainment of the high school diploma. On the other hand, it also has been faced with a persistent social need for an ever-increasing level of substantive achievement at each grade level. For example, in at least one suburban school system with a large proportion of high achievers, complaints are beginning to be heard that "the 12th grade is a waste of time." As a result, the educational system has been faced with strong pressures to raise grade-level standards--for those who can handle the additional difficulty with ease--and, at the same time, to avoid raising grade-level standards to avoid excluding those who are newly expected to meet prior standards.

This would seem to be a difficult compromise, indeed. It suggests that the rate at which the system has accommodated an increasing proportion of the age-eligible population has been constrained by the learning process itself, given the compromises required by these two strongly desired, but conflicting social objectives. Each marginal group, newly accommodated at a particular grade level, presumably represents a somewhat lower level of substantive attainment than the average of their more fortunate contemporaries. At the same time, it is entirely possible that each newly accommodated marginal group also represents a level of substantive attainment at least equal to some of their more fortunate predecessors.
Although one may suggest that growth in the proportion of the eligible population completing work for the high school diploma has been constrained by the learning process itself, it is important to repeat that there have been periods when a reduction in the number of acceptable alternatives to completing the diploma has caused the rate of growth to increase (1930's) and periods when an increase in the number of socially desirable alternatives has caused the rate of growth to decline. It is doubtful, for example, that many high school students were compelled to enter the armed forces during the 1940's. Thus, social and economic considerations which might alter the options of students are not irrelevant to this growth process.

The point of this discussion is not simply to make a forecast that, given a function describing the behavior of this ratio over the past 70 years, the proportion of 18-year olds attaining the diploma will reach 85 per cent in the Summer of 1976. Rather, the point is to understand the nature of such growth for the purpose of asking what will be required of the students, the educational system, and society at large if we choose to alter this rate of growth in alternative ways?

The Undergraduate Level

One can be impressed with the achievement of the elementary and secondary system during the past century and look with some pride on the attainment of a nearly universal system of public secondary school instruction. The
achievement in higher education has been no less impressive. Chart 2 suggests that the percentage of each generation completing a BA level degree has increased from about 2 per cent during the first two decades of the 1900's to about 20 per cent today. [3] [4] This ratio has increased by a factor of 10 in the past 50 years.

The ratio presented is actually the ratio of the number of BA level degrees awarded in a given year to a weighted average of the number of persons in each of 11 age cohorts from age 21 through age 31 on July 1 of each year. For example, a Census Bureau study [5] shows that in October 1965 about 15 per cent of 4th year college students were 20 years old and suggests that about 2 per cent were 30 years of age. Beyond these age limits the number of students accounted for is less than 1 per cent of the total number of 4th year students. Thus, the base for the ratio shown in Chart 2 was constructed to include 15 per cent of the number of 21-year olds on July 1 of the year in which the degrees were awarded and 2 per cent of the number of 31-year olds, together with corresponding percentages of each of the intervening age groups.

This ratio also must be taken only as an index of the proportion of each generation completing the degree. Again, it is the long term trend which is important.4 The fact that the value of the ratio for

4 The same qualifications must be attached to the trend of this index as to the one shown in Chart 1. The age distribution of degree recipients has not remained constant over this time period. The proportions of the earlier generations ever completing the degree is likely to be somewhat higher than that shown.
certain specified years departs significantly from the ratio it is intended to represent is of less significance. For example, the ratio for the World War II years and the years of the GI bill are much lower and higher, respectively, than the proportion of those generations who actually completed the degree.

This index suggests that the rate at which each generation has attained the BA level degree has increased by an average of about 3.6 per 1000 annually since 1920. This experience has not been uniform, however. Unlike the proportion of 18-year olds completing high school, this ratio remained below the long-run trend during the depression years as well as the war years. One possible explanation of the depression experience is simply that, relative to the economic and financial needs of students, undergraduate study was subsidized to a lesser extent than elementary and secondary study. Unlike the alternative of continuing one's high school education for 17-19 year olds, entering college was not as attractive an alternative for the 18-30 year old when employment opportunities declined during the 1930's.

Also, the post-WWII War II experience for higher education was unlike that of our high schools. The student financial aid granted returning veterans caused many of those who otherwise would have gone to college in the years 1940-46 to take up their academic careers again after the war. Undoubtedly, the aid given veterans also caused some who otherwise would not have gone to college to do so after the war. But, just as
certainly, there were others who would have gone to college but for the combination of an economic depression and a war who later judged their opportunity lost even with the additional financial assistance. On balance, it is a moot question whether the World War II veterans' aid did much more to advance growth in this ratio than compensate for the loss during the war.

The experience for both the 1966-67 and the 1967-68 school years require special attention. In both years a significant rise in the ratio of Chart 2 occurred. This can be explained by the effect of the Higher Education Act of 1955 which made more than half a billion dollars a year available to students in the form of loans and grants. This clearly made it possible for many students to graduate in those years than would otherwise have been the case. However, it is instructive to recognize that the effect of that legislation observed during 1967 and 1968 was necessarily confined to those who were within at least 3 years of graduation at the time the program was authorized. In other words, this result must represent the program's influence on part-time students and students who otherwise would have delayed their studies for a time. Subsequently, other effects of the newer governmental programs of the past years will be discussed.

In assessing the future of post-secondary education, however, one would wish to know more about the relationship between the quantitative output of institutions of higher education and the quantitative output of
the elementary and secondary system, because one is generally accepted to be a prerequisite for the other.

**Progression From High School to College**

Chart 3 shows the ratio of the number of BA level degrees awarded annually to the number of high school diplomas awarded 5 years earlier. [3]

[1] A 5-year lag is chosen simply because, in recent years, the average age on receipt of the BA level degree has been 23 as compared to an average age on receipt of the high school diploma of 18. Neither a 4-year lag nor a 6-year lag, however, makes much difference in the conclusions reached about long-run significance of this ratio.

The important points of Chart 3 are that the ratio of BA level degree recipients to high school graduates fell from somewhere near .75 in 1875 to a level of about .3 where it stabilized during the decade preceding 1913. It then fell to a level of about .2 by 1918. It rose again to a level of just under .3 in the prosperous period during the last half of the 1920's. It fell again during the Depression of the 1930's and the period of World War II. Of course, this index rose well above .3 during the period of the GI bill. But, it seems to have stabilized following the Korean War at just under .3 where it has remained for the past 10-12 years—again, with the exception of the 1967-68 school year.
RATIO OF THE NUMBER OF BA LEVEL DEGREES TO THE NUMBER OF HIGH SCHOOL DIPLOMAS FIVE YEARS EARLIER

1959 - 1967
\[
\frac{Y}{X} = 0.29
\]
\[
\sigma = 0.01
\]
This relationship does not accord with the widely held belief that there has been a rising propensity for high school graduates to enter and complete college—a view which is a perfectly logical implication of a generally rising level of educational attainment within a homogeneous system of publicly and privately subsidized instruction. But the American instructional system has not developed in such a manner.

During the last third of the 19th Century the groundwork was being laid for a massive new system of public instruction. This period saw the origin and development of the land-grant colleges at the same time the goal of universal secondary education began to be placed in effect. While higher education began to encompass a wider and wider variety of subject matter—following the clearly expressed intention of the land-grant college movement—the secondary schools were producing a growing proportion of high school graduates within a population of young people which itself was growing at a rapid rate. This growth in school age children was the result of both a growing number of births and a significant immigration. Higher education was unable to hold its own in producing roughly proportionate numbers of BA degrees within each new wave of high school graduates. Thus, from 1870 to 1900 the number of 18-year olds almost doubled while the annual number of high school graduates increased 6 times and the annual number of BA's awarded increased a little more than three-and-a-half times.

Following 1900, however, with the exception of wars, depressions, and the effort following World War II to compensate for the educational
losses of a war, institutions of higher education apparently have tended to graduate a stable percentage of high school graduates relative to the last 30 years of the 19th century.

Furthermore, as Chart 4 shows, the ratio of BA level completions to undergraduate enrollment has also been remarkably stable over this same period. It might be attributed to a shorter average time in college—a reduction in part-time and intermittent college work—rather than to any fundamental change in the ratio of those ever completing to those starting the BA level process. Whatever its cause, neither does this result accord with what one might expect within the context of a rising average level of educational attainment produced within a single homogeneous system of instruction.

Chart 5 offers additional evidence of the behavior of the ratio of completions to starts in four-year degree-credit programs. Information on first-time enrollees has been available only since 1939, but the data suggest that for the period of the last 10 years, at least, about 46 per cent of those starting the BA process have not completed the degree. From 1950 to 1960, this indicator suggests a decline in the completion ratio. Because of the influence of returning veterans following World War II, the experience for the earlier decade from 1940 to 1950 is difficult to interpret. However, the data of Charts 4 and 5 suggest a gradual decline
CHART 4

RATIO OF NUMBER OF BA LEVEL DEGREES TO TOTAL UNDERGRADUATE ENROLLMENT THREE YEARS EARLIER

1950 1960 1970
NUMBER OF BA LEVEL DEGREES AS A RATIO TO THE NUMBER
OF FIRST-TIME DEGREE-CREDIT ENROLLEES IN
INSTITUTIONS OF HIGHER EDUCATION FOUR YEARS EARLIER

1955 - 1967
\frac{X}{(X)} = 0.54
\sigma = 0.01
in the completion ratio from about 1950 to 1960 following a longer-term gradual rise in this ratio from the turn of the century.

The long-run trend in the ratio of those starting the college process to those completing high school can be inferred from the material shown in Chart 6. This chart shows the ratio of undergraduate enrollment in the indicated year to the number of high school graduates two years earlier. Because of the more stable pattern of completions to starts as reflected in the ratio of Chart 4, one would expect this ratio to follow the general pattern of the ratio of college completions to high school completion as shown in Chart 3. The ratio of Chart 3 is simply the product of the ratios shown in Charts 4 and 6 with an appropriate time lag.

This chart suggests that the general decline in the proportion of high school graduates entering and completing college extended from the late 19th century well into the mid-1930's. But, subsequent to World War II, the proportion entering the 4-year process began a gradually rising trend.

The more recently available material of Chart 7, shows the number of first-time degree-credit students as a ratio to the number of high school graduates one year earlier. This material suggests a gradually rising trend in the proportion of high school graduates who enter degree-credit college programs, dating from the end of World War II. However,
TOTAL UNDERGRADUATE ENROLLMENT AS A RATIO TO THE NUMBER OF HIGH SCHOOL GRADUATES TWO YEARS EARLIER

1955 - 1962

-1.92

-0.13

1.0% Mt. Mew. 0.110111

CHART 6

---

32
NUMBER OF FIRST-TIME DEGREE-CREDIT ENROLLEES IN HIGHER EDUCATION AS A RATIO TO THE NUMBER OF HIGH SCHOOL GRADUATES ONE YEAR EARLIER

1955 - 1963
\[ r = 0.55 \]
\[ s = 0.02 \]
The continuing rising trend has been offset by a gradually falling trend in the proportion completing the process dating from about 1950 when the first post-war freshman classes might have been expected to complete the undergraduate process. Thus, the stimulus given to the entry rate following World War II was apparently accompanied by a decline in the completion rate. The entry rate has continued its gradually rising course since 1950. As stated earlier, the completion ratio seems to have been quite stable in the 1960's.

Later, evidence will be offered to suggest that this phenomenon of a falling completion rate associated with a rising entry rate in the post-secondary system might be an expected result of any significant attempt to increase the rate of growth in the proportion of individuals passing through the system. There is reason to expect that the completion rate would fall before it began to rise following an effective effort to increase the rate of growth in the system.

Another Source of Data

These time-series data, derived from institutional reports to the U. S. Office of Education, exhibit considerable variability from year-to-year and, at the post-secondary level at least, are subject to significant influences on individuals beyond the age of 16 which affect the timing of college experience as well as the ultimate rates at which individuals complete given levels. While such influences are not irrelevant to an
understanding of the process of growth in the instructional system, one would wish to abstract from matters of timing. To do this requires the use of Census material on specific age cohorts.

The manner in which the elementary, secondary and post-secondary components of the instructional system have developed during the 20th century can be seen in Chart 8. Illustrated are data from the Decennial Census reports for 1940, 1950, 1960 and a Census survey of 1968 [8] showing the percentage of individuals at each decade who completed specified number of years of school. Prior to 1940, the material reflects the experience of those age groups in 1940 who were age 35-39 in 1930, 1920, 1910 respectively, and 75 and over in 1900. The 1968 age group 30-34 was used to estimate the experience of 35-39 year olds in 1970. The 1968 age group 25-29 was used to estimate the experience of the 35-39 year olds in 1980 for grades 1-12. The post-secondary experience for this latter group is a projection based upon the data of Charts 5 and 7.

The discontinuous manner in which the three segments of the instructional system have been developed is clearly apparent. Neither the secondary component, school years 9-12, nor the higher education component, years 13-16, have developed as parts of a homogeneous instructional system. Historically, the rates at which each generation has progressed from one year to the next in the system have been discontinuous at year 9 and year 13. However, the discontinuity between year 8 and year 9 has been progressively eliminated. The 14 year olds of about 1955 continued on from grade 8 to
YEARS OF SCHOOL COMPLETED FOR POPULATION COHORT AGE 35 TO 39 BY DECADES: 1900 TO 1980
grade 9 at a rate consistent with a systematically continuous function. But the discontinuity between years 12 and 13 has remained.

The question arises: To what extent does the Census material recording the experience of 35-39 year olds at the beginning of each decade reflect the time series relationships exhibited earlier? Table 1 is derived from the material shown in Chart 8.

### Table 1

<table>
<thead>
<tr>
<th>(1)</th>
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<tr>
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<td>Ratio: Year 13</td>
<td>Ratio: Year 16</td>
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<tr>
<td>35-39</td>
<td>18</td>
<td>23</td>
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<tr>
<td>1900</td>
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<td>1884-1888</td>
<td>.34</td>
<td>.67</td>
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<td>1910</td>
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<td>.40</td>
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<td>1970</td>
<td>1949-1953</td>
<td>1954-1958(P)</td>
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<td>.79</td>
<td>.40</td>
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<td>1980</td>
<td>1959-1963</td>
<td>1964-1968(P)</td>
<td>.95</td>
<td>.81</td>
<td>.43**</td>
<td>.54**</td>
<td>.23**</td>
</tr>
</tbody>
</table>

* As shown in Chart 8
** Projection based upon data of Chart 5 and Chart 7
(P) Preliminary estimate as described in text

The ratio shown in column (4) of Table 1 shows the rate at which the structural discontinuity between the elementary and secondary segments of the system has

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5 As shown in Chart 8 for the expected experience of 35-39 year olds in 1980.
been progressively closed over the 80 year period. During this same period the structural discontinuity between the secondary and higher education segments, as reflected by the ratio of column (6), remained and, in fact, became more pronounced during the 1930's and 1940's.

It is interesting to note, however, that in the process of bringing the 9th grade completion rates up to a level consistent with elementary school experience, completion rates between year 9 and year 12 (column 5) actually fell between 1880 and 1920. (This is to say, the proportion of each generation completing grade 9 increased at a faster rate than the proportion completing grade 12.) It is possible, therefore, that could the discontinuity between the post-secondary and secondary segments of the instructional system begin to close, completion rates between year 13 and year 16 might be expected to fall before a rising trend develops.

One would expect that the ratios shown in column (7) would exhibit a long-run pattern of change similar to the ratio shown in Chart 4 and a level approximately similar to that of Chart 5. Namely, a long-run stability with perhaps a gradually rising trend to a level of about .54. This seems to be the case, with the exception of the observations for the years prior to 1930. But these earlier observations were all derived from material obtained during the census enumeration of 1940. They reflect the experience of individuals who were in fact 55-59, 65-69, and 75 and over, respectively, in 1940. Thus, these results are subject to considerably more error than the results for later years taken from sequential census reports.
For example, to the extent that mortality rates are inversely correlated with the level of educational attainment, then one would expect that ex post measurement of educational experience would tend toward current experience under conditions of a generally rising rate of educational attainment. Thus, it is more likely that there has been a slow, but persistent rise in the ratio of college completions to starts until 1950 with a reduction in the ratio between 1950 and 1960. Thus, the data of column (7) are not necessarily inconsistent with the ratios of both Charts 4 and 5 described earlier.

One would also expect the ratio shown in column (6) of Table 1 to exhibit a long-run pattern of change similar to that shown in Chart 6 and a general level of the ratio of Chart 7. The pattern of change is similar. A general decline in the ratio during the 1930's and 1940's followed by a rise to the prior level of the 1920's. The expected decline from the late 19th century is not apparent. But, again, one cannot say what the Census of 1900 might have shown had questions been asked regarding the number of years of school completed in that year.

The level of the ratio shown in column (6) is about 10 per cent lower than the level of the ratio shown in Chart 7. However, it is known that the reports of household respondents to Census enumerators are subject to a significant degree of reporting error. In 1960 the proportion of the population age 25 and over reporting at least 12 years of school completed was found to be overstated by about 6 per cent. Also, there is a definitional

problem. The term "12 years of school" is not likely to be equivalent to "high school graduation" for all respondents to the Census.

In Chart 8 a clear peak can be seen at school years 8, 12, and 16. This suggests the possibility of a net overstatement of some degree at these years.\(^7\) Thus, it is entirely possible that the level of the ratio shown in column (6) of Table 2 could differ from that of Chart 7 due to reporting error and definitional differences in the Census data on one hand and variations of timing in the ratio of Chart 7 on the other. The proportions of the population reporting the completion of years 13 through 16 are significantly smaller than the proportion completing year 12 and are thus subject to a smaller amount of reporting error. In addition, the meaning of 13 or 16 years of "regular" school, as defined by the Census, is likely to be much closer to the concepts used by institutions of higher education in reporting degree-credit work to the U.S. Office of Education. This would tend to explain why the level of the ratio of column (6) is lower than that of Chart 7 while the level of the ratio of column (7) is in much closer agreement with the ratio of Chart 5.

One would expect the ratio of column (8) of Table 1 to agree with the level and general pattern of change of the ratio shown in Chart 3. The pattern of long-run stability is apparent with a decline during the mid 1930's and 1940's. However, the level of the ratio is about 9 per cent.

\(^7\) However, it is also probably true that our society attaches a special value to the completion of years 8, 12, and 16 which is not carried by the completion of other amounts of schooling.
lower than that of Chart 3. Again, the difference between the Census reports and the institutional reports could account for this discrepancy in level. Also, the marked decline in the ratio of Chart 3 during the 19th century is not apparent in the Census data collected in 1940 and for those earlier generations. The general pattern for the observations for 1940 forward, however, is in reasonable agreement with the data of Chart 3.

Summary: Years 1-8

The elementary, secondary and higher education components of the instructional system in the United States have been developed as largely independent segments.

During the course of the past 90 years the elementary system has grown at a faster rate than the number of school age children, raising the proportion of each generation completing the 8th grade from about 51 per cent of those who were age 14 in 1877 to an expected completion rate of about 97 per cent of those who were age 14 in 1967. The proportion completing each incremental year from grade 1 through 8 has tended to follow a continuous and largely predictable function for each generation. Rates of attrition at each grade level have persistently decreased from one generation to the next.
Summary: Yenta 9-12

The secondary system, comprising grades 9 through 12, has grown at a faster rate than the elementary system during the past 90 years, raising the proportion of each generation completing the 12th grade from roughly 5-10 per cent of those who were 18 in 1880 to an expected rate of about 80 per cent of those who were 18 in 1970.

Notwithstanding the fact that roughly 20 per cent of today's 18-year old population will not be expected to complete the 12th grade, the structural discontinuity between the elementary system and the secondary system, which was in striking evidence in the late 19th century, and which remained during the first half of the 20th century, largely has been eliminated. Between 1953 and 1960 the attrition rate between grades 8 and 9 became a largely predictable and continuous function of attrition rates within the elementary system. Subsequently, this maturation was extended to grades 10, 11 and 12.

Following the decade of 1960, the proportion of each generation completing each incremental year from grade 9 through grade 12 may be expected to follow a continuous and largely predictable function of prerequisite experience for each generation.

Between 1880 and about 1925, the rate of attrition between grade 9 and 12 actually increased. Beginning about 1925, however, rates of
attrition at each grade level have decreased from one generation to the
next. Because the secondary system has only recently reached a state
of maturity with respect to the elementary system in this respect, the
future rate of growth in the proportion of each generation completing
the 12th grade may be expected to slow. In the future this proportion
will be essentially a function of the proportion of each generation completing
prior levels.

Summary: Years 13-16

What we describe today as higher education (more appropriately, the
tertiary system), comprising grades 13 through 16, has grown at approximately
the same rate as the secondary system during the past 85 years. The propor-
tion of each generation completing the 16th year has increased from less
than 2.3 per cent of those who were 23 years old in 1885 to an expected
rate of about 20 per cent of those who were 23 years old in 1969. By
and large, the structural discontinuity between the secondary and tertiary
system which existed at the turn of the century still exists today. The
same attrition rate between year 12 and year 16 which existed at the turn
of the century was still in evidence as late as 1968.

Institutional data on enrollment and degrees awarded in higher education,
in relation to the number of high school diplomas awarded annually, suggest
that attrition between grades 12 and 13 actually increased (proportion
entering college fell) from 1870 until the end of World War I. This attrition rate then diminished (proportion entering college rose) during the 1920's. With the onset of the depression of the 1930's, attrition from grade 12 to grade 13 increased again following a trend which lasted until the end of World War II. Available evidence suggests that this attrition has diminished since that time. Entry rates from high school to college have been rising in recent years. But, the proportion of high school graduates who enter college stands at about the same level today as in 1920 and at the turn of the century.

The rate of attrition between grades 13 and 16 apparently followed a gradually falling trend throughout the 20th century until about 1950. From 1950 to about 1960, however, with the advent of a rising rate of high school graduates entering college at the end of World War II, attrition from year 13 to year 16 increased. For the past 10 years the rate at which beginning degree-credit students have completed a four-year degree has been virtually constant at about 54 or 55 per cent.

On net balance, the experience for the tertiary grades 13 through 16 has been such that the proportion of high school graduates who complete a four-year degree has been virtually constant since the turn of the century with the exception of the depression period of the 1930's and the World War II period of the 1940's, for which generations this rate of attainment declined. The experience for the 23-year-olds of 1968 is essentially in
line with these statements, but their full exposure to college will not be complete for another 10 years at least. One may therefore assume that this state of affairs may be changing.

Some Recent Institutional Changes

Notwithstanding the historical stability of the proportion of high school graduates completing college, the number of 18-year olds in the population has increased by a factor of about 1.7 since the end of World War II. [2] As shown in Chart 9, a significant increase in the number of 18-year olds occurred in the mid-1960's when the post-war babies reached the age of 18. Also, as has been described, the proportion of 18-year olds completing high school increased by a factor of more than 1.5 since the war period. This resulted in an increase by a factor of more than 2.6 in the number of individuals eligible for post-secondary instruction, with much of this increase occurring after 1965.

At the beginning of the post-war period most of the institutions of higher education in the United States were more than 50 years old and well established. The established campuses, having dealt with the over-capacity enrollments of returning veterans by 1950, began to reach the practical limits to their size in the early 1960's. Since then, the established institutions have understandably responded to pressures to grow further partly by raising entrance requirements, raising tuition, and otherwise limiting enrollment. New campuses were required.
POPULATION 18 YEARS OF AGE: 1900 - 1986
JULY 1

CHART 9
Possibly the most significant change in the institutional structure of the tertiary system to occur since the formation of the land grant colleges during the late 19th century is the recent growth in the number of two-year colleges. With the implementation of the Higher Education Facilities Act of 1963 and the Higher Education Act of 1965 the establishment of new four-year campuses and new community colleges was greatly accelerated. Between the Fall of 1965 and the Fall of 1968 there was a net increase in the number of two-year institutions of 185. The number of four-year institutions increased by 67 and the number of universities increased by 5.

Chart 10 shows that, in the course of this change, the proportion of first-time four-year degree-credit students who enter two-year institutions has risen from about 20 per cent in 1950 to more than one-third today. [7] It is a matter of no little interest to compare this result with the degree-credit completion ratio shown earlier in Chart 5. Specifically, while the proportion of Chart 10 increased from 20 per cent in 1954 to 27 per cent in 1963, the completion ratio 5 years later remained essentially unchanged at 54 per cent from 1959 to 1968.

Thus, in addition to providing new opportunities for tertiary instruction outside the traditional four-year programs, the new community colleges are also assuming a significant and growing share of traditional lower division instruction.
RATIO OF FIRST-TIME DEGREE-CREDIT ENROLLMENT IN TWO YEAR INSTITUTIONS TO FIRST-TIME DEGREE-CREDIT ENROLLMENT IN ALL INSTITUTIONS - HIGHER EDUCATION

CHART 10

RATIO

33.3%

21.3%
There are three reasons for believing that this development represents as significant a change in the institutional structure of traditional degree granting programs (even within the context of a constant proportion of high school graduates completing the BA level degree) as it probably does for less traditional tertiary non-degree programs.

The first reason is purely empirical. If the completion rate for four-year degree programs rises for those entering two-year institutions, relative to the completion rate for those entering four-year institutions, then it is clear that some share of the task of traditional lower-division instruction is being assumed by the newer institutions. While the empirical evidence on this point is not unambiguous, data published by the American Council on Education show that the proportion of freshmen entering two-year colleges with an average high school grade (self-assessed) of B+ or better decreased less than proportionately between the Fall of 1966 and the Fall of 1969. The proportion of freshmen reporting an average high school grade (self-assessed) of C or below actually declined at two-year colleges as compared with an increase in this proportion for all institutions combined. This result is shown in Table 2.
### Table 2
Percentage of Freshmen Reporting an Average High School Grade of:

<table>
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<th>Fall of 1966</th>
<th>Fall of 1969</th>
<th>Difference</th>
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<tr>
<td><strong>B+ or Better</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Institutions</td>
<td>32.4</td>
<td>28.1</td>
<td>-4.3</td>
</tr>
<tr>
<td>University</td>
<td>42.9</td>
<td>40.2</td>
<td>-2.7</td>
</tr>
<tr>
<td>4-Year College</td>
<td>37.4</td>
<td>36.4</td>
<td>-1.0</td>
</tr>
<tr>
<td>2-Year College</td>
<td>10.7</td>
<td>10.3</td>
<td>-0.4</td>
</tr>
<tr>
<td><strong>C or D (omitting C+)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All Institutions</td>
<td>14.4</td>
<td>15.6</td>
<td>+1.2</td>
</tr>
<tr>
<td>University</td>
<td>7.4</td>
<td>7.5</td>
<td>+0.1</td>
</tr>
<tr>
<td>4-Year College</td>
<td>10.1</td>
<td>8.8</td>
<td>-1.3</td>
</tr>
<tr>
<td>2-Year College</td>
<td>30.5</td>
<td>28.6</td>
<td>-1.9</td>
</tr>
</tbody>
</table>

Source: American Council On Education, National Norms For Entering College Freshmen, Fall 1966 and Fall 1969.

Second, to suggest the contrary—that this growth in community colleges is exclusively devoted to serving those who would otherwise terminate their formal instruction at some point short of a four-year degree— is to suggest that some selection process (including the possibility of self-selection) exists which permits an effective *ex ante* prediction as to who will and who will not successfully complete a four-year program.
The available evidence suggests very strongly that no such selection process exists.  

Third, if this growth in community colleges effectively reduces the cost to individuals of lower-division instruction, it could be expected to increase the demand for upper division instruction (and eventually graduate instruction), assuming no off-setting increases in the cost at higher levels, even under circumstances which produce a decline in the ratio of completions to starts in four-year programs. A reason for this is very simply stated. An increase in the proportion of an age cohort completing any given number of units of instruction, say \( n \), may be viewed as also increasing the proportion of that cohort eligible for unit \( n+1 \). And, for any society in which the amount of instruction one has completed imparts some special advantage over one's contemporaries with less (or is believed to so impart), then a strong social desire for a continuously growing system is likely to result. As evidence of this possibility, one is referred again to Chart 8 and Table 1 describing the experience of growth in the secondary system between 1875 and 1915.

The Graduate Level

The proportion of the total number of degrees of all types awarded annually which are accounted for by graduate level degrees has risen from

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about 6 per cent in 1910 to about 20 per cent in the Summer of 1968. [3] [9] [10] Census material shows that more than 5 per cent of those who were age 30-34 in 1968 completed 5 or more years of college. Data on advanced degrees awarded when related to the approximate size of population cohorts involved at that level suggest that more than 5 per cent of today's generation will complete at least the MA level degree.

Chart 11 shows that the ratio of MA level degrees awarded annually to the number of BA level degrees awarded two years earlier has been progressively increasing since at least 1910. [9] [3] This ratio is now at a level of more than .25, suggesting that more than one out of every 4 college graduates completes an advanced degree. There is no evidence to suggest that growth in this ratio will decline.

This experience strongly suggests a proposition worth testing further: That attrition rates from year 16 to years 17, 18 and subsequent levels of instruction may be continuous and usefully predictable functions of prior attainment. There is some incomplete evidence, not presented here because of its tenuous nature, that the discontinuity which has been apparent at school years 9 and 13 may not have occurred to the same degree at year 17. If this proves to be the case, it would mean that the future size of classes beyond year 16 may be determined largely by the extent to which the present discontinuity between year 12 and 13 is closed, and the attrition rate within the tertiary system of the future. This also would depend, of course, upon the future structure of costs and the institutional policies
RATIO OF THE NUMBER OF MA LEVEL DEGREES TO THE NUMBER OF BA LEVEL DEGREES Two YEARS EARLIER

Chart 11

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...
concerning financing and enrollment. Without further analysis, one may only point out that the behavior of the ratio shown in Chart 11 is very much what one would expect from a generally rising level of educational attainment within a homogeneous system of instruction beyond year 12. That is, the data imply a continuously falling rate of attrition between any two levels of the system from one generation to the next.

Expenditures

Growth in current expenditures per man-year of instruction produced in both the elementary-secondary component and the higher education component are illustrated by the estimates shown in Chart 12. [11] [12] [13] [14] [15]

The data are expressed in constant 1967-1968 dollars. In preparing these estimates, adjustments were made to available Office of Education data to approximate current expenditures for instructional purposes only. For example, the estimates are not intended to reflect institutional expenditures on auxiliary enterprises such as the operation of dormitories. The estimates do include an allowance for administrative expense (not related to organized research), plant maintenance, and all departmental expenditures. Capital expenditures are not included, however. Annual expenditures are divided by estimates of the number of full-time equivalent man-years of instruction produced at all levels of instruction and deflated by a consumer price index.
COMPARISON OF YEARLY EXPENDITURES ON CURRENT ACCOUNT PER STUDENT IN HIGHER EDUCATION AND IN ELEMENTARY AND SECONDARY EDUCATION CONSTANT 1967-1968 DOLLARS

CHART 12
As is evident in Chart 12, the estimates for institutions of higher education are subject to considerably more year-to-year variation than the estimates for the elementary and secondary system. One reason for this is simply that wars and depressions have had a far greater influence on the size of classes at institutions of higher education than for the elementary and secondary system. With sizeable fixed costs, the average expenditure per student at institutions of higher education necessarily shows a wide fluctuation as students have withdrawn during depressions and wars and as institutions accommodated the over-capacity enrollment following World War II.

If one abstracts from the rather wide fluctuations due to the temporary influences on the size of enrollment in higher education, it can nevertheless be seen that average expenditures on current account have followed a long-term pattern of persistent growth which is quite similar in form, if not degree, for both the elementary-secondary system and higher education. Both curves rise with increasing annual increments. However, the rate of increase is quite different for the two components of the instructional system.

Average current expenditures per student in the elementary-secondary system (in constant dollars) has increased by a factor of 11 from 1890 to 1968. However, for the higher education component, the average expenditure has increased only 2.8 times during the same period.
The fact that over long periods of time both components of the instructional system are subject to increasing costs has disturbed many individuals responsible for the administration of the instructional system. Are average expenditures to rise indefinitely? Is education subject to some peculiar affliction which precludes the ability to advance productivity? Are educational institutions capable of accommodating an increasing number of students per dollar expanded?

Chart 13 shows the same data for institutions of higher education as that shown in Chart 12. But, for Chart 13, average expenditures per student are related to the number of students being served. Thus, it becomes entirely possible that, with the exception of years in which sudden and unplanned swings in enrollment occur, average costs per student have increased at a decreasing rate as the number of students being served has increased. 9

This result is all the more remarkable when one considers the significant growth in graduate instruction relative to undergraduate, the broadening of the curriculum, and the increased levels of instructional complexity dealt with at institutions of higher education over the past 80 years. The particular mathematical function used to describe the smooth dashed line in Chart 13 serves to express this relationship reasonably well for the observation of 1890 as for those observations covering the decade of the 1960’s. But, this result has been influenced

9 The smooth curve may be expressed as $A = 31.5 N^{-26}$ where $A$ is the average expenditure per man-year in constant 1967-68 dollars and $N$ is the number of man-years of enrollment. The function is fitted to the data for the years 1890, 1910, 1942, 1944, 1960, 1961, 1964, 1966, and 1968.