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ABSTRACT
                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)

THE QUANTITY OF FORMAL INSTRUCTION

IN THE UNITED STATES

by

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with the assistance of

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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.

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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 accomodates 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

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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.

CONTENTS

ABSTRACT

The most striking accomplishment of the educational system during
the 20th Century has been the growth and maturation of a ne rl 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 accomodates 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

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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 oppor-
tunity would be realized. (pp. 59-63)

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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
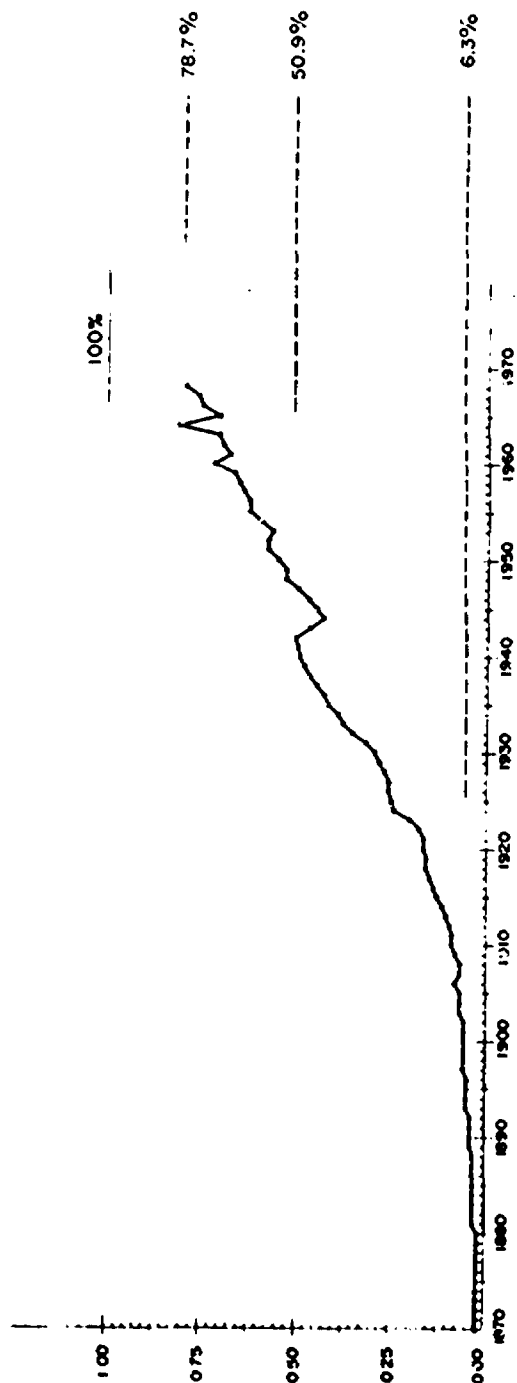the generation of 1900.[1]

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

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[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 ever received the diploma would be less steep than that of this index.

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CHART 1

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RATIO OF THE NUMBER OF HIGH SCHOOL DIPLOMAS TO 18 YEAR OLD POPULATION

100%

78.7%

50.9%

6.3%

1.00
0.75
0.50
0.25
0.00

1870 1880 1890 1900 1910 1920 1930 1940 1950 1960 1970

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 per
cent 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 graduate 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 16-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.

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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, 18 and 1' 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 accelera-
tion 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

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[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.

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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 contempo-
raries. 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.

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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 7C
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

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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

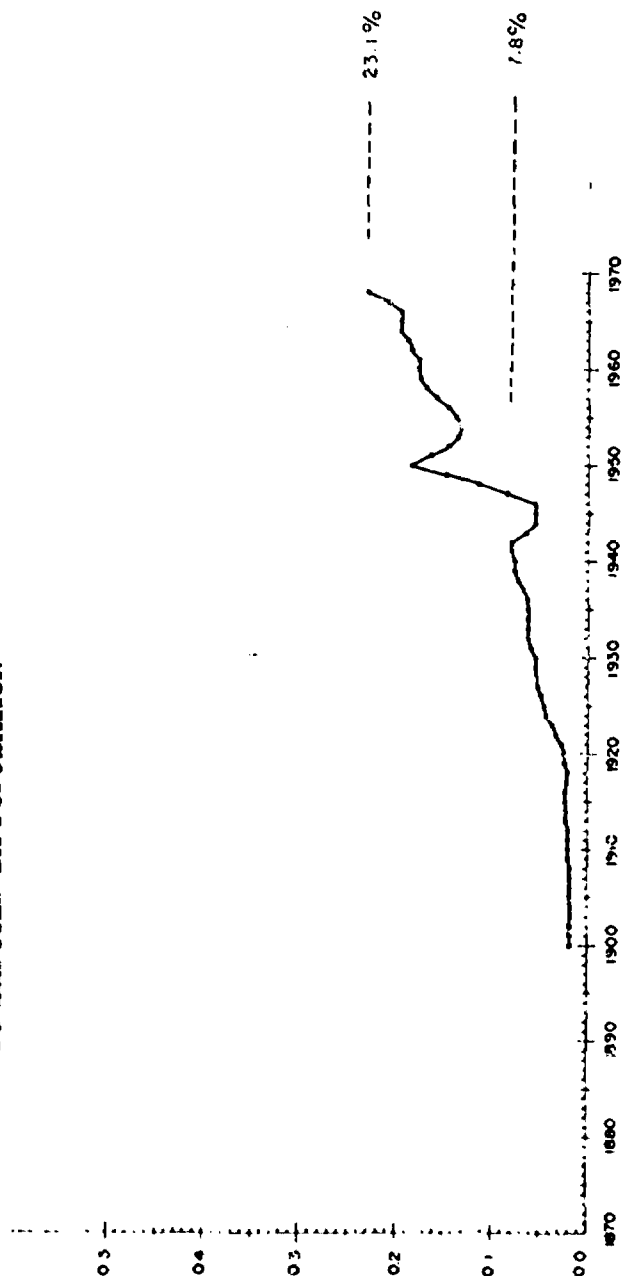percentages of each of the intervening age groups.

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

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[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.

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**RATIO OF NUMBER OF BA LEVEL DEGREES
TO EXPOSED BA POPULATION**

23.1%

1.8%

1870   1880   1890   1900   19;0   1920   1930   1940   1950   1960   1970

03   04   03   02   0;   00

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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 compl -ed
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 extant 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-World 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

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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 muc'
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 1965 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

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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-
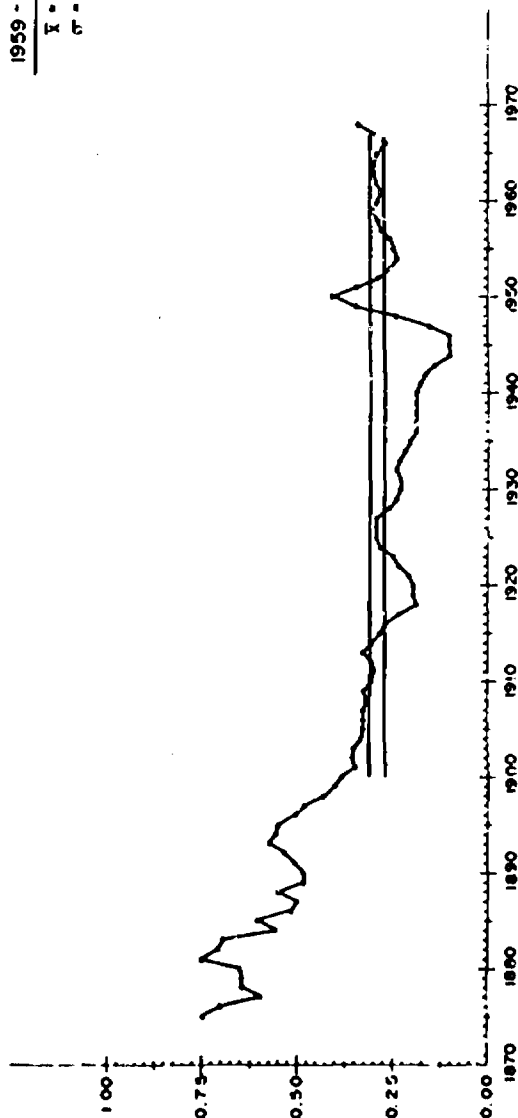12 years--again, with the exception of the 1967-68 school year.

CHART 3

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RATIO OF THE NUMBER OF BA LEVEL DEGREES TO THE
NUMBER OF HIGH SCHOOL DIPLOMAS FIVE YEARS EARLIER

1959 - 1967
x̄ = 0.29
σ = 0.01

This relationship does not accord with the widely held belief that there has been a rising propensity for high school gr   es 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 college 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

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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. [3] [6] The gradual, but perceptible, long-run rise in this
ratio 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
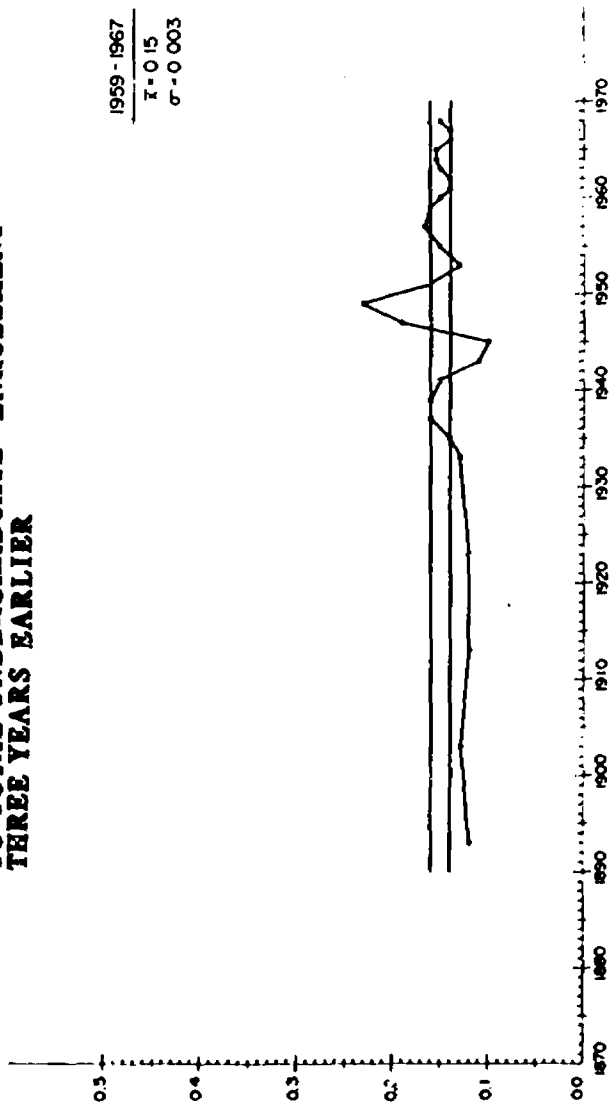instruction.

Chart 5 offers additional evidence of the behavior of the ratio of
completions to starts in four-year degree-credit programs. [3] [7] Infor-
mation 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

CHART 5
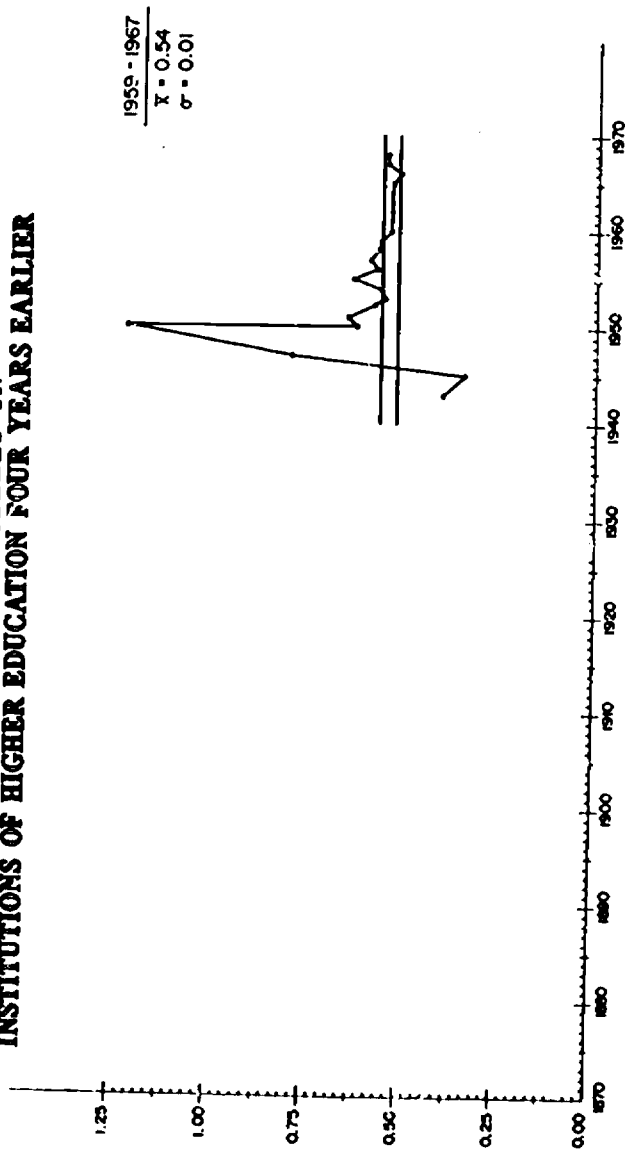
NUMBER OF BA LEVEL DEGREES AS A RATIO TO THE NUMBER
OF FIRST-TIME DEGREE-CREDIT ENROLLEES IN
INSTITUTIONS OF HIGHER EDUCATION FOUR YEARS EARLIER

$$\frac{1959 - 1967}{\overline{X} = 0.54 \quad \sigma = 0.01}$$

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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. [6] [1] 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. [7] [1] 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,

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CHART 6

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TOTAL UNDERGRADUATE ENROLLMENT AS A RATIO TO THE
NUMBER OF HIGH SCHOOL GRADUATES TWO YEARS EARLIER

1955 - 1963

$\bar{x} = 1.92$
$\sigma = 0.13$

1870   1880   1890   1900   1910   1920   1930   1940   1950   1960   1970

0   1   2   3   4   5
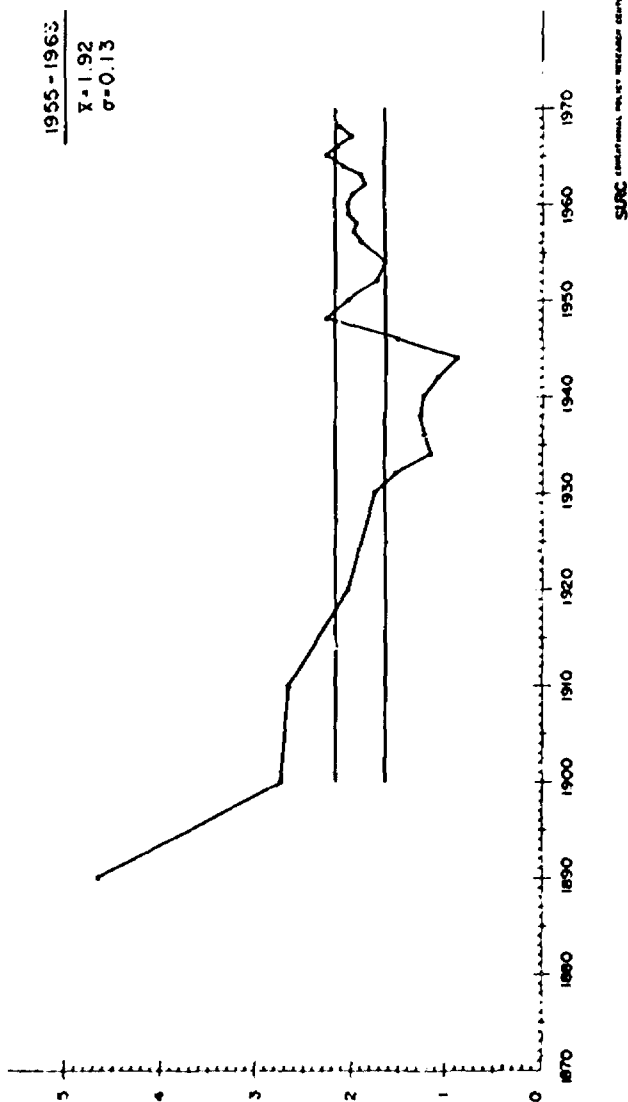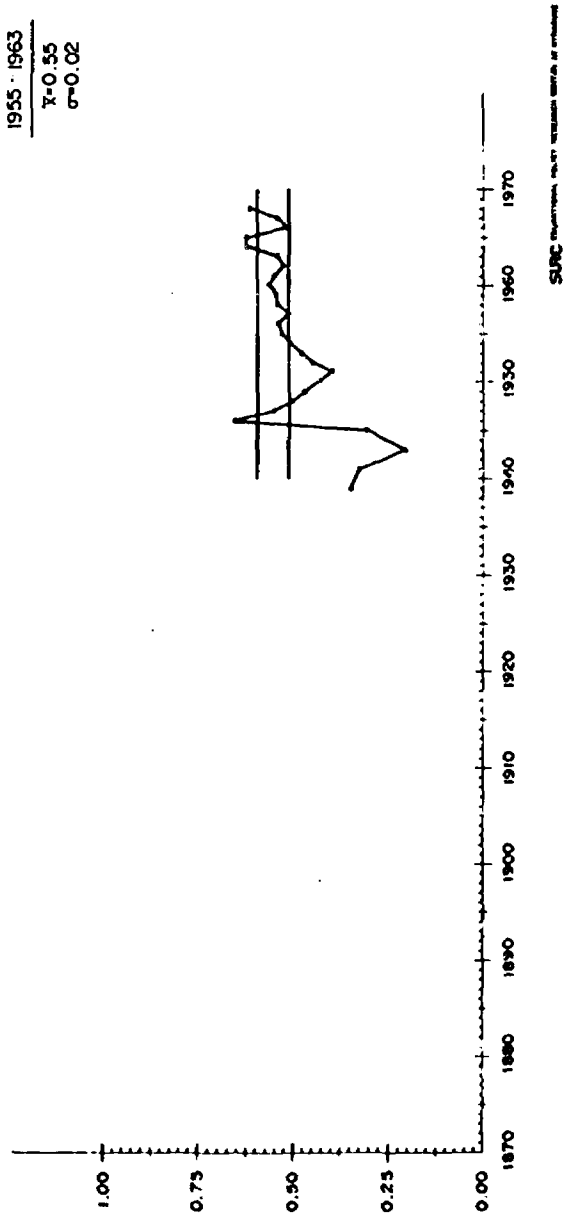
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CHART 7

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
x̄ = 0.55
σ = 0.02

20

33

this rising trend has also 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 18 which affect the timing
of college experience as well as the ultimate rates at which individuals
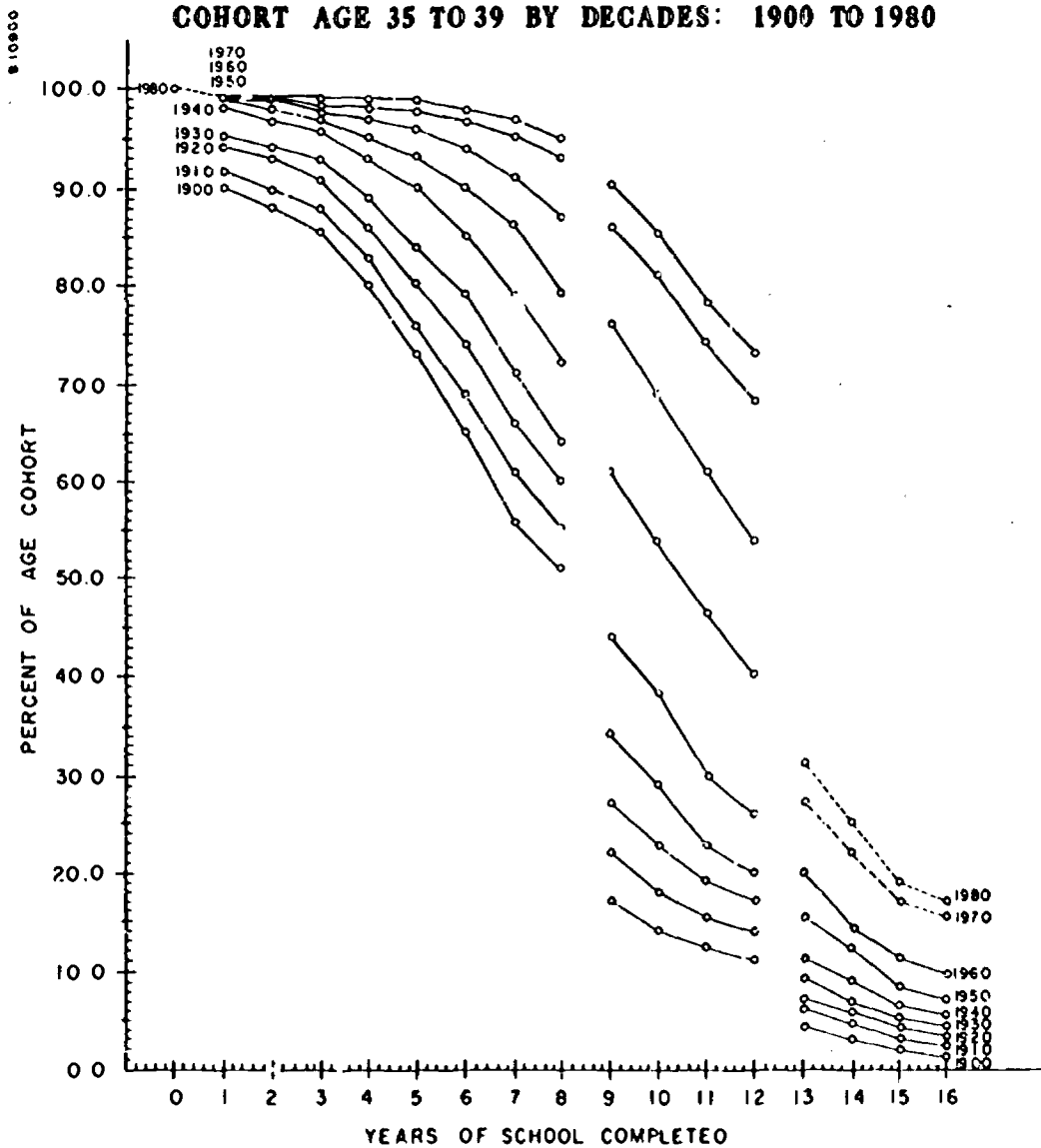complete given levels. While such influences are not irrelevant to an

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

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CHART 8

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.[5]

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 I

Ratios Derived from Years of School Completed by Population Cohorts Age 35-39 by Decades 1900-1980*

(1) Year of age 35-39	(2) Years of age 18	(3) Years of age 23	(4) Ratio: Year 9 / Year 8	(5) Ratio: Year 12 / Year 9	(6) Ratio: Year 13 / Year 12	(7) Ratio: Year 16 / Year 13	(8) Ratio: Year 16 / Year 12
1900	1879-1883	1884-1888	.34	.67	.42	.46	.19
1910	1889-1893	1894-1898	.40	.65	.45	.45	.20
1920	1899-1903	1904-1908	.46	.63	.43	.45	.19
1930	1909-1913	1914-1918	.53	.61	.45	.45	.20
1940	1919-1923	1924-1928	.62	.60	.44	.46	.20
1950	1929-1933	1934-1938	.79	.66	.38	.47	.18
1960	1939-1943	1944-1948	.88	.72	.36	.49	.18
1970	1949-1953	1954-1958(P)	.94	.79	.40	.55	.20
1980	1959-1963	1964-1968(P)	.95	.81	.43**	.54**	.23**

*   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
 iould 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.[6] Also, there is a definitional

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6
   See: U.S. Bureau of the Census. _Current Population Reports_, Series P-20,
   No. 182, U.S. Government Printing Office, Washington, D.C., April 29, 1969.

problem. The term "12 years of ╷ ¹ool" 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 instit⌐tions 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

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[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.

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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: Years 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 1950 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 complet 1 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

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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.
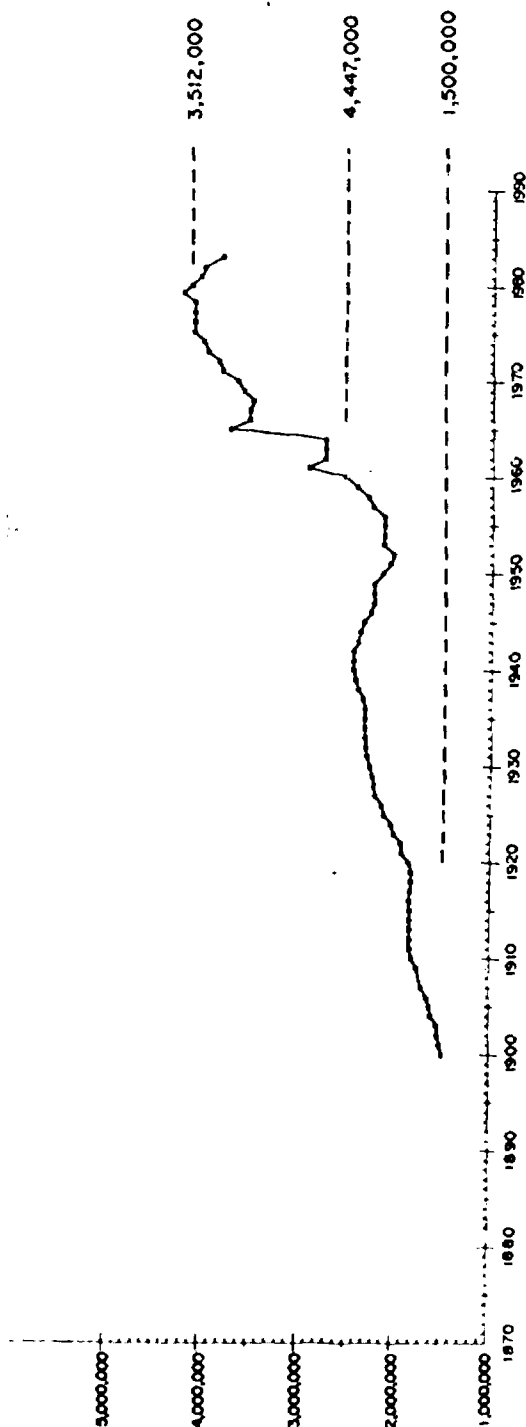
Some Recent Institutional Changes

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.

CHART 9

A10893

POPULATION 18 YEARS OF AGE : 1900 – 1986
JULY 1

3,512,000

4,447,000

1,500,000

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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
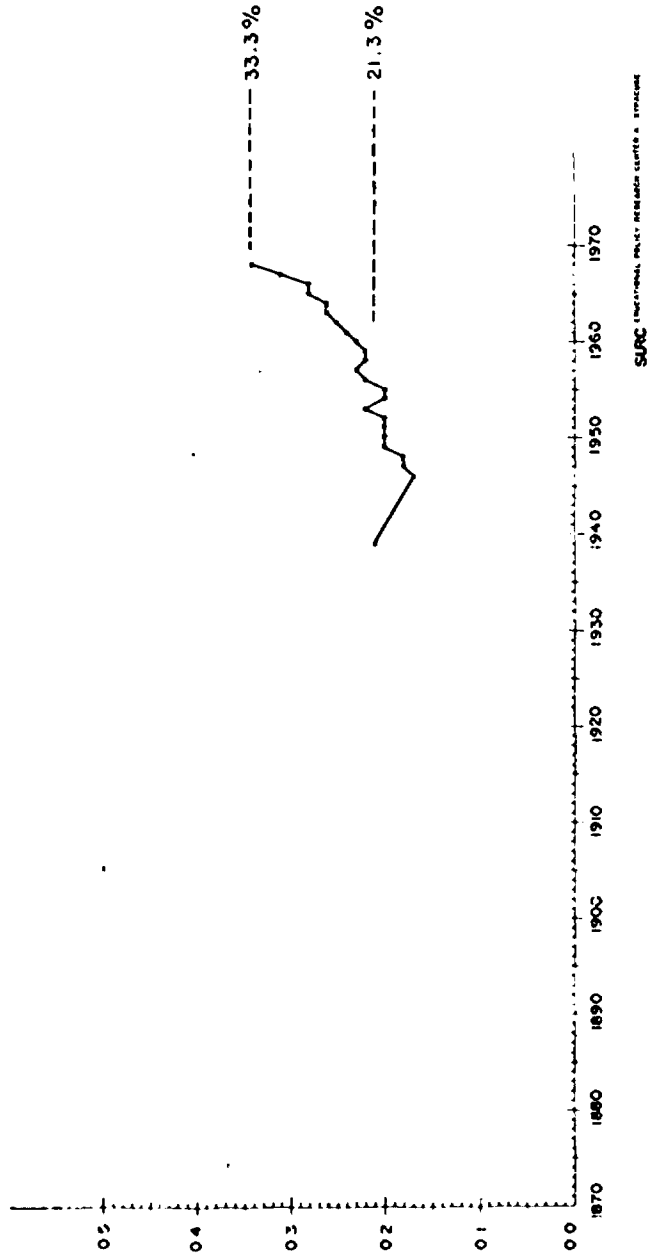by 5.

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.

CHART 10

A10889

RATIO OF FIRST-TIME DEGREE-CREDIT ENROLLMENT IN TWO YEAR INSTITUTIONS TO FIRST-TIME DEGREE-CREDIT ENROLLMENT IN ALL INSTITUTIONS - HIGHER EDUCATION

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:

B+ or Better

	Fall of 1966	Fall of 1969	Difference
All Institutions	32.4	28.1	-4.3
University	42.9	40.2	-2.7
4-Year College	37.4	36.4	-1.0
2-Year College	10.7	10.3	-0.4

C or D (omitting C+)

	Fall of 1966	Fall of 1969	Difference
All Institutions	14.4	15.6	+1.2
University	7.4	7.5	+0.1
4-Year College	10.1	8.8	-1.3
2-Year College	30.5	28.6	-1.9

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. [8]

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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[8] For example, see: Lavin, David E., _The Prediction of Academic Performance_, New York: Russell Sage Foundation, 1965.

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
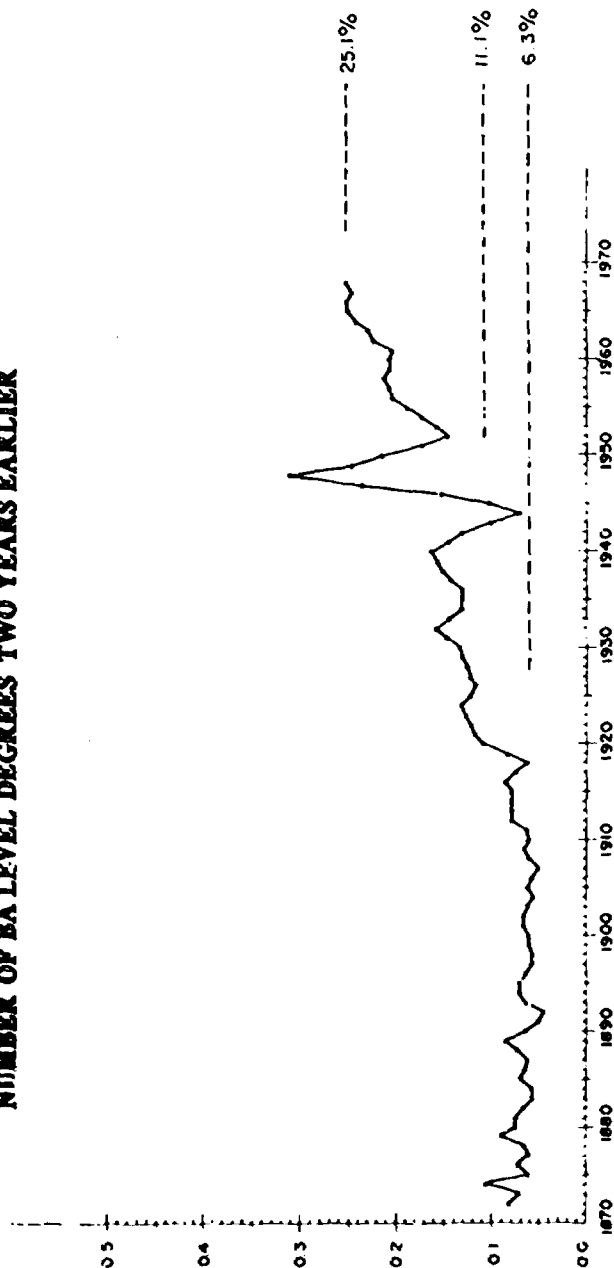generation will complete at least the MA level degree.

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 progres-
sively 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

CHART 11

A 10891

RATIO OF THE NUMBER OF MA LEVEL DEGREES TO THE
NUMBER OF BA LEVEL DEGREES TWO YEARS EARLIER

25.1%

11.1%

6.3%

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
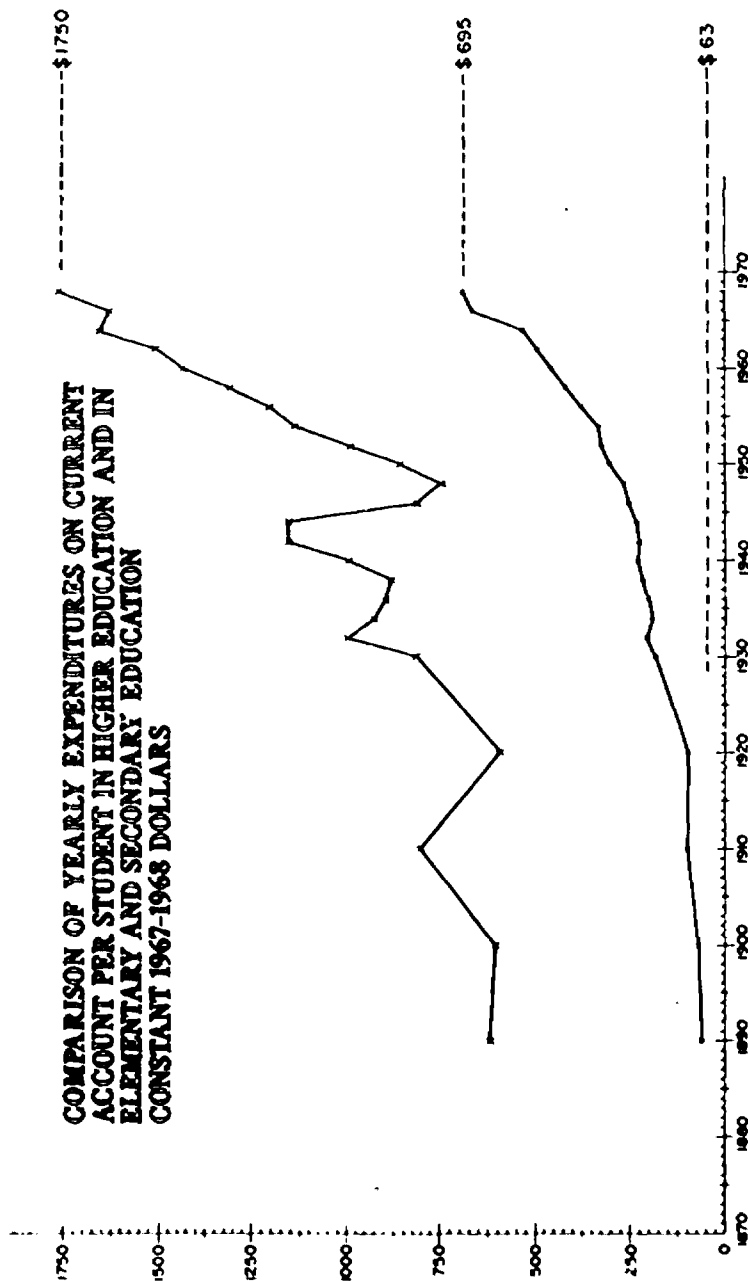any two levels of the system from one generation to the next.

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 expendi-
tures 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.

CHART 12

A10088

COMPARISON OF YEARLY EXPENDITURES ON CURRENT
ACCOUNT PER STUDENT IN HIGHER EDUCATION AND IN
ELEMENTARY AND SECONDARY EDUCATION
CONSTANT 1967-1968 DOLLARS

— $1750

— $695

— $63

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1870   1880   1890   1900   1910   1920   1930   1940   1950   1960   1970

0
250
500
750
1000
1250
1500
1750

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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

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[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, 1962, 1964, 1966, and 1968.