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EPB MEETING

Tuesday, Sept. 14  
8:30 a.m.

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note inside



ECONOMIC POLICY BOARD  
EXECUTIVE COMMITTEE MEETING

September 14, 1976  
8:30 a.m.  
Roosevelt Room

AGENDA

- |   |       |
|---|-------|
| 1. Public Service Employment Bill       | Labor |
| 2. Report of Task Force on Productivity | CEA   |

COUNCIL OF ECONOMIC ADVISERS  
WASHINGTON

ALAN GREENSPAN, CHAIRMAN  
PAUL W. MACAVOY  
BURTON G. MALKIEL

September 13, 1976

*Paul  
Levy*

MEMORANDUM FOR THE EXECUTIVE COMMITTEE OF THE  
ECONOMIC POLICY BOARD

Subject: Report of the Task Force on Productivity

The attached paper presents a preliminary report on the Task Force on Productivity. The Task Force has decided to present its findings in two papers. The first, which is attached, presents our analysis of the sources of slower productivity growth in the U. S. and the prospects for the future. A forthcoming paper will discuss in detail the policy alternatives identified in the concluding section of the paper.

The Task Force particularly wishes to thank members of the Commerce Department and Labor Department for their help in performing the underlying analysis supporting the conclusions of the report. Thanks are also due to Edward Denison, the father of productivity accounting, for his invaluable help.

*Burt*  
Burton G. Malkiel



Report of the Interagency Task Force on U.S. Productivity  
Growth: Recent History and Prospects for the Future

I. Introduction

The focus of this paper is on aggregate U.S. labor productivity growth. Accordingly, we have taken real gross national product per labor hour employed as our indicator of labor productivity. Table I shows the history of labor productivity over the 1947-1973 period. The time periods reported in Table I were chosen to encompass peak periods of economic activity. This should minimize business cycle distortions of productivity movements.

The data in Table I suggest that productivity has slowed considerably. It is important to ask whether the slowdown is permanent in nature. A closely related issue is the question of whether economic policy measures can be designed which would significantly affect long-run productivity growth. The only way to resolve these issues is to undertake a careful accounting of the sources of productivity growth and to develop forecasts of movements in the factors which affect productivity.

The analysis of this paper indicates that the slowdown in productivity growth, in the 1970's in particular, can be traced to a very slow growth in the capital/labor ratio in the years 1970-75 and to a change in the labor force mix because of the entrance into the work force of large numbers of young and inexperienced workers. Our estimates indicate that these two factors in combination resulted in a reduction in the percent growth in productivity of as much as .6 percent from the 2 percent levels of the middle and late 1960's. The labor force mix factor is only temporary in its depressing effects. During the first half of the 1970's it was an important offset to contributions from other productivity enhancing factors such as increased education. As



the young work force gains experience later in the decade, the effect of age mix changes should be to increase the productivity growth rate.

There were a number of other temporary factors working to reduce productivity increases in the period 1970-75. The energy price increases may well have made obsolete parts of the capital stock associated with energy intensive technologies. New technologies which are energy intensive may also have become obsolete before they were introduced. Because of this the rate of introduction of new technologies may have temporarily slowed. Environmental regulations are known to have resulted in the closing of some production facilities. They also resulted in large capital expenditures on pollution abatement devices which do not contribute directly to production. Steel and other primary metals are examples of industries affected by these problems. Another factor which may have contributed to a temporary decline in economic efficiency in the early 1970's was the imposition of wage and price controls.

Under the assumption that many of the disruptions of the 1970's were temporary aberrations which will not be operating in the late 1970's, we have estimated that the rate of productivity growth will rise from the virtually zero levels of 1974-75 to the 2.0 to 2.2 percent range in the period 1978-81. This is unfortunately, .5 percent or more lower than the growth rates of the 1950's and 1960's. It is estimated that faster rates of growth in the capital/labor ratio and increases in the experience of the work force will add perhaps .5 percent to the percentage rate of productivity growth in the late 1970's. We do expect strong productivity gains in 1976, but most of this will be of a purely cyclical sort. The factors which account for longer term productivity growth will contribute relatively little in 1976.

## II. A Catalogue of the Sources of Productivity Change

It is useful to catalogue the major sources of productivity change. These include the quantity and quality of capital goods and the quality of labor.

### a) The Quantity of Capital

Increases in the quantity of productive capital goods per unit of labor input (the capital/labor ratio) can be expected to increase the amount of output per hour of labor employed. Capital goods supplement labor in production. The more of these goods available to a given work force, the greater production will be. In assessing the contribution of changes in the capital/labor ratio to productivity growth we will make use of existing data on real stocks of capital and total hours of labor for the U.S.

### b) Labor Quality Changes

Contributions to labor quality changes would include: Changes in the age, sex, educational, industrial and occupational composition of the labor force. It is well known, for example, that productivity varies systematically among individuals due to age differences, and differences in educational attainment and sex. In a competitive society such differences reveal themselves in wage differentials among individuals. Other things equal, more highly educated and more experienced individuals are more skilled,

more productive, and earn more. Since wage differentials are indicators of productivity differences, they provide a means for assessing the effects on productivity of compositional changes in the work force.

c) Changes in the Quality of Capital - Technological Change

On the microeconomic level this is the most visible source of productivity growth. However, capital quality changes are much more difficult to measure in the aggregate. Because of these measurement difficulties, the effects of capital quality improvements can be observed only indirectly. We can, however, directly observe one factor which is an important source of technological improvements, research and development (R&D) expenditures.

While it is unfortunate that we do not have direct measures of the effects of capital quality changes, we should recognize that we still can measure the effect of a significant proportion of the factors which contribute to productivity and output growth. Moreover, many of the factors affecting growth are demographic in nature and easily forecast for, say, a five year period.

III. Factors Affecting Productivity and Economic Growth, 1956-1980

In the preceding section we developed a list of factors considered to be important in affecting productivity growth. We now present a quantitative analysis of the historical behavior of a number of these factors, and forecasts for the 1976-81 period.



a) The Quantity of Capital

The period 1956-75 was marked by dramatic shifts in the ways that the factors which contribute to economic growth worked their effects. In the period 1956-66 the growth of hours of labor averaged only 1 percent per annum while capital stock growth averaged 3.7 percent. As a consequence the capital/labor ratio grew by 2.7 percent annually on average. In the period 1966-1975, the growth of hours worked rose to 1.8 percent per annum while capital growth was 3.4 percent. The result was a 1.7 percent rate of growth in the capital/labor ratio. In fact, the capital/labor ratio throughout the late 50's and 60's grew at a rate that was never less than 2 percent per year. In the 1970's, the rate of growth of the capital/labor ratio was above 2 percent in only one year, 1973. The ratio actually fell in 1975. Due to the rapid expected growth in the labor force and an anticipated slow recovery of gross investment in fixed capital, the ratio is likely to grow very slowly in 1976 and 1977. Even if capital stock growth accelerates sharply, it may not be until 1980 that we see a return to the growth rates of the 1960's. The detailed results for labor and capital are summarized in Table II.

b) Labor Quality

Shifts in the different factors affecting labor quality are less dramatic. Changes in the work experience of the labor

force is an important factor affecting productivity movements throughout the 1970's. Productivity is reduced when the proportion of inexperienced workers in the work force increases. The surge in the labor input as shown in Table II reflects the very high fertility rates of the decade following World War II. The individuals born in these years were new entrants to the work force in the late 60's and the early to mid-70's. The productivity of new entrants is reduced for a time, because they lack work experience. As we move into the late 70's, the depressing effect of the new entrants on productivity should reverse itself. The late 1960's and early 1970's surge in the young entrants can be seen in Table III. The percent of the employed population in the 16-19 and 20-24 year groups rises throughout the 1960's, but levels off about 1973. The percent in the 20-24 year group is expected to hold at about the 1974-75 levels while the percent in the 16-19 year group should fall. There was very little movement in the percent represented by the 25-34 year group until 1971, at which point a sharp rise begins. This rise can be expected to continue throughout the decade and to be accompanied by productivity gains.

The basic trends in the educational quality of the work force should be much the same in the period 1976-81 as in

the earlier period. Tables IV and V presents estimates of the percent distribution of the employed male and female population 16 years and over. The projections for 1976-1981 are based on estimates of the educational attainment of the population through 1980 prepared by the Bureau of the Census. It was necessary to adjust these projections to reflect educational attainment of the employed population. Holding other factors fixed, increases in the formal education of the work force will increase productivity. The trends reported in the tables through 1981 reflect the fact that older population groups retiring from the work force have less formal education than the younger individuals entering. Accordingly, the positive contribution of education to productivity growth found in earlier periods should continue into the 1980's.

As noted above, productivity is also affected by shifts of the population among industries with differing levels of productivity. The shift of employment from farm to non-farm provides an interesting example. From the end of World War II to 1970 the proportion of total hours of labor employed in the farm sector of the U.S. economy fell from 19 percent to 5 percent. Since labor productivity in farming (as measured in the national income accounts) was lower than in the nonfarm sector, aggregate measured productivity rose. It has been estimated that the farm

to nonfarm shifts accounted for more than 10 percent of the total labor productivity increase in the period 1947-1976. However, the shift in employment from farm to nonfarm slowed in the mid-1960's and employment in the service sectors and government has expanded relative to other sectors. We are currently estimating the contribution of industrial shifts to productivity growth to be zero for the 1970-81 period.

c) The Quality of Capital

As noted, we do not have adequate direct measures of capital quality. However, we can measure a variable which should be an important factor in affecting the quality of capital, research and development. Chart I shows National Science Foundation estimates of current and constant dollar research and development (R&D) expenditures for the years 1967-75 and a forecast for 1976. Real R&D expenditures in 1975 are down about 7 percent from their peak level of \$30 billion in 1969. As a share of GNP, R&D has fallen steadily from a peak of 3.0 percent in 1964 to 2.3 percent.

IV. Overall Assessment

Table VI provides a summary growth accounting of the factors which affect productivity. As noted in Section II, not all of the factors which affect productivity are observable. In particular, changes in the quality of the stock of capital are not directly measurable, at least in the aggregate.

It is likely, however, that the effects of such quality changes can be observed indirectly. First, the total percentage change in productivity is observable. It is also possible, using growth accounting procedures patterned on those developed by Edward F. Denison to obtain direct estimates of the contributions to productivity of 1) changes in the capital/labor ratio and 2) of changes in the age, sex, education, industry, and occupation mix of the population. This second item is measured by using observed wage rate differences as proxies for productivity differences among individuals. Much of the difference between the total observed percentage change in productivity and the percentage change accounted for by the measurable factors is probably due to capital quality changes. Since our focus is on productivity trends, the output per hour of labor, labor quantity and labor quality variables reported in Table VI have been corrected for cyclical variation. Column 1. of Table VI gives the percentage change in output (real GNP) per hour for various periods from 1965-1981. The projections for the 1976-1981 period will be discussed later. Column 2. reports the contribution to Column 1. accounted for by increases in the capital/labor ratio, and Column 3. gives the contribution of changes in the age, sex, education, etc., composition of the work force. Finally, Column 4. shows the contribution of unobservable factors such as capital quality changes.

In the period 1970-75, the contribution of the capital/labor ratio to the percentage growth in productivity was roughly one-half of its value in earlier periods. In the 1973-75 period the contribution of the capital/labor ratio was virtually zero, because of the very low levels of investment expenditures. The contribution of compositional changes to productivity

growth was relatively small in the 1966-75 period in comparison to earlier years, ranging from .09 percent in the late 60's to .22 percent in the 1973-75 period. The benefits of increased education in this period were largely offset by the depressing effect of the very large numbers of young and inexperienced workers entering the work force at this time. As the young work force gains experience the compositional effects should yield a significant positive contribution in the late 70's.

The effects on productivity of unobservable factors are reported in Column 4. It is of some interest that in the periods 1956-65, 1965-70 and 1970-73, the unobservable factors contributed roughly 1.0+ percent to productivity growth and -.52 percent in the 1973-75 period. The measurable factors did contribute something to the low (in fact, negative) productivity growth in 1973-75; however, the unobservables were by far the most important factors in the dismal productivity performance of the 1973-75 period.

It is an interesting question as to what may have been responsible for the poor 1973-75 performance. The effectiveness of capital investment in contribution to productivity growth may have been lowered by the need to allocate some investment funds to pollution abatement. Also, one could argue that the -.52 percent nonmeasurable contribution reflected a once and for all destruction of productive capacity. It might be argued that the capacity destruction was a consequence of the very large changes in relative energy prices in 1974 which rendered some plant and equipment obsolete. Another source of lost capacity would be the shutdown of some production facilities to comply with environmental regulations. If some of the capital stock was actually scrapped we should expect to find large writeoffs in the form

of capital consumption allowances. The capital consumption allowances in book value terms, however, have shown little more than the normal steady trend. A more plausible argument might be that, because of the large increases in energy costs, the (marginal) productivity of all capital (new and old) fell, but not to a level that would justify large-scale scrapping. Evidence for the above argument might be found in a permanent decline in the full employment share of nonwage income payments in GNP. Unfortunately, data on the economy in a full employment state have yet to become available in the post-1974 period.

Another point of view would place little emphasis on two-year movements in productivity and would simply observe that the trend in productivity changes for the last ten years has been negative, and that the average rate of growth attributable to unobservable factors was .4 percent for the years 1970-75, less than half its value in earlier periods. They might couple this with the fact that research and development spending as a percent of GNP has declined steadily from 3.0 percent in 1965 to 2.3 percent in 1976. There may be something to such an argument, but it is extremely difficult to attribute more than a slight influence to the slowdown in R&D spending. The flow of new ideas is not likely to be proportional to the amount of R&D purchased. Another possible candidate for a long-run slowdown in productivity growth would be increased costs of extraction of raw materials as the easy to mine materials are worked out.

It seems reasonable to assume that the effects of R&D slowdowns, and rising extraction costs affect productivity growth in a very slow and steady

way. They do not cause aberrations such as the 1974-75 productivity experience. The flow of new ideas is probably also of a steady sort. However, the implementation of new ideas may not be. In fact, with the large relative energy price shifts of 1974-75, it may be that whole lines of thought on energy using technology may have become obsolete. Producers may have been forced to consider unfamiliar technologies. The resulting uncertainty could have resulted in a hiatus in the introduction of new technologies. Data are simply not available at the moment to confirm such a hypothesis. However, if the 1974-75 experience can be traced to a temporary phenomenon such as the one just cited, and to a once and for all decline in the (marginal) productivity of capital, it becomes possible to offer projections for the 1976-81 period. If we can assume a return to the 1.0 percent rate of contribution to productivity growth of the unmeasurable factors, the results of Table VI for measurable productivity growth suggest a return to 2.0 percent to 2.2 percent productivity growth in the 1978-81 period. This is still perhaps .5 percent lower than the rates of growth found in the period before 1965. For the near-term, 1976-1977, we have assumed a contribution of .75 percent for the nonmeasurable factors. This, together with an expected slow growth in the capital labor ratio, leads to a 1.29 percent productivity growth in 1976-77. The projections of Column 2., Table VI make use of the capital/labor ratio projections from Table II. The projections of the effects of age, sex, education, etc., composition changes in the work force are based on demographic projections of the composition of the work force provided by the Bureau of Labor Statistics and the Bureau of the Census.



IV. Economic Policies to Increase Productivity growth

If, given present economic policies, productivity growth is not expected to return to the pre-1965 levels, it is appropriate to consider the desirability of economic policy changes which would stimulate productivity. While one can imagine policy measures (incentive system) which would affect the age, sex, occupational and industrial mix of the work force, such interference in the private sector would be economically as well as politically unwise. The obvious candidates for affecting the growth of productivity are:

1. Greater fixed investment incentives, which should increase the quantity of capital.
2. Improvements in the use of resources devoted to education, which might increase the quality of labor.
3. Public policies that might be expected to increase the nonmeasurable sources of productivity growth such as:
  - a. Increased R&D expenditures;
  - b. Reform of the regulatory system; and
  - c. Improvement in the functioning of the labor market.

With the help of its task force on productivity, the CEA will study alternative policies to enhance productivity growth and present its findings in a subsequent report.



September 14, 1976

Charts for the Report of the Interagency  
Task Force on U.S. Productivity Growth

Table I

Period	Annual Rate of Growth - Real Gross National Product per Hour - Percent
1947-53 .....	4.20
1953-68 .....	2.61
1968-73 .....	1.41

Source: The labor hours series is the sum of labor hours employed in the private sector (from Employment and Earnings, Table C-11) plus government sector labor hours estimating using an assumed 40 hour workweek.

Table II.-- Annual Percentage Changes in Hours of Labor,  
Stocks of Fixed Capital and the Capital/Labor Ratio

Year	Labor	Capital	Capital/ Labor
1957	.6	3.7	3.1
1958	.7	2.8	2.1
1959	.9	3.6	2.7
1960	.9	3.3	2.4
1961	.9	3.0	2.1
1962	.5	3.5	3.0
1963	1.4	3.7	2.3
1964	1.2	4.0	2.8
1965	1.3	4.7	3.4
1966	1.2	4.6	3.4
1967	1.7	3.8	2.1
1968	1.5	4.1	2.6
1969	1.7	4.0	2.3
1970	1.9	3.2	1.3
1971	1.9	3.4	1.5
1972	2.1	4.0	1.9
1973	1.8	4.2	2.4
1974	1.7	2.9	1.2
1975	1.6	1.4	-.2
1976	1.7	1.9	.2
1977	1.6	2.7	1.1
1978	1.5	3.0	1.5
1979	1.5	3.4	1.9
1980	1.3	3.7	2.4
1981	1.2	3.7	2.5

Notes: The labor time series (historical and projected) is a full employment labor hours series developed as part of the CEA potential output studies. The capital stock series for the historical period is the sum of the Department of Commerce constant (1972) dollar net stocks of business and residential fixed capital. The capital projections are in line with CEA's most recent forecasts of business fixed investment and residential construction.

Table III.--Percent Distribution of the Employed Population  
by Age Groups

Year	16-19	20-24	25-34	35-64	65+
1960 .....	6.28	9.31	20.72	59.02	4.67
1961 .....	6.25	9.48	20.43	59.30	4.54
1962 .....	6.29	9.66	19.95	59.58	4.51
1963 .....	6.28	10.05	19.65	59.71	4.30
1964 .....	6.52	10.54	19.40	59.25	4.29
1965 .....	7.09	10.84	19.27	58.58	4.23
1966 .....	7.85	10.92	19.23	57.94	4.06
1967 .....	7.64	11.42	19.60	57.29	4.05
1968 .....	7.61	11.54	20.11	56.71	4.03
1969 .....	7.85	11.96	20.38	55.74	4.05
1970 .....	7.81	12.36	20.73	55.14	3.96
1971 .....	7.83	12.82	21.06	54.46	3.84
1972 .....	8.23	13.34	21.87	52.90	3.67
1973 .....	8.57	13.84	22.74	51.44	3.40
1974 .....	8.61	13.85	23.51	50.75	3.28
1975 .....	8.31	13.73	24.27	50.41	3.28
1976 .....	8.39	13.72	24.67	49.78	3.29
1977 .....	8.22	13.92	25.18	49.75	3.29
1978 .....	8.14	14.01	25.48	49.15	3.18
1979 .....	7.97	13.92	25.98	48.73	3.18
1980 .....	7.80	13.93	26.59	48.42	3.18
1981 .....	7.54	13.93	27.29	48.10	3.08

Source: Bureau of Labor Statistics -- Household Survey.

Table IV.--Percent Distribution of Employed Population (Males)  
 By Educational Attainment -  
 Corrected for Coverage in 1972-75

	Grade School			High School		College			Median Years
	1-4	5-7	8	1-3	4	1-3	4	5+	
Males-1960									
1961									
1962	5.1	9.8	13.9	19.2	29.1	10.6	7.3	5.0	12.1
1963									
1964									
1965	4.3	8.3	12.7	18.9	32.3	10.6	7.5	5.4	12.2
1966	3.9	8.0	12.3	19.0	32.9	10.7	7.8	5.4	12.3
1967	3.6	7.8	11.6	18.5	33.1	11.9	8.0	5.5	12.3
1968	3.3	7.3	11.1	18.2	33.9	12.2	7.9	6.0	12.3
1969	3.2	6.9	10.6	17.8	34.6	12.7	7.9	6.3	12.3
1970	2.8	6.7	10.1	17.2	35.2	13.4	8.2	6.4	12.4
1971	2.7	6.1	9.5	16.5	35.8	14.0	8.7	6.7	12.4
1972	2.6	5.8	8.8	16.3	36.1	14.4	8.9	7.0	12.4
1973	2.5	5.4	7.8	15.8	37.0	15.0	9.3	7.2	12.5
1974	2.4	5.1	7.5	15.1	37.1	15.5	9.6	7.8	12.5
1975	2.1	4.6	6.7	14.2	37.2	16.3	10.6	8.4	12.6
1976	1.8	4.3	6.4	14.0	37.4	16.6	10.8	8.7	12.6
1977	1.7	4.1	6.1	13.7	37.7	16.9	11.0	8.8	12.6
1978	1.6	3.9	5.7	13.4	38.1	17.1	11.2	9.0	12.7
1979	1.6	3.7	5.4	13.2	38.1	17.4	11.4	9.2	12.7
1980	1.5	3.5	5.1	12.9	38.3	17.7	11.7	9.4	12.8
1981	1.4	3.3	4.8	12.6	38.4	18.0	12.0	9.6	12.9

Source: The historical data are from the Special Labor Force Reports - Series on Educational Attainment.

Table V.--Percent Distribution of Employed Population (Females)  
by Educational Attainment -- Corrected for Coverage in 1972-75

Period	Grade School			High School		College			Median years
	0-4	5-7	8	1-3	4	1-3	4	5+	
Females: 1960 .....									
1961 .....									
1962 .....	3.0	7.2	11.5	18.1	38.8	11.5	7.2	2.8	12.3
1963 .....									
1964 .....									
1965 .....	2.3	6.1	10.5	18.1	42.1	10.6	7.2	3.2	12.3
1966 .....	2.1	6.2	9.4	18.0	43.1	11.1	6.9	3.3	12.3
1967 .....	2.0	5.7	8.9	18.0	43.2	11.9	7.3	3.0	12.4
1968 .....	1.8	5.3	8.6	17.1	43.9	12.5	7.6	3.2	12.4
1969 .....	1.9	5.1	7.8	16.9	45.0	12.6	7.3	3.4	12.4
1970 .....	1.6	4.4	7.6	16.5	45.6	13.3	7.5	3.6	12.4
1971 .....	1.4	4.3	7.1	15.8	45.5	14.0	8.0	3.9	12.5
1972 .....	1.4	3.9	6.5	15.6	46.5	13.8	8.3	3.9	12.4
1973 .....	1.3	3.5	5.9	15.1	46.9	14.5	8.7	4.1	12.5
1974 .....	1.1	3.5	5.3	14.5	46.0	15.9	9.2	4.5	12.5
1975 .....	1.0	3.1	5.1	13.4	46.5	16.2	9.6	5.0	12.5
1976 .....	.9	3.0	4.8	13.2	46.6	16.3	9.9	5.2	12.5
1977 .....	.9	2.9	4.5	13.0	46.8	16.5	10.1	5.3	12.6
1978 .....	.8	2.7	4.2	12.8	46.9	16.7	10.4	5.4	12.6
1979 .....	.8	2.5	4.0	12.6	47.0	16.8	10.6	5.6	12.6
1980 .....	.7	2.4	3.8	12.4	47.1	17.0	10.9	5.7	12.6
1981 .....	.7	2.3	3.6	12.2	47.0	17.2	11.2	5.8	12.6

Source: The historical data are from the Special Labor Force Reports - Series on Educational Attainment.

Chart I.  
R&D funding trends: 1967-76

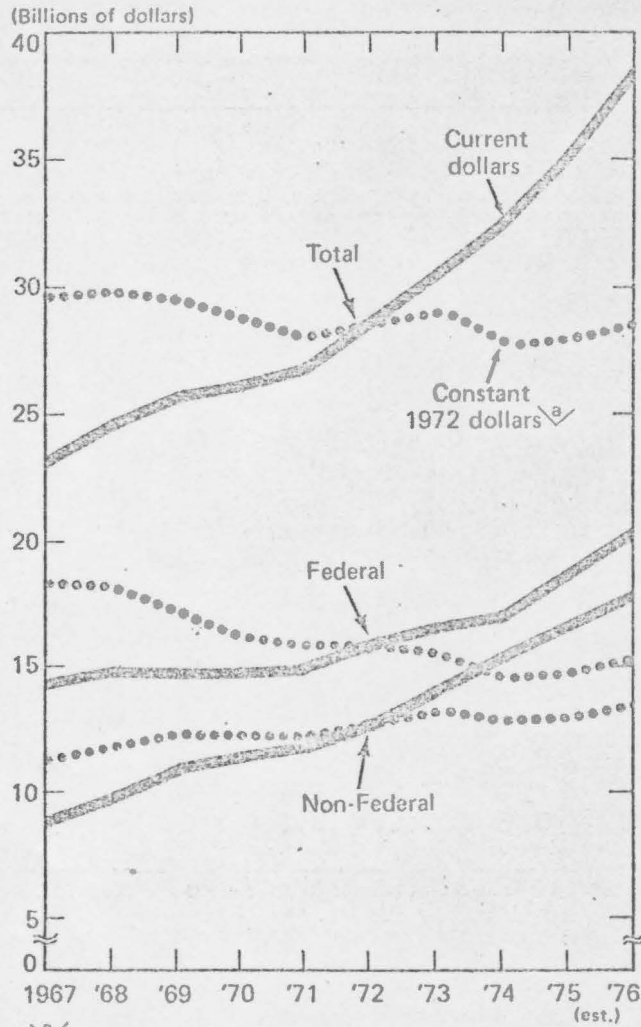




Table VI.--Contributions to the Percent Change in  
Real GNP per Hour of Labor

	1.	2.	3.	4.
Period	Total Percent change real GNP per hour of labor	Contribution to percent change of changes in the Capital/ Labor Ratio	Contribution to percent change of changes in the composition of the Workforce	Col.1-(Col.2+3) Contribution to percent change of unobservable factors
1956-1965 .....	2.61	.88	.47	1.26
1965-1970 .....	2.04	.79	.09	1.16
1970-1975 .....	1.04	.45	.19	.40
1970-1973 .....	1.83	.64	.18	1.01
1973-1975 .....	-.14	.16	.22	-.52
1976-1977 .....	1.29	.21	.31	.75
1978-1981 .....	2.13	.68	.45	1.00

\*Source: See the Statistical Appendix to this Report. The entry in Column 3. for 1956-1965 is inferred from Edward F. Denison, Accounting for United States Economic Growth, (The Brookings Institution, 1974) p. 138. The procedures used to develop this table are approximations of Denison's. Also, Denison's output measure was real national income, whereas we are working with real gross national product. Accordingly, the numbers reported herein are not strictly comparable with Denison's.

EYES ONLY

MINUTES OF  
ECONOMIC POLICY BOARD  
EXECUTIVE COMMITTEE MEETING

September 13, 1976

Attendees: Messrs. Simon, Seidman, Lynn, Richardson, Gorog,  
Porter, Darman, Perritt, Walker, Bell, Katz, Jones

1. Statement on Tax Bill

The Executive Committee briefly discussed a draft statement on the tax bill.

Decision

Executive Committee members were requested to provide their comments and suggested changes to Mr. Seidman's office by 2:00 p. m. today.

2. Sugar Situation

Mr. Bell reported on the work of the Sugar Policy Task Force. The discussion focused on the outlook for sugar prices; the history of U.S. sugar policy and the advantages and disadvantages of various policy options, including an increase in the tariff, a lowering of the quota and removing sugar from the Generalized System of Preferences.

Decision

Executive Committee members were requested to provide Mr. Seidman's office with their comments and recommendations for incorporation into a decision memorandum for the President on sugar.

3. Report of Task Force on Services and the MTN

The Executive Committee reviewed a report on the work of the Task Force on Services and the Multilateral Trade Negotiations.

EYES ONLY

The discussion focused on the importance of services in the international economy and the implications of the fact that service sector participation in international markets is predominately associated with investment rather than trade; the recommendations of the Task Force with respect to services and the multinational trade negotiations, government/industry consultation, government organization, services and investment; and United States patent policy regarding the transfer of technology generated through government research and development expenditures.

Decision

Executive Committee members were requested to provide Mr. Seidman's office with their comments and position on the recommendations of the Task Force on Services and the MTN no later than c. o. b. Thursday, September 16.

ALAN GREENSPAN, CHAIRMAN  
PAUL W. MACAVOY  
BURTON G. MALKIEL


September 13, 1976

MEMORANDUM FOR THE EXECUTIVE COMMITTEE OF THE  
ECONOMIC POLICY BOARD

Subject: Report of the Task Force on Productivity

The attached paper presents a preliminary report on the Task Force on Productivity. The Task Force has decided to present its findings in two papers. The first, which is attached, presents our analysis of the sources of slower productivity growth in the U. S. and the prospects for the future. A forthcoming paper will discuss in detail the policy alternatives identified in the concluding section of the paper.

The Task Force particularly wishes to thank members of the Commerce Department and Labor Department for their help in performing the underlying analysis supporting the conclusions of the report. Thanks are also due to Edward Denison, the father of productivity accounting, for his invaluable help.

  
Burton G. Malkiel



Report of the Interagency Task Force on U.S. Productivity  
Growth: Recent History and Prospects for the Future

I. Introduction

The focus of this paper is on aggregate U.S. labor productivity growth. Accordingly, we have taken real gross national product per labor hour employed as our indicator of labor productivity. Table I shows the history of labor productivity over the 1947-1973 period. The time periods reported in Table I were chosen to encompass peak periods of economic activity. This should minimize business cycle distortions of productivity movements.

The data in Table I suggest that productivity has slowed considerably. It is important to ask whether the slowdown is permanent in nature. A closely related issue is the question of whether economic policy measures can be designed which would significantly affect long-run productivity growth. The only way to resolve these issues is to undertake a careful accounting of the sources of productivity growth and to develop forecasts of movements in the factors which affect productivity.

The analysis of this paper indicates that the slowdown in productivity growth, in the 1970's in particular, can be traced to a very slow growth in the capital/labor ratio in the years 1970-75 and to a change in the labor force mix because of the entrance into the work force of large numbers of young and inexperienced workers. Our estimates indicate that these two factors in combination resulted in a reduction in the percent growth in productivity of as much as .6 percent from the 2 percent levels of the middle and late 1960's. The labor force mix factor is only temporary in its depressing effects. During the first half of the 1970's it was an important offset to contributions from other productivity enhancing factors such as increased education. As



the young work force gains experience later in the decade, the effect of age mix changes should be to increase the productivity growth rate.

There were a number of other temporary factors working to reduce productivity increases in the period 1970-75. The energy price increases may well have made obsolete parts of the capital stock associated with energy intensive technologies. New technologies which are energy intensive may also have become obsolete before they were introduced. Because of this the rate of introduction of new technologies may have temporarily slowed. Environmental regulations are known to have resulted in the closing of some production facilities. They also resulted in large capital expenditures on pollution abatement devices which do not contribute directly to production. Steel and other primary metals are examples of industries affected by these problems. Another factor which may have contributed to a temporary decline in economic efficiency in the early 1970's was the imposition of wage and price controls.

Under the assumption that many of the disruptions of the 1970's were temporary aberrations which will not be operating in the late 1970's, we have estimated that the rate of productivity growth will rise from the virtually zero levels of 1974-75 to the 2.0 to 2.2 percent range in the period 1978-81. This is unfortunately, .5 percent or more lower than the growth rates of the 1950's and 1960's. It is estimated that faster rates of growth in the capital/labor ratio and increases in the experience of the work force will add perhaps .5 percent to the percentage rate of productivity growth in the late 1970's. We do expect strong productivity gains in 1976, but most of this will be of a purely cyclical sort. The factors which account for longer term productivity growth will contribute relatively little in 1976.

## II. A Catalogue of the Sources of Productivity Change

It is useful to catalogue the major sources of productivity change. These include the quantity and quality of capital goods and the quality of labor.

### a) The Quantity of Capital

Increases in the quantity of productive capital goods per unit of labor input (the capital/labor ratio) can be expected to increase the amount of output per hour of labor employed. Capital goods supplement labor in production. The more of these goods available to a given work force, the greater production will be. In assessing the contribution of changes in the capital/labor ratio to productivity growth we will make use of existing data on real stocks of capital and total hours of labor for the U.S.

### b) Labor Quality Changes

Contributions to labor quality changes would include: Changes in the age, sex, educational, industrial and occupational composition of the labor force. It is well known, for example, that productivity varies systematically among individuals due to age differences, and differences in educational attainment and sex. In a competitive society such differences reveal themselves in wage differentials among individuals. Other things equal, more highly educated and more experienced individuals are more skilled,

more productive, and earn more. Since wage differentials are indicators of productivity differences, they provide a means for assessing the effects on productivity of compositional changes in the work force.

c) Changes in the Quality of Capital - Technological Change

On the microeconomic level this is the most visible source of productivity growth. However, capital quality changes are much more difficult to measure in the aggregate. Because of these measurement difficulties, the effects of capital quality improvements can be observed only indirectly. We can, however, directly observe one factor which is an important source of technological improvements, research and development (R&D) expenditures.

While it is unfortunate that we do not have direct measures of the effects of capital quality changes, we should recognize that we still can measure the effect of a significant proportion of the factors which contribute to productivity and output growth. Moreover, many of the factors affecting growth are demographic in nature and easily forecast for, say, a five year period.

III. Factors Affecting Productivity and Economic Growth, 1956-1980

In the preceding section we developed a list of factors considered to be important in affecting productivity growth. We now present a quantitative analysis of the historical behavior of a number of these factors, and forecasts for the 1976-81 period.



a) The Quantity of Capital

The period 1956-75 was marked by dramatic shifts in the ways that the factors which contribute to economic growth worked their effects. In the period 1956-66 the growth of hours of labor averaged only 1 percent per annum while capital stock growth averaged 3.7 percent. As a consequence the capital/labor ratio grew by 2.7 percent annually on average. In the period 1966-1975, the growth of hours worked rose to 1.8 percent per annum while capital growth was 3.4 percent. The result was a 1.7 percent rate of growth in the capital/labor ratio. In fact, the capital/labor ratio throughout the late 50's and 60's grew at a rate that was never less than 2 percent per year. In the 1970's, the rate of growth of the capital/labor ratio was above 2 percent in only one year, 1973. The ratio actually fell in 1975. Due to the rapid expected growth in the labor force and an anticipated slow recovery of gross investment in fixed capital, the ratio is likely to grow very slowly in 1976 and 1977. Even if capital stock growth accelerates sharply, it may not be until 1980 that we see a return to the growth rates of the 1960's. The detailed results for labor and capital are summarized in Table II.

b) Labor Quality

Shifts in the different factors affecting labor quality are less dramatic. Changes in the work experience of the labor

force is an important factor affecting productivity movements throughout the 1970's. Productivity is reduced when the proportion of inexperienced workers in the work force increases. The surge in the labor input as shown in Table II reflects the very high fertility rates of the decade following World War II. The individuals born in these years were new entrants to the work force in the late 60's and the early to mid-70's. The productivity of new entrants is reduced for a time, because they lack work experience. As we move into the late 70's, the depressing effect of the new entrants on productivity should reverse itself. The late 1960's and early 1970's surge in the young entrants can be seen in Table III. The percent of the employed population in the 16-19 and 20-24 year groups rises throughout the 1960's, but levels off about 1973. The percent in the 20-24 year group is expected to hold at about the 1974-75 levels while the percent in the 16-19 year group should fall. There was very little movement in the percent represented by the 25-34 year group until 1971, at which point a sharp rise begins. This rise can be expected to continue throughout the decade and to be accompanied by productivity gains.

The basic trends in the educational quality of the work force should be much the same in the period 1976-81 as in

the earlier period. Tables IV and V presents estimates of the percent distribution of the employed male and female population 16 years and over. The projections for 1976-1981 are based on estimates of the educational attainment of the population through 1980 prepared by the Bureau of the Census. It was necessary to adjust these projections to reflect educational attainment of the employed population. Holding other factors fixed, increases in the formal education of the work force will increase productivity. The trends reported in the tables through 1981 reflect the fact that older population groups retiring from the work force have less formal education than the younger individuals entering. Accordingly, the positive contribution of education to productivity growth found in earlier periods should continue into the 1980's.

As noted above, productivity is also affected by shifts of the population among industries with differing levels of productivity. The shift of employment from farm to non-farm provides an interesting example. From the end of World War II to 1970 the proportion of total hours of labor employed in the farm sector of the U.S. economy fell from 19 percent to 5 percent. Since labor productivity in farming (as measured in the national income accounts) was lower than in the nonfarm sector, aggregate measured productivity rose. It has been estimated that the farm

to nonfarm shifts accounted for more than 10 percent of the total labor productivity increase in the period 1947-1976. However, the shift in employment from farm to nonfarm slowed in the mid-1960's and employment in the service sectors and government has expanded relative to other sectors. We are currently estimating the contribution of industrial shifts to productivity growth to be zero for the 1970-81 period.

c) The Quality of Capital

As noted, we do not have adequate direct measures of capital quality. However, we can measure a variable which should be an important factor in affecting the quality of capital, research and development. Chart I shows National Science Foundation estimates of current and constant dollar research and development (R&D) expenditures for the years 1967-75 and a forecast for 1976. Real R&D expenditures in 1975 are down about 7 percent from their peak level of \$30 billion in 1969. As a share of GNP, R&D has fallen steadily from a peak of 3.0 percent in 1964 to 2.3 percent.

IV. Overall Assessment

Table VI provides a summary growth accounting of the factors which affect productivity. As noted in Section II, not all of the factors which affect productivity are observable. In particular, changes in the quality of the stock of capital are not directly measurable, at least in the aggregate.

It is likely, however, that the effects of such quality changes can be observed indirectly. First, the total percentage change in productivity is observable. It is also possible, using growth accounting procedures patterned on those developed by Edward F. Denison to obtain direct estimates of the contributions to productivity of 1) changes in the capital/labor ratio and 2) of changes in the age, sex, education, industry, and occupation mix of the population. This second item is measured by using observed wage rate differences as proxies for productivity differences among individuals. Much of the difference between the total observed percentage change in productivity and the percentage change accounted for by the measurable factors is probably due to capital quality changes. Since our focus is on productivity trends, the output per hour of labor, labor quantity and labor quality variables reported in Table VI have been corrected for cyclical variation. Column 1. of Table VI gives the percentage change in output (real GNP) per hour for various periods from 1965-1981. The projections for the 1976-1981 period will be discussed later. Column 2. reports the contribution to Column 1. accounted for by increases in the capital/labor ratio, and Column 3. gives the contribution of changes in the age, sex, education, etc., composition of the work force. Finally, Column 4. shows the contribution of unobservable factors such as capital quality changes.

In the period 1970-75, the contribution of the capital/labor ratio to the percentage growth in productivity was roughly one-half of its value in earlier periods. In the 1973-75 period the contribution of the capital/labor ratio was virtually zero, because of the very low levels of investment expenditures. The contribution of compositional changes to productivity

growth was relatively small in the 1966-75 period in comparison to earlier years, ranging from .09 percent in the late 60's to .22 percent in the 1973-75 period. The benefits of increased education in this period were largely offset by the depressing effect of the very large numbers of young and inexperienced workers entering the work force at this time. As the young work force gains experience the compositional effects should yield a significant positive contribution in the late 70's.

The effects on productivity of unobservable factors are reported in Column 4. It is of some interest that in the periods 1956-65, 1965-70 and 1970-73, the unobservable factors contributed roughly 1.0+ percent to productivity growth and -.52 percent in the 1973-75 period. The measurable factors did contribute something to the low (in fact, negative) productivity growth in 1973-75; however, the unobservables were by far the most important factors in the dismal productivity performance of the 1973-75 period.

It is an interesting question as to what may have been responsible for the poor 1973-75 performance. The effectiveness of capital investment in contribution to productivity growth may have been lowered by the need to allocate some investment funds to pollution abatement. Also, one could argue that the -.52 percent nonmeasurable contribution reflected a once and for all destruction of productive capacity. It might be argued that the capacity destruction was a consequence of the very large changes in relative energy prices in 1974 which rendered some plant and equipment obsolete. Another source of lost capacity would be the shutdown of some production facilities to comply with environmental regulations. If some of the capital stock was actually scrapped we should expect to find large writeoffs in the form

of capital consumption allowances. The capital consumption allowances in book value terms, however, have shown little more than the normal steady trend. A more plausible argument might be that, because of the large increases in energy costs, the (marginal) productivity of all capital (new and old) fell, but not to a level that would justify large-scale scrapping. Evidence for the above argument might be found in a permanent decline in the full employment share of nonwage income payments in GNP. Unfortunately, data on the economy in a full employment state have yet to become available in the post-1974 period.

Another point of view would place little emphasis on two-year movements in productivity and would simply observe that the trend in productivity changes for the last ten years has been negative, and that the average rate of growth attributable to unobservable factors was .4 percent for the years 1970-75, less than half its value in earlier periods. They might couple this with the fact that research and development spending as a percent of GNP has declined steadily from 3.0 percent in 1965 to 2.3 percent in 1976. There may be something to such an argument, but it is extremely difficult to attribute more than a slight influence to the slowdown in R&D spending. The flow of new ideas is not likely to be proportional to the amount of R&D purchased. Another possible candidate for a long-run slowdown in productivity growth would be increased costs of extraction of raw materials as the easy to mine materials are worked out.

It seems reasonable to assume that the effects of R&D slowdowns, and rising extraction costs affect productivity growth in a very slow and steady

way. They do not cause aberrations such as the 1974-75 productivity experience. The flow of new ideas is probably also of a steady sort. However, the implementation of new ideas may not be. In fact, with the large relative energy price shifts of 1974-75, it may be that whole lines of thought on energy using technology may have become obsolete. Producers may have been forced to consider unfamiliar technologies. The resulting uncertainty could have resulted in a hiatus in the introduction of new technologies. Data are simply not available at the moment to confirm such a hypothesis. However, if the 1974-75 experience can be traced to a temporary phenomenon such as the one just cited, and to a once and for all decline in the (marginal) productivity of capital, it becomes possible to offer projections for the 1976-81 period. If we can assume a return to the 1.0 percent rate of contribution to productivity growth of the unmeasurable factors, the results of Table VI for measurable productivity growth suggest a return to 2.0 percent to 2.2 percent productivity growth in the 1978-81 period. This is still perhaps .5 percent lower than the rates of growth found in the period before 1965. For the near-term, 1976-1977, we have assumed a contribution of .75 percent for the nonmeasurable factors. This, together with an expected slow growth in the capital labor ratio, leads to a 1.29 percent productivity growth in 1976-77. The projections of Column 2., Table VI make use of the capital/labor ratio projections from Table II. The projections of the effects of age, sex, education, etc., composition changes in the work force are based on demographic projections of the composition of the work force provided by the Bureau of Labor Statistics and the Bureau of the Census.



IV. Economic Policies to Increase Productivity growth

If, given present economic policies, productivity growth is not expected to return to the pre-1965 levels, it is appropriate to consider the desirability of economic policy changes which would stimulate productivity. While one can imagine policy measures (incentive system) which would affect the age, sex, occupational and industrial mix of the work force, such interference in the private sector would be economically as well as politically unwise. The obvious candidates for affecting the growth of productivity are:

1. Greater fixed investment incentives, which should increase the quantity of capital.
2. Improvements in the use of resources devoted to education, which might increase the quality of labor.
3. Public policies that might be expected to increase the nonmeasurable sources of productivity growth such as:
  - a. Increased R&D expenditures;
  - b. Reform of the regulatory system; and
  - c. Improvement in the functioning of the labor market.

With the help of its task force on productivity, the CEA will study alternative policies to enhance productivity growth and present its findings in a subsequent report.



September 14, 1976

Charts for the Report of the Interagency  
Task Force on U.S. Productivity Growth

Table I

Period	Annual Rate of Growth - Real Gross National Product per Hour - Percent
1947-53 .....	4.20
1953-68 .....	2.61
1968-73 .....	1.41

Source: The labor hours series is the sum of labor hours employed in the private sector (from Employment and Earnings, Table C-11) plus government sector labor hours estimating using an assumed 40 hour workweek.



Table II.-- Annual Percentage Changes in Hours of Labor,  
Stocks of Fixed Capital and the Capital/Labor Ratio

Year	Labor	Capital	Capital/ Labor
1957	.6	3.7	3.1
1958	.7	2.8	2.1
1959	.9	3.6	2.7
1960	.9	3.3	2.4
1961	.9	3.0	2.1
1962	.5	3.5	3.0
1963	1.4	3.7	2.3
1964	1.2	4.0	2.8
1965	1.3	4.7	3.4
1966	1.2	4.6	3.4
1967	1.7	3.8	2.1
1968	1.5	4.1	2.6
1969	1.7	4.0	2.3
1970	1.9	3.2	1.3
1971	1.9	3.4	1.5
1972	2.1	4.0	1.9
1973	1.8	4.2	2.4
1974	1.7	2.9	1.2
1975	1.6	1.4	-.2
1976	1.7	1.9	.2
1977	1.6	2.7	1.1
1978	1.5	3.0	1.5
1979	1.5	3.4	1.9
1980	1.3	3.7	2.4
1981	1.2	3.7	2.5

Notes: The labor time series (historical and projected) is a full employment labor hours series developed as part of the CEA potential output studies. The capital stock series for the historical period is the sum of the Department of Commerce constant (1972) dollar net stocks of business and residential fixed capital. The capital projections are in line with CEA's most recent forecasts of business fixed investment and residential construction.

Table III.--Percent Distribution of the Employed Population  
by Age Groups

Year	16-19	20-24	25-34	35-64	65+
1960 .....	6.28	9.31	20.72	59.02	4.67
1961 .....	6.25	9.48	20.43	59.30	4.54
1962 .....	6.29	9.66	19.95	59.58	4.51
1963 .....	6.28	10.05	19.65	59.71	4.30
1964 .....	6.52	10.54	19.40	59.25	4.29
1965 .....	7.09	10.84	19.27	58.58	4.23
1966 .....	7.85	10.92	19.23	57.94	4.06
1967 .....	7.64	11.42	19.60	57.29	4.05
1968 .....	7.61	11.54	20.11	56.71	4.03
1969 .....	7.85	11.96	20.38	55.74	4.05
1970 .....	7.81	12.36	20.73	55.14	3.96
1971 .....	7.83	12.82	21.06	54.46	3.84
1972 .....	8.23	13.34	21.87	52.90	3.67
1973 .....	8.57	13.84	22.74	51.44	3.40
1974 .....	8.61	13.85	23.51	50.75	3.28
1975 .....	8.31	13.73	24.27	50.41	3.28
1976 .....	8.39	13.72	24.67	49.78	3.29
1977 .....	8.22	13.92	25.18	49.75	3.29
1978 .....	8.14	14.01	25.48	49.15	3.18
1979 .....	7.97	13.92	25.98	48.73	3.18
1980 .....	7.80	13.93	26.59	48.42	3.18
1981 .....	7.54	13.93	27.29	48.10	3.08

Source: Bureau of Labor Statistics -- Household Survey.

Table IV.--Percent Distribution of Employed Population (Males)  
By Educational Attainment -  
Corrected for Coverage in 1972-75

	Grade School			High School		College			Median Years
	1-4	5-7	8	1-3	4	1-3	4	5+	
Males-1960									
1961									
1962	5.1	9.8	13.9	19.2	29.1	10.6	7.3	5.0	12.1
1963									
1964									
1965	4.3	8.3	12.7	18.9	32.3	10.6	7.5	5.4	12.2
1966	3.9	8.0	12.3	19.0	32.9	10.7	7.8	5.4	12.3
1967	3.6	7.8	11.6	18.5	33.1	11.9	8.0	5.5	12.3
1968	3.3	7.3	11.1	18.2	33.9	12.2	7.9	6.0	12.3
1969	3.2	6.9	10.6	17.8	34.6	12.7	7.9	6.3	12.3
1970	2.8	6.7	10.1	17.2	35.2	13.4	8.2	6.4	12.4
1971	2.7	6.1	9.5	16.5	35.8	14.0	8.7	6.7	12.4
1972	2.6	5.8	8.8	16.3	36.1	14.4	8.9	7.0	12.4
1973	2.5	5.4	7.8	15.8	37.0	15.0	9.3	7.2	12.5
1974	2.4	5.1	7.5	15.1	37.1	15.5	9.6	7.8	12.5
1975	2.1	4.6	6.7	14.2	37.2	16.3	10.6	8.4	12.6
1976	1.8	4.3	6.4	14.0	37.4	16.6	10.8	8.7	12.6
1977	1.7	4.1	6.1	13.7	37.7	16.9	11.0	8.8	12.6
1978	1.6	3.9	5.7	13.4	38.1	17.1	11.2	9.0	12.7
1979	1.6	3.7	5.4	13.2	38.1	17.4	11.4	9.2	12.7
1980	1.5	3.5	5.1	12.9	38.3	17.7	11.7	9.4	12.8
1981	1.4	3.3	4.8	12.6	38.4	18.0	12.0	9.6	12.9

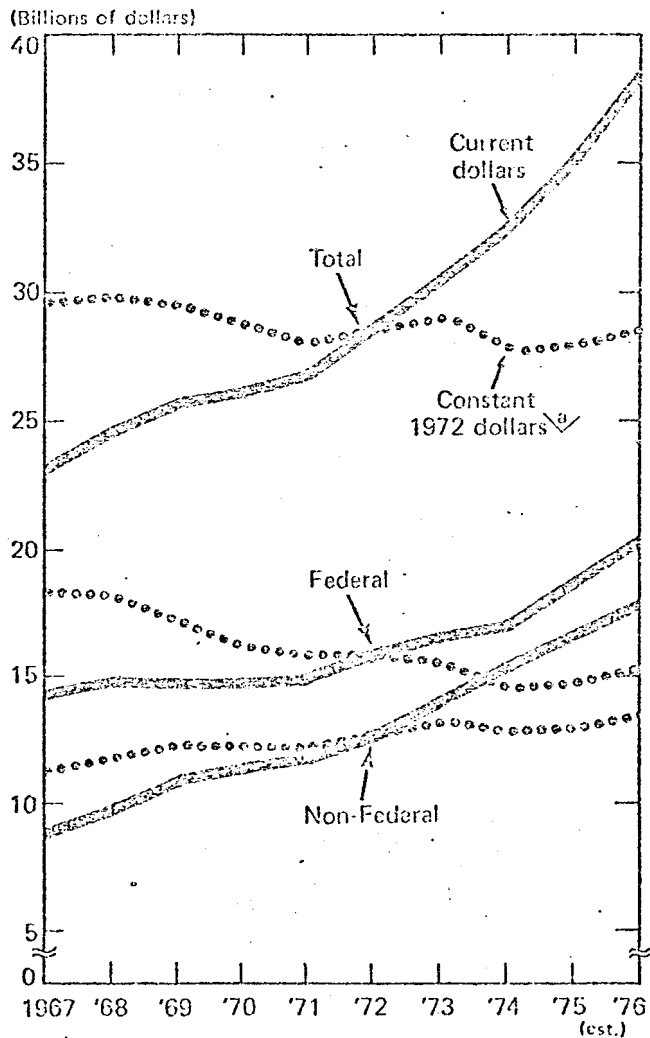
Source: The historical data are from the Special Labor Force Reports - Series on Educational Attainment.

Table V.--Percent Distribution of Employed Population (Females)  
by Educational Attainment -- Corrected for Coverage in 1972-75

Period	Grade School			High School		College			Median years
	0-4	5-7	8	1-3	4	1-3	4	5+	
Females: 1960 .....									
1961 .....									
1962 .....	3.0	7.2	11.5	18.1	38.8	11.5	7.2	2.8	12.3
1963 .....									
1964 .....									
1965 .....	2.3	6.1	10.5	18.1	42.1	10.6	7.2	3.2	12.3
1966 .....	2.1	6.2	9.4	18.0	43.1	11.1	6.9	3.3	12.3
1967 .....	2.0	5.7	8.9	18.0	43.2	11.9	7.3	3.0	12.4
1968 .....	1.8	5.3	8.6	17.1	43.9	12.5	7.6	3.2	12.4
1969 .....	1.9	5.1	7.8	16.9	45.0	12.6	7.3	3.4	12.4
1970 .....	1.6	4.4	7.6	16.5	45.6	13.3	7.5	3.6	12.4
1971 .....	1.4	4.3	7.1	15.8	45.5	14.0	8.0	3.9	12.5
1972 .....	1.4	3.9	6.5	15.6	46.5	13.8	8.3	3.9	12.4
1973 .....	1.3	3.5	5.9	15.1	46.9	14.5	8.7	4.1	12.5
1974 .....	1.1	3.5	5.3	14.5	46.0	15.9	9.2	4.5	12.5
1975 .....	1.0	3.1	5.1	13.4	46.5	16.2	9.6	5.0	12.5
1976 .....	.9	3.0	4.8	13.2	46.6	16.3	9.9	5.2	12.5
1977 .....	.9	2.9	4.5	13.0	46.8	16.5	10.1	5.3	12.6
1978 .....	.8	2.7	4.2	12.8	46.9	16.7	10.4	5.4	12.6
1979 .....	.8	2.5	4.0	12.6	47.0	16.8	10.6	5.6	12.6
1980 .....	.7	2.4	3.8	12.4	47.1	17.0	10.9	5.7	12.6
1981 .....	.7	2.3	3.6	12.2	47.0	17.2	11.2	5.8	12.6

Source: The historical data are from the Special Labor Force Reports - Series on Educational Attainment.

Chart I.  
R&D funding trends: 1967-76



<sup>a</sup>Based on GNP implicit price deflator.  
SOURCE: National Science Foundation



Table VI.--Contributions to the Percent Change in  
Real GNP per Hour of Labor

	1.	2.	3.	4.
Period	Total Percent change real GNP per hour of labor	Contribution to percent change of changes in the Capital/ Labor Ratio	Contribution to percent change of changes in the composition of the Workforce	Col.1-(Col.2+3) Contribution to percent change of unobservable factors
1956-1965 .....	2.61	.88	.47	1.26
1965-1970 .....	2.04	.79	.09	1.16
1970-1975 .....	1.04	.45	.19	.40
1970-1973 .....	1.83	.64	.18	1.01
1973-1975 .....	-.14	.16	.22	-.52
1976-1977 .....	1.29	.21	.31	.75
1978-1981 .....	2.13	.68	.45	1.00

\*Source: See the Statistical Appendix to this Report. The entry in Column 3. for 1956-1965 is inferred from Edward F. Denison, Accounting for United States Economic Growth, (The Brookings Institution, 1974) p. 138. The procedures used to develop this table are approximations of Denison's. Also, Denison's output measure was real national income, whereas we are working with real gross national product. Accordingly, the numbers reported herein are not strictly comparable with Denison's.