EXECUTIVE OFFICE OF THE PRESIDENT

COUNCIL OF ECONOMIC ADVISERS

WASHINGTON, D.C. 20500

November 4, 1985

MEMORANDUM FOR T2

FROM: LINCOLN ANDERSON LA

SUBJECT: Evaluation of the "Evaluation of the Mid-Session Growth Path"

In a memo to T2 dated October 31, Ahmad Al-Samarrie, Robert Anderson, Robert Kilpatrick, James Russel, and Kemble Stokes (AAKRS) presented an evaluation. I think that evaluation is flawed and that strong counter arguments exist. This memo presents the counter arguments.

Summary

The main AAKRS conclusion - low productivity growth will continue -- rests on two pieces of information: 1) observed data for the current cyclical recovery and 2) a "growth accounting" analysis by Stokes.[1] Concerning the first argument, I think a case can easily be made that extremely low growth rates in labor costs in the recovery to date, combined with considerable available labor supply, have led to substitution of labor input (growing at record rates) for productivity enhancing measures.[2] Concerning the second argument, I offer John Kendrick's, "growth accounting" analysis and forecast, which strongly supports the current Administration forecast.[3] In particular, I would note that effects Stokes casually dismissed (op cit top of page 8), Kendrick puts more weight on. Finally, I would note that

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1. "Thoughts on Long-Run Productivity Trends" memo to T3 dated October 28, 1985.

2. I am always surprised to see economic analysis which is devoid of analysis of relative price change.

3. "Long-Term Economic Projection: Stronger U.S. Growth Ahead," John Kendrick, Southern Economic Journal, April 1984 (attached).

the Administration forecast of real GNP per employee does not deviate from the postwar trend even if one assumes the unemployment rate remains at 7 percent for the next five years.

The second point AAKRS made is that the current Administration forecast, which shows nonfarm business employment growing relative to total household basis employment is unplausible. They do not expect this ratio to grow. They also argue that if this ratio does not grow then GNP growth is necessarily reduced. The first argument assumes that farm and government employment will grow as fast as private nonfarm employment. This is highly unlikely. The second argument does not follow. The Administration forecast assumes nonfarm business output will also grow faster than GNP (but still within trend). If farm and government employment grow faster than forecast then farm and government output will grow faster than forecast and nonfarm business output slower. The argument that GNP growth would be reduced does not follow. My conclusion is that the case AAKRS present is unpersuasive.

Observed Data Over Cyclical Recoveries

AAKRS point out that "the cyclical recovery in productivity is the weakest in the postwar period." They conclude that: "This expansion provides no evidence of an improving trend," and very strongly base all further analysis on the assumption that the 1970s trend will continue. Such a conclusion is very premature at best and worse, neglects any analysis of why productivity growth has been low in the last 11 quarters while hours worked has grown at a record rate (see Chart 1, top panel).

I think a good argument can be made that a major portion of the slowdown reflects cost minimization. During periods of slack in the economy, employers have the choice of increasing output by hiring additional labor or increasing expenditures on productivity enhancing measures. As shown in Chart 1 (bottom panels) average real compensation growth is at a record low. Average growth in unit labor costs (despite poor productivity) is way below the 1970s performance. While it is difficult to quantify the impact of the decline in labor costs, I would argue that it could have exerted a major impact on results to date. This effect in no way precludes a resumption of faster productivity growth as the recovery proceeds and record level investment translates into productive capacity. My conclusion is that casual observation of productivity growth in isolation over the last eleven quarters is not informative.

Forecast Growth Accounting

John Kendrick provides a growth accounting analysis and forecast that differs from the Stokes analysis and forecast (Kendrick's full article is attached). Forecasts are forecasts

and reasonable men can differ. Kendrick's assumptions are very close to the Administration forecast (higher in fact) while AAKRS are much lower. The point is that AAKRS's analysis proves nothing, it is merely different. I find Kendrick's analysis more compelling, but that is a personal viewpoint.

	Actual 1948-81	Administration 1981-90	Kendrick 1981-90	AAKRS 1981-90
Real GNP	3.5	3.4	4.0	3.0
Labor input	1.4	2.0*	1.3	1.6
Productivity	2.0	1.8*	2.7	1.4

* Administration forecasts of productivity growth and employment growth are 0.4% higher than GNP growth because both are nonfarm business measures. Nonfarm business output growth is 0.4% above GNP growth in the forecast (see summary or later discussion).

Another way to address this issue is using trend output or production function approaches.[4] Just to cut through the nonfarm business confusion and to address concerns that the Administration forecast of the unemployment rate is unduly optimistic, I offer Chart 2 as food for thought. This chart shows the ratio of real GNP to household basis civilian employment over the postwar period and the peak to peak trend (1948-81). Trend growth is 1.8%. The chart also shows the ratio of the Administration real GNP forecast to employment assuming a 7.0 percent unemployment rate. Even if no further decline in the unemployment rate is assumed, the Administration forecast does not return to trend.

	Postwar Average	Administration Forecast	Administration Forecast for Real GNP but Constant UR
	(Average Annual Percent Change)		
Growth in GNP per employee	1.8%	1.6%	1.7%

My conclusion is that even if the Administration forecast assumed no further decline in the unemployment rate, there

4. I have two papers that evaluate the Administration forecast using each approach which I will recirculate on request. (Neither paper finds obvious deviations from plausible forecast values.)

would be no obvious compelling reason to reduce the real GNP forecast.[5]

Bridge Between Household and Establishment Employment

Finally, AAKRS raise the issue of the bridge between household and establishment employment as a problem.[6] AAKRS thinks the forecast ratio is growing too fast. They think a more appropriate assumption would be to hold the ratio constant at current levels. Implicit in this recommendation is the assumption that farm, State and local government, and Federal Government employment will grow as fast as private nonfarm employment over the forecast period.

I think such an assumption is: 1) contrary to Administration policy of reducing federal civilian employment; 2) contrary to expected trends in State and local government employment; and 3) nonsensical for the farm sector.[7]

Next, AAKRS allege that reducing the ratio "would translate into 0.1-0.2 percent per year slower total real GNP growth." That might be true if the GNP forecast assumed rapid growth in farm and government output but no employment growth. But, in fact, the Administration assumptions already assume GNP growth that is 0.3 percent below output growth in the nonfarm business sector (Chart 3 shows growth in nonfarm output per employee).

If AAKRS want to shift around employment by sector, they should shift around output by sector as well.

Conclusion

I find nothing in the AAKRS or Stokes memo that is particularly persuasive. This does not mean that they are

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5. May Okun's Law rest in peace.

6. One alleged problem is that the ratio is managed "on one side to hit an unemployment rate target and on the other side to boost wage and salary payments." This will come as news to DRI which asserts in the November 1985 U.S. Forecast Summary (page 4) that the Administration profits share of GNP is too high - "assuming a high profit share is a well-known technique to enhance revenue estimates without making a clearly outrageous real GNP or inflation forecast."

7. AAKRS might also look at private sector forecasts of this ratio. DRI, for example (Trend 25YR0985), forecasts civilian household basis employment to grow 8.0% by 1990 while private, nonfarm establishment employment is forecast to grow 9.7%.

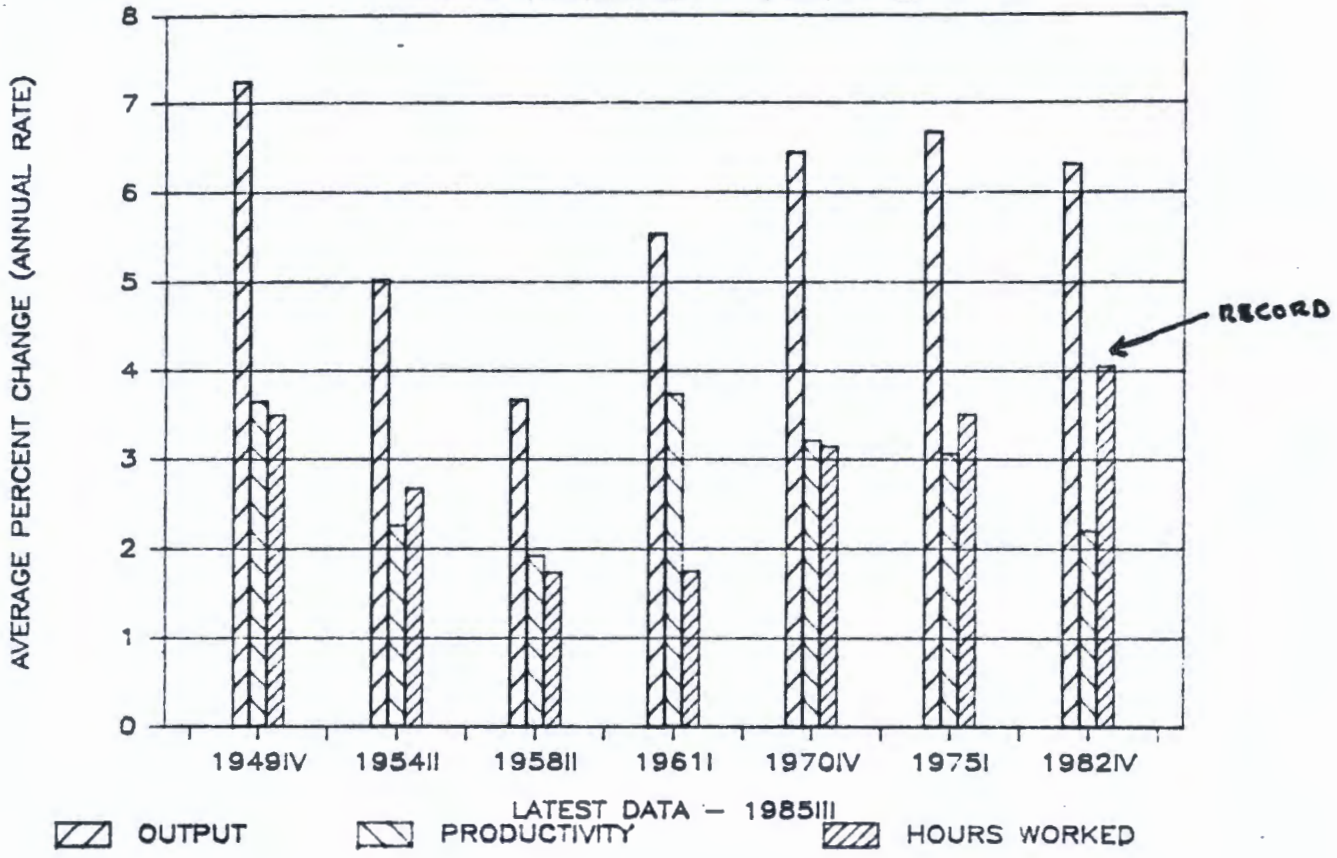
wrong; forecasting is hardly a science. I would hope that this effort is not the best or the last. AAKRS tend to dismiss the upcoming revision in the National Income and Product Accounts: "It is our understanding that these revisions will not significantly affect historical growth trends." I think this view is highly speculative and also ignores the potential for major shifts in the composition of GNP which could well alter the analysis.

Attachments

CHART 1

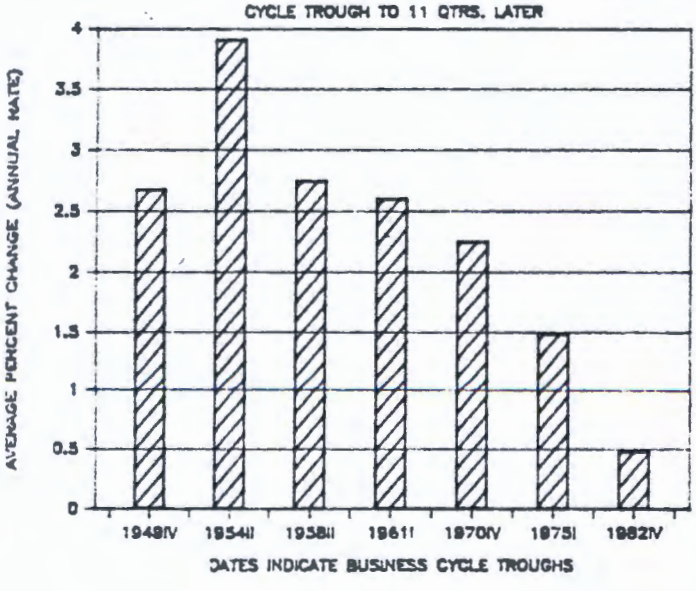
N.F.B. OUTPUT, PRODUCTIVITY & HOURS

CYCLE TROUGH TO 11 QTRS. LATER



GROWTH IN REAL COMPENSATION PER HOUR

CYCLE TROUGH TO 11 QTRS. LATER



GROWTH IN UNIT LABOR COSTS

CYCLE TROUGH TO 11 QTRS. LATER

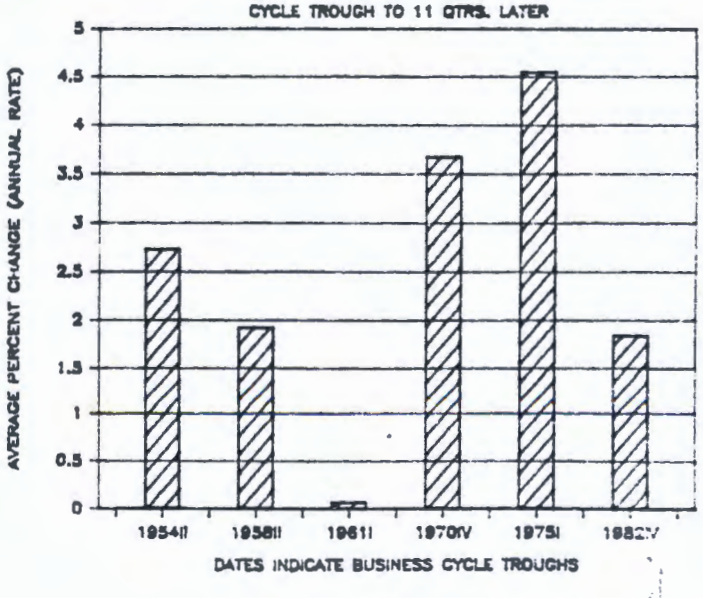
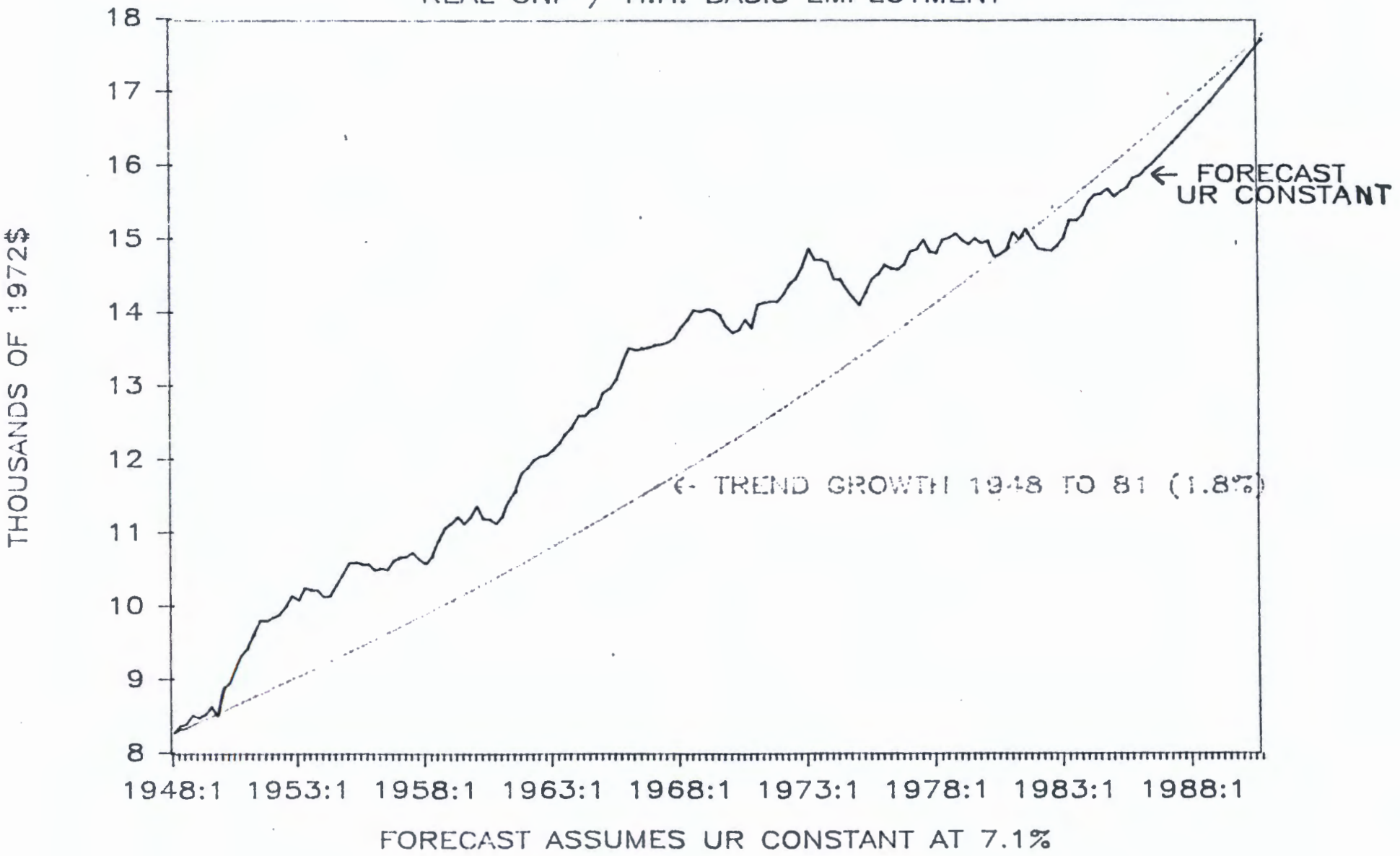


CHART 2

GNP PER EMPLOYEE

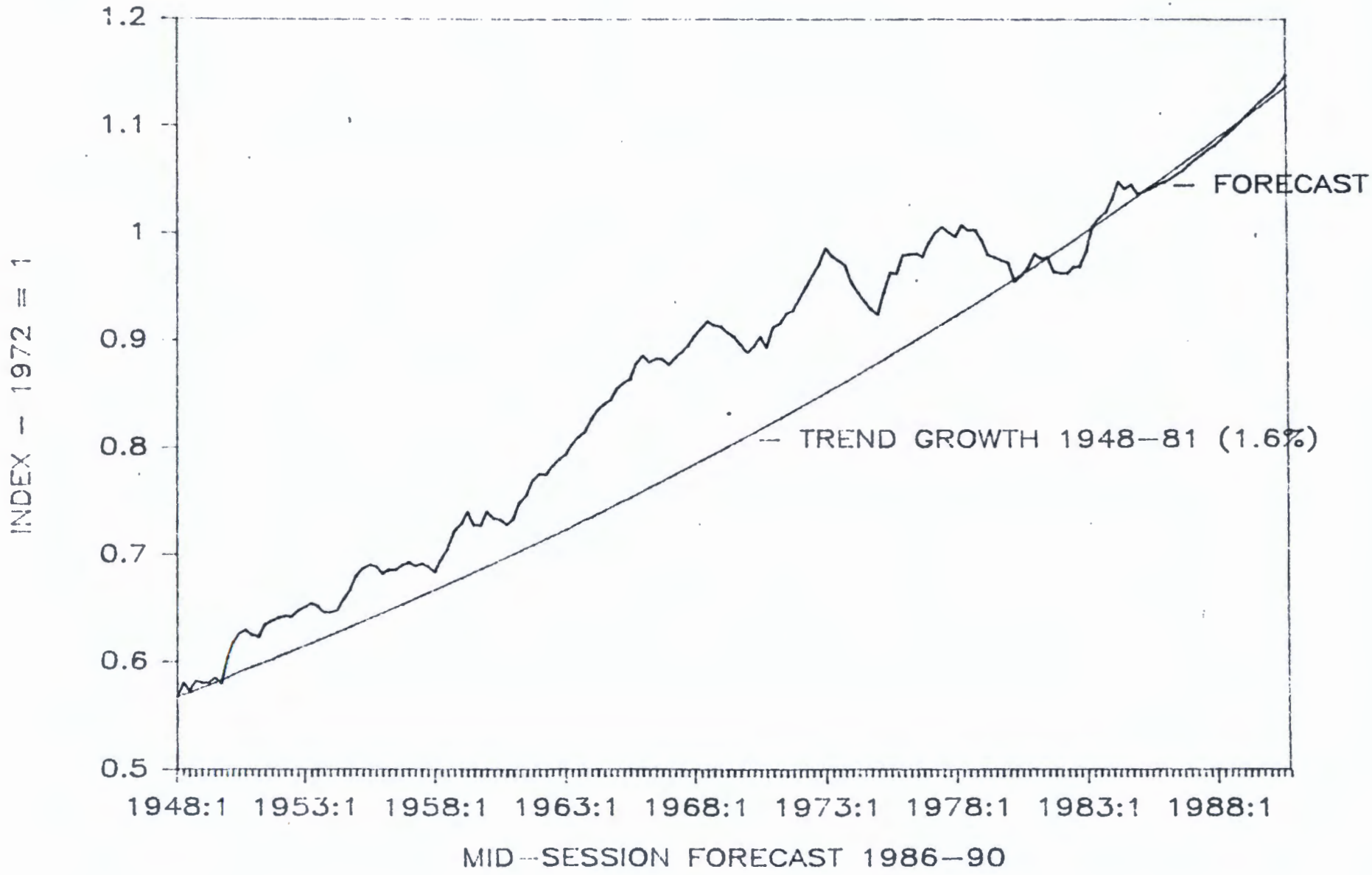
REAL GNP / H.H. BASIS EMPLOYMENT



FORECAST ASSUMES UR CONSTANT AT 7.1%

CHART 3

N.F.B. OUTPUT PER N.F.B. EMPLOYEE



SOUTHERN ECONOMIC JOURNAL April 1984

Long-Term Economic Projection: Stronger U.S. Growth Ahead*

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First, I shall make some general comments about long-term economic projections, and then turn to my own forecast of growth rates of U.S. gross national product (GNP) in constant and current dollars between the most recent cycle peak in 1981 and the year 2000. Then I shall briefly discuss methodology and problems in projecting components such as types of final demand and outputs and employment by industry. In conclusion, I have a few suggestions about how to make the art of forecasting still more scientific—if that is not a contradiction in terms—and the need to improve the capability within the Federal government, not only for projection, but also for developing policies to promote productivity and economic progress over the long haul.

I. General Observations

When Does the Long Term Begin?

In my book, the long term begins five years from the current period. The average length of the post-World War II U.S. business cycle has been about five years. Within that timespan, developments are dominated by the cycle and forecasts are made from the final demand side. Actually, our ability to make passable demand-side forecasts does not exceed a year or two, which is the practical planning horizon of most firms, governments, nonprofit institutions, and those individuals who tend to plan. Some people refer to the 2- to 4-year time horizon as the medium term to underline the dimmer vision with which demand forecasts can be made as policy decisions in response to unforeseeable future developments loom larger.

From five years on out, most projections are made from the supply side based on projections of inputs and productivity, though a stylized cyclical movement may be superimposed on the trend. In business parlance, too, five years is long term.

At the macro-economic level, the unemployment rate used for the target year, or the ratio of actual to potential GNP, is assumed rather than based on a projection of aggregate

* Presidential Address delivered at the fifty-third annual meeting of the Southern Economic Association, Washington, D.C., November 22, 1983.

demand which only a charlatan would pretend to be able to do with acceptable margins of error 5 or more years out.

Sometimes projections 5 to 15 years into the future are called "intermediate term," but I believe that usage is not helpful since the basic distinction between long and short term is methodological stemming from human myopia concerning the future. It is true that up to 16 years into the future everyone who will be in the labor force (as currently defined) is now born, which helps a lot in the labor force and input projections. Also, most of the significant technology that will be used widely up to 10 or 15 years from now has at least been conceived and most is already in use or being introduced, although many small improvements will be made that are a major source of productivity gains. Further, the Kuznets long wave has averaged 15 to 20 years in length, and can provide some clues to developments over that time span — or it can trip-up the unwary who ignore alterations in rates of growth across cycle averages. These are the reasons why I confine my U.S. macro-economic projection to the year 2000, which is now within sight.

I would not object to projections 20 to 25 years or more being called "very long term." Labor force growth after 16 years is increasingly determined by future birth rates that are notoriously difficult to predict. New technologies that are currently unimaginable will become increasingly important. And who knows what social and political developments will occur? But a descriptive term is unnecessary; we can just refer specifically to 25- or 50- or 100-year projections.

The Demand for Long-Term Projections

Like it or not, there is a strong and growing demand for long-term economic projections, despite their conditional and uncertain nature. As individuals or as policy makers in private or public organizations we all have to make decisions that are influenced by our views of the shape of the longer-term future. Firms and other organizations need to project the demand for their goods or services in order to plan investments in plants and equipment to ensure a sufficient growth of productive capacity. Personnel recruitment and training plans, and procurement strategies are affected. Planning for debt service on long-term bonds issued to finance expansions, and the management of insurance programs and pension plans, whether Social Security or private, require long-term projections of revenues and disbursements.

For individuals, quite apart from satsifying curiosity, some notion of future trends helps in career choices and educational plans, and in personal investment strategies. As Arthur F. Burns has put it: "The choice before man is not whether to engage in forecasting or to abstain from it, but whether to base expectations on 'hunches' or on lessons carefully distilled from experience."[1]

The supply of long-term projections has increased along with demand. Already in World War II there were groups in the Department of Labor and the National Resources Planning Board preparing projections as part of post-war planning exercises, for which Wassily Leontief and Paul Samuelson served as consultants. The Department of Commerce issued an influential set of projections entitled "Markets After the War," which is credited with encouraging business executives to set their sights high in planning expansions of capacity.

1. Burns is cited in Peterson [35, 171].

After several occasional long-term projections, the National Planning Association (NPA) began a regular series of national projections over 30 years, and regional economic projections 20 years ago. At about the same time, the Department of Labor began its periodic series of projections of real GNP, industry output and employment for a decade or so into the future, now revised every two years. The Commerce Department has prepared industry forecasts for years, and the Bureau of Economic Analysis in that Department cooperates with the Economic Research Service in the Department of Agriculture in preparing detailed long-term regional projections.

Private consulting firms, such as Data Resources, Inc., Wharton Econometrics, and Chase Econometrics, now make long-term as well as short-term projections in great detail. In addition, there have also been major *ad hoc* sets of projections for special purposes. An early example is the report of the President's Commission on Materials Policy [37]; and more recently *The Global 2000 Report to the President* was completed at the end of the Carter administration [11].

The Statistical Base

Projections are conditioned throughout by the nature and quality of the statistical base. In the first place, we are not forecasting reality as such, but rather the empirical counterpart of reality represented in recent decades by the national income and product accounts (NIPA) and associated economic time series. Given the assumptions, the quality of projections depends to an important extent on the scope, detail, and accuracy of the historical estimates on the basis of which past trends are calculated and relationships used to project the dependent variables.

If significant revisions are made in the concepts or structure of the acounts, these must be considered in evaluating the projections. Also, one may be presumed to be projecting the final set of revised estimates for the target year, since successive revisions are made until the ultimate benchmarking on complete census data. In the past, the early estimates tended to fall below the final estimates of real GNP and associated aggregates.

Although the official estimates of national income were first published in 1935, these were of little value for forecasting. But the publication of GNP estimates in 1942, and the complete set of national income and product accounts in 1947, opened up the modern era of forecasting. Since NIPA was based on Keynesian principles, the structuring of GNP around final demand by the major economic sectors was ready made for cyclical projections.

Economists concerned with long-term projections from the supply side, however, had to resort to rough methods of deflation until the first official estimates of real GNP were published by George Jaszi and me [17] in January 1951. The Conference on Research in Income and Wealth sessions on long-term economic projections were scheduled for 1951 to follow the publication of the constant dollar GNP accounts. In my paper for that conference, "National Productivity and Its Long-Term Projection" [20, 67–104], I made use of the new official estimates to calculate the cycle-adjusted trend rates of growth in real product per man-hour in the farm, private nonfarm and total private sectors of the economy, and the effects of interindustry labor shifts. In that paper I developed the concept of "total factor productivity," and indicated the desirability of using it for analysis and projection. The subsequent studies of capital formation and its financing, headed by Simon Kuznets

[31], and the national wealth estimates of Raymond Goldsmith [15], made possible my estimates and analysis of total factor productivity by industry for the National Bureau of Economic Research in *Productivity Trends in the United States* [15], a preliminary summary of which was published in 1956 [21]. Since then, the Commerce Department has gradually expanded its estimates of reproducible national wealth to include everything except government inventories.

Already around 1960 BEA had integrated interindustry purchase and sales (input-output, or "I-O") matrices into NIPA, and published real gross product originating by industry. Later, capital flow matrices were published. In 1984 the national reproducible wealth estimates become available on an industry basis.

In April of 1983 BLS published its initial estimates of "multifactor productivity" by sector, and in 1984 will publish the industry detail based on its own versions of capital stocks [41]. These developments will further enhance the tool-kits of forecasters. The historical estimates shown in Table I are derived from the new BLS series, which show much the same movements as recent extensions of my total factor productivity estimates.[2]

The sector income and outlay (or "appropriation") accounts were part of the original 1947 NIPA. In 1959 the Federal Reserve Board first published sector capital, or "flow-of-funds" accounts, reconcilable with the BEA current accounts. They have come out on a quarterly basis for over two decades now, and are of great use in financial projections. In October 1983 the FRB, building on the BEA tangible wealth estimates, published complete sector and national balance sheets (exclusive of public tangible assets), together with reconciliations of their stock and flow tables [6]. Previously we had been dependent on occasional studies by Raymond Goldsmith and a few other individual scholars.[3] The FRB publication is another milestone in the progress of official statistics. It will make life still easier when the BEA and FRB accounts are fully integrated with respect to definitions and sectoring.

Despite several remaining problems, a full set of national economic accounts by sector and industry, as depicted in Figure 1, is now virtually complete.[4] All this progress in economic accounts has made possible parallel progress in the scope and complexity of projections. But a note of warning is called for. Budgetary stringencies of the past couple of years have halted progress and, in some respects, there has been retrogression in the scope and quality of data. It is important that there be no further deterioration of the Federal statistical system. Indeed, if we are to improve further our ability to analyze and project the economy, and thus improve the basis for policy decisions, the administration must provide adequate resources to strengthen the data base.

Qualifying Assumptions and Alternative Projections

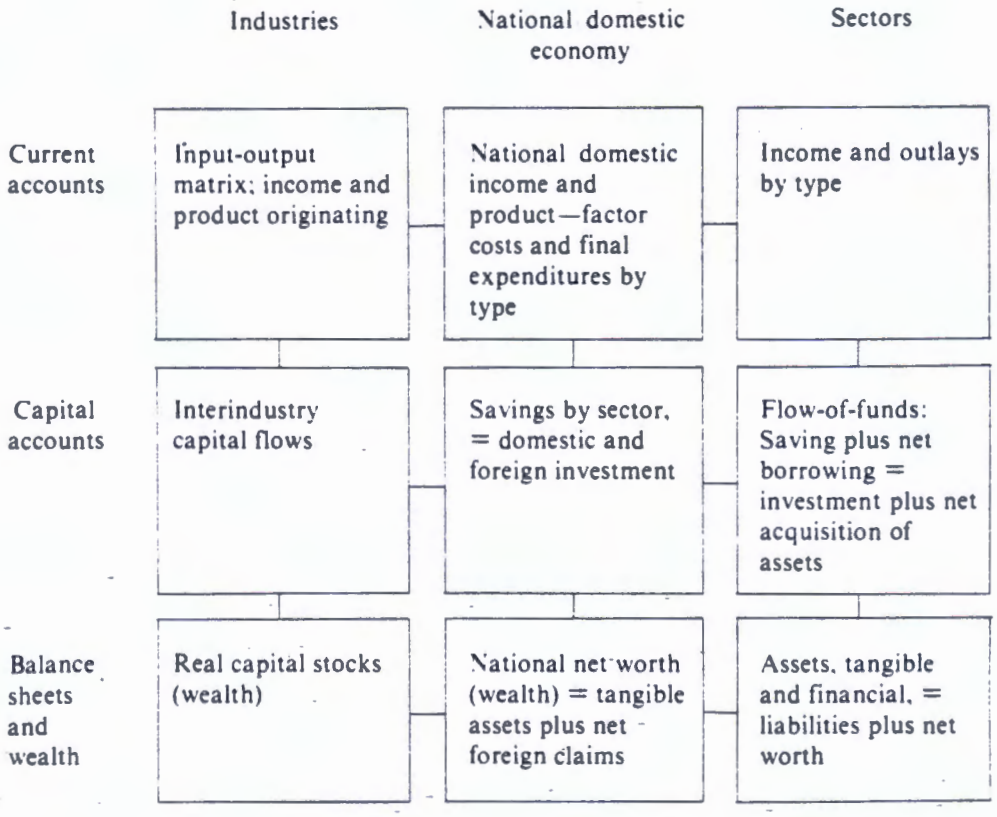
Any forecast or projection for whatever period rests on certain implicit or explicit assumptions. It is usually assumed at least implicitly than there is a high degree of continuity in national and social developments, and that past relationships will hold in the future. It is

2. See my 1980 volume with Elliot Grossman [28]. Since then, Grossman has revised and extended the total factor productivity estimates quarterly and annually for the American Productivity Center [2].

3. A review of historical wealth estimates and a blueprint for complete sector and national balance sheets and wealth estimates was published in 1964 [43]. See also my 1976 study of national wealth [24].

4. As noted in my textbook on economic accounts, the vision of a comprehensive and systematic set of economic accounts has evolved gradually over the years [23, 1-9]. Its implementation has been one of the great innovations of economics.

National Economic Accounts
By Sector and Industry



Source: Based on John W. Kendrick, Assisted by Carol S. Carson, *Economic Accounts and Their Uses*. New York: McGraw-Hill Book Co., 1972.

Figure 1.

generally assumed explicitly that there will be no major exogenous shock to the economy such as war, revolution, natural disaster, or politico-economic actions of major magnitude, such as the OPEC oil price hikes of 1973 and 1979. For purposes of emergency planning, war or other disasters are assumed, of course, as a basis for planning subsequent actions. Explicit assumptions are also usually made concerning major policy variables: on the demand side, fiscal and monetary policies; on the supply side, the determinants of capital and labor inputs and of productivity.

In addition to an economic projection based on the forecaster's notion of the most probable set of policy assumptions, it is fashionable to present two or more alternative projections or "scenarios." These are usually based on more and on less favorable sets of policy assumptions, and are sometimes described as setting the higher and lower limits of the probable expansion path. The presentation of several sets of projections has the virtue of underscoring the uncertainties that surround any view of the economic future. The same effect can be obtained by indicating the band within which it is expected that the future value of the forecast variable will lie within a given probability, say 90 percent.

With regard to the 4.0 percent real GNP growth rate projected in Table I for the 1981–90 period, I would say that the probable growth path would lie within +0.5 and −1.5 of that rate. Thus, my projection is on the high side of the 2.5 to 4.5 percent range.

The client of several forecasting services, each of which presents several alternative projections, faces a dilemma. As William Ascher points out, ". . . the selection of a 'most likely' forecast is in itself an act of forecasting, since the policymaker chooses the forecast which reflects assumptions and methods that appear most reasonble to him" [4, 1–2].

II. A Macro-economic Projection

I turn now to my unitary set of projections for the U.S. economy through the year 2000.

Assumptions

My general background assumptions are the usual ones noted earlier—no major wars or other disruptions. This is not meant to indicate complacency concerning worldwide resource and environmental problems, and problems of population growth and food sufficiency in some countries. *The Global 2000 Report to the President*, prepared in the late 1970s, stressed potentially disruptive developments in these areas, using projections that assume ". . . no change in public policies, institutions, or rates of technological advance" [11, 1]. Already it is apparent that the projections of fertility rates and population growth were too high. And it is not realistic to assume that public policies in other countries, and in international agencies, would not be directed to alleviating stresses and trying to solve emerging problems.

The material means for tackling the problems, some of which are related to growth itself, have increased greatly in the last three decades. Most of the other industrialized countries have shown significantly faster growth in productivity and real income per capita than the United States due importantly to technological catch-up. In fact, I would expect the rates of growth of the high-flyers such as Germany, France, and Japan to continue at the slower pace of the past decade in coming years due to the greater costs of making pioneering technological innovations as compared with borrowing advanced technology.[5] But the most impressive development since 1950 has been high rates of growth of productivity and real per capita income in many less developed countries, and historically respectable growth rates in many others, including most of the centrally planned economies. As Irving Kravis and Robert Lipsey wrote in a recent paper summarizing their studies:

> The conclusion seems clear that rapid economic growth has become a much more diffused phenomenon than was the case in the first half of the 20th Century or in the preceding period. In terms of the grouped data we have been using, rapid growth has bypassed only a fifth of the nations of the world containing less than 10% of the world's population [29].

It does not seem unreasonable to expect that countries will devote some portion of the productivity growth increment to solving problems as they emerge, including development

5. As I argued in a recent article, technological "catch-up" associated with higher rates of capital formation were major factors in the higher rates of productivity growth in other industrialized nations than in the United States [26, 125–170].

of necessary new technologies. Certainly the problems have been well publicized. Even the gloomy assessments may have the virtue of stirring action. *The Global 2000* report noted: "A keener awareness of the nature of the current trends . . . may induce changes that will alter these trends and the projected outcomes" [11,1]. Indeed, the report notes a number of encouraging policy developments in recent years. On balance, I agree with the late Herman Kahn in his work written in 1976, *The Next 200 Years*:

> We are presenting here a scenario for America and the world that sees the dominant issues of today—population, economic growth, energy, raw materials, food and pollution—as basically solvable or resolvable in the near- and medium-term future, transitory issues of a transitory era, the problems of a time between world penury and world prosperity [18,25].

With respect to specific economic policies, it is assumed that the supply-side policy thrust promoted by President Reagan will be preserved for the rest of the decade. This is not necessarily predicated on a second term for President Reagan. Already by the late 1970s a consensus had formed that measures were needed to promote saving, investment and productivity, as reflected in unanimous reports of the Joint Economic Committee.[6] There were tax reductions in the Revenue Act of 1978, and the investment tax credit was liberalized and made permanent. In 1979 President Carter issued his innovation initiatives, although they had little effect before he left office. But there was bipartisan agreement that measures to promote economic growth were needed.

Specifically, I assume that the provisions of the Tax Acts of 1981 and 1982 (ERTA and TEFRA) remain in effect, particularly the accelerated cost recovery system, and the indexation of personal income tax brackets, exemptions, and the standard deduction beginning in 1985. I further assume that the 25 percent incremental R & D tax credit will be made permanent in 1985. The increases in social security contributions embodied in current legislation are expected to hold, as well as the miscellaneous tax increases under TEFRA. If further tax changes are enacted this decade, I assume they will not be permitted to detract from the investment incentives now in place which are expected to result in a significant increase in the rate of growth of the real capital stock as shown in the projection table, as well as in the rate of technological innovation.

Some econometric models assume specific monetary growth rates. Hickman and Coen, for example, assume 7 percent M_1 growth for 1983–89 [7,3]. I would assume a somewhat more flexible policy, but one that would seek to prevent any substantial acceleration of inflation. This will probably mean one minor economic contraction before the end of the decade (latter 1986 if the current expansion runs the average length of those since 1945). But recovery would be sufficient to lower the unemployment rate to 6 percent by 1990 in my projection, which by then will be a bit above the "natural" rate defined in terms of normal frictional and structural unemployment. But it may be below the rate associated with a constant rate of wage- and price inflation.

Some longer-range forecasts also make explicit assumptions regarding the proportion of GNP absorbed by governments. In mine, I need only assume that public employment grows less than in the private economy. However, the broader assumption of Hickman-

6. In the midyear report and staff study of the Joint Economic Committee *Outlook 1980s* in August 1979, it was stated (p. 6): "America's dismal productivity performance is an important cause of the nation's stagflation . . . the solution lies in the adoption of longer-run policies aimed at expanding the supply of the economy; that is, at expanding the nation's productive potential in a manner that raises dramatically the growth of American productivity." This and other similar statements are cited in Kendrick's study in *Contemporary Economic Problems, 1982* [27, 3–4].

Coen that real government purchases of goods and services rise by from 3 to 4 percent a year on average seems reasonable.

Policy assumptions for the 1990s become much more problematical. Given the acceleration of economic growth in the 1980s, it would not be surprising if the political pendulum swung back in the 1990s towards more emphasis on social welfare, with transfer payments again increasing as a proportion of GNP, accompanied by tax increases. Some deceleration in the growth rate during the 1990s would also accord with the contours of the typical Kuznets long wave, following stronger growth from 1982 until the early or mid-1990s.

We need to know more about the long-wave than we do, but the work of Abramovitz, Easterlin and others underscores the importance of demographic developments, and their impact on the building industry in particular [1;5]. Population in the prime house-buying age groups peaks at the end of the 1980s, and declines in the 1990s with the exit of the post-war baby boom cohort. The DRI *U.S Long-Term Review* states: "From 1990 onward, demographic considerations lead to a long, slow decline in housing activity" [12,11.127]. This is a major element in a slowing in overall economic growth in the 1990s in the DRI scenario.

Methodology

Some forecasters still combine projections of labor input and real product per unit of labor to arrive at real product. I prefer to project both labor and capital input to combine with projections of total factor productivity, if only because growth of the latter is somewhat more stable than that of labor productivity. In any case, the rate of growth of total factor productivity, plus the rate of factor substitution based on the input projections, yields the rate of labor productivity growth as shown in the table.

The chief difference between my projection methodology and the standard approach is in the productivity element. Some forecasters (including DRI) merely extrapolate recent trends, possibly modified judgmentally. Others have attempted to use a multiple regression approach. But as the number of independent variables increases, this approach is increasingly bedevilled by problems of multicollinearity. To me, it is preferable to use a growth accounting framework, as pioneered by Edward F. Denison, with some modifications.[7] In particular, I measure labor and capital inputs without allowance for changes in efficiency or "quality," nor for change in rates of utilization, so that these variables come "below the line" as part of the explanation for the "residual" productivity change. Indicators can be found for most of the independent variables, projected, and weighted by their relative contributions to gross national income.

Labor Input

We start with the BLS labor force projections. These are based on Census Bureau projections of population 16 years of age and over, by sex and age class, multiplied by BLS projections of labor force participation ratios for each [41,1-18]. Compared with a 2.4 average annual percentage growth in the labor force from 1973 to 1981, the BLS projects a 1.4 percent growth rate from 1981 to 1990, and 0.9 percent from 1990 to 2000.

7. For a further discussion of the ways in which my growth accounting schema differs from Denison's see my paper in *Contemporary Economic Problems, 1979* [25, 31-32].

Table I. Sources of Growth in Real Gross Product, U.S. Private Domestic Business Economy; Subperiods 1948-73 and 1973-81; Projections 1981-1990, 1990-2000

	Actual		Projected	
	1948-73	1973-81	1981-90	1990-2000
	(Average annual percentage growth rates)			
Real gross product	3.7	2.2	4.0	3.2
Total factor input	1.7	2.0	2.2	1.8
Labor	0.7	1.4	1.3	0.9
Capital	3.6	3.2	4.0	3.6
Real product per unit of labor	3.0	0.8	2.7	2.3
Capital/labor substitution	1.0	0.6	0.9	0.9
Total factor productivity	2.0	0.1	1.8	1.4
	(Percentage point contributions to growth)			
Advances in knowledge	1.4	0.7	1.2	1.0
Stock changes	1.2	0.7	1.0	0.9
Vintage effect	0.2	0	0.2	0.1
Changes in labor quality	0.5	0.6	0.9	0.9
Education and training	0.6	0.7	0.7	0.6
Health and safety	0.1	0.1	0.1	0.1
Age-sex composition	−0.2	−0.2	0.1	0.2
Changes in quality of land	0	−0.2	−0.3	−0.3
Resource reallocations	0.4	0.1	0	0
Volume changes	0.3	−0.3	0.6	0.4
Economies of scale	0.4	0.2	0.4	0.3
Capacity utilization	−0.1	−0.5	0.2	0.1
Government regulations	0	−0.2	−0.1	−0.1
Actual/potential efficiency and n.e.c.	−0.6	−0.6	−0.5	−0.5

The BLS projections are an indispensable guide, but I feel that they are too mechanical and pay insufficient attention to economic factors in labor supply. We need to know much more in this area, but it appears that there is some after-tax wage elasticity of supply of women and self-employed. Given the recent personal income tax cuts, and reduced incentives for early retirement, I have upped the BLS projections to 1.5 percent growth in this decade and 1.0 percent in the 1990s. In the National Planning Association (NPA) projections, Terleckyj actually shows increases in the labor force participation ratios of men over 55 [38, 26–28]. I am merely assuming they level off, rather than continue to decline as projected by BLS.

Since I assume a 6 percent unemployment rate in 1990 compared with 7.5 in 1981, and a 5 percent rate in 2000, employment is projected to rise at 1.6 and 1.1 percent average annual rates 1981–90 and 1990–2000 respectively. The rates of increase in total hours are

reduced to 1.3 and 0.9 percent a year for the two periods, however, since I assume 0.3 and 0.2 percentage point average annual rates of decline in average hours worked. This is slightly below the trend rate of the past 50 years, since it is expected that the growth in the proportion of part-time jobs will slow down as the increase in the female share of employment decelerates.

Real Capital Stocks and Inputs

A number of analysts have demonstrated that the net effect of the Tax Acts of 1981 and 1982 (ERTA and TEFRA) will be to increase significantly the after-tax rate of return on investment. Hulten and Robertson estimate that the marginal corporate tax rate on plant and equipment outlays has dropped to 15.8 percent from a 32.8 percent average for the years 1973–81 [16,33]. Fullerton and Henderson calculate that the marginal effective rate of total taxation on property income was reduced to 29 percent from 37 percent by 1982 [14,7].

Corporate profits before tax, with inventory valuation and captial consumption adjustments, had fallen to a 7.7 percent average ratio to GNP for the 1973–81 period from 10.2 percent 1960–69. Here, too, the prospect is for better performance for the rest of the 1980s than in the 1970s due to the favorable cost-price developments, discussed later. In my view, corporate profits before tax will average at least 9 percent of GNP for the rest of the decade and the recovery of after-tax profits will be even better.

Given the outlook for higher after-tax profit margins, cash flow and expected rates of return on new investment, I expect the ratio of saving and investment to GNP to rise by at least one percentage point, with nonresidential business investment averaging 12.5 percent of the gross national product. This would result in a 0.8 percentage point increase in the average annual growth of capital input up to 4.0 percent, close to the projected rise in real gross product.

The accelerated pace of technological progress, discussed next, will also contribute to raising the marginal efficiency of investment. And the strength of business fixed investment during the current cycle helps support the notion that capital stocks will grow strongly in the years ahead [8,44–5].

Productivity Components

The growth accounting approach forces one to think systematically about all the major causes of productivity growth, and assign values to their expected contributions. The following sections summarize the results of that analysis.

Technological Advance. The most important single variable underlying productivity change is the rate of technological progress as embodied in the ways and means of production through cost-reducing innovations. Most of this is associated with prior research and development outlays. We extrapolate the contribution of technological advance as estimated by Denison for 1948–66 by cumulative real R & D outlays with allowance for the lags between such outlays and completed projects, and between the latter and commercial application. With the decline in R & D as a percent of GNP from 3.0 percent in 1964 to 2.2 percent in 1977, the cumulative real outlays showed a marked deceleration in the 1970s. Since then, as a result of the turnaround in publicly funded R & D in 1977–78, and the stimulus to stronger advances in private R & D outlays from the 25 percent

incremental R & D tax credit, the ratio of R & D to GNP came back to 2.5 percent in 1982.

The National Science Foundation estimates that real R & D outlays will rise by more than 4 percent in 1983 and 7 percent in 1985, which will bring the ratio to GNP up to 2.7 percent [32]. I project that the growth in real R & D spending will gradually decelerate from 7 percent in 1984 to 4 percent in 1990. Given our projected growth trend in real GNP, the R & D/GNP ratio would be back to its old high of 3.0 percent by 1990. Thereafter, given the restoration of respectable rates of productivity advance, I assume that real R & D outlays would parallel the growth of real GNP. This would result in some retardation in the rate of growth of the real R & D stock and thus in the rate of technological progress as shown in the table.

Furthermore, the accelerated growth of the real fixed capital stock noted above will reduce the average age of plant and equipment. This "vintage effect" shown in the table is associated with a more rapid diffusion of new technology. Contributing to this effect has been the big increase in the flow of venture capital since the 1978 reduction in the capital gains tax from 49 to 28 percent, and then to 20 percent for individuals in 1981. Initial public stock offerings rose more than ten-fold from 1977 to 1983, with high technology firms the chief beneficiaries [36,5].

Quality of Human Resources. Per capita investments in education, training, health and safety are continuing to rise at about the same pace as during the previous period. The rate of growth in educational capital must eventually slacken, probably before the end of the century, as the proportion of the population with advanced degrees mounts ever higher.

The main change in the current decade is in the age-sex composition of the work force. The post–World War II baby boom cohort is passing into the prime age brackets, and the rate of increase in the female participation ratio is slackening. This will mean an increase in the average experience of workers, which contributes positively to productivity and reverses the negative effect of the changes in the late '60s and '70s.

Labor efficiency, which we consider to be the chief element of the final residual, may conveniently be discussed here. This variable is limited to changes in the ratio of actual to potential efficiency of labor of a given quality with given technology. In recent years there has been a tremendous increase in "employee involvement" schemes designed to improve efficiency. Some, like Scanlon or Improshare plans, ESOPs and profit-sharing, use financial incentives. Others, such as quality circles and joint labor-management productivity teams, do not. All attempt to induce workers to identify with the goals of the enterprise, and provide mechanisms for eliciting constructive suggestions from employees.

A recent survey by the New York Stock Exchange indicates that most managements judge these EI plans to have had a positive effect on productivity, and the smart productivity increases during the past year may reflect this as well as the normal effect of recovery [34,28–9]. Accordingly, I am adding 0.1 to the residual 1981–90. No further improvement is expected in the 1990s since the initial positive effects of human resource programs tend to wear off with the passage of time.

Quality of Natural Resources. Up until about 1970 in the U.S. the tendency toward diminishing returns in extractive industries was more than offset by technological progress. Productivity rose at above-average rates in mining as well as in agriculture. Since 1970 productivity in the mineral industries has declined absolutely. About half of the decline

from earlier trends is attributable to safety and environmental regulations. The rest may be attributed to the declining quality and accessibility of ores and oil wells.

Those who fear natural resource constraints on growth have underestimated the mitigating influence of the market pricing mechanism. Increasing prices of resources that have become scarcer stimulate conservation in use of those resources, shifts to relatively more abundant and cheaper resources, and technologic advances to improve supply conditions.

Resource Reallocations. After World War II there were significant productivity gains from shifting resources out of activities with below-average productivity as measured by relative factor remuneration, e.g., farming and nonfarm self-employment. The scope for further gains from reallocations has narrowed greatly, however. In principle, national productivity also reflects relative shifts of resources among industries with different rates of productivity growth. Thus, high income elasticities of demand for services have shifted labor into this sector in which productivity growth has been less than the national average. On the other hand, in the nonfarm commodity-producing sector, price elasticities have ensured that resources shifted towards those industries with relative productivity gains and relative price declines. On balance I anticipate that the net effect of resource reallocations will not be significant during the forecast period.

Volume Changes. The contribution of scale economies, if this growth accounting exercise is in the right ball park, will rise from 0.2 percentage point 1973–81 to 0.4 in this decade, and 0.3 point in the next. This is based on Denison's method of calculating scale economies [13,190].

Assuming that unemployment will drop from the 7.5 percent of 1981 (and 8.8 percent in October 1983) to 6.0 percent in 1990 and 5.0 percent in 2000 means that ratios of actual to potential GNP will rise upwards of 4 percent 1981–90 and around 2½ percent 1990–2000. About half of these percentages will translate into productivity improvements as capital and overhead labor are used more intensively. Translated into annual rates, the contributions of improved cyclical positions in the boundary years round to 0.2 and 0.1 percentage points 1981–90 and 1990–2000.

Government Impact. During the early 1970s when the costs of complying with environmental, health and safety regulations were rising most rapidly, Denison estimates their negative impact on economic growth as measured at 0.4 percentage point; the average impact 1973–81 was 0.2 point [13, 67–74]. Already in the latter Carter years there were attempts to rationalize social regulations and cut back economic regulations. These efforts were accelerated under President Reagan.

In view of the projected acceleration in economic growth and presumably in environmental fall-out as well, I expect a continued increase in the ratio of anti-pollution outlays to GNP, especially in view of the wide public concern over the issue. The proportion will rise more slowly in the years ahead, however, than in the 1970s. This will reduce the negative impact of regulatory costs on productivity growth in the forecast period.

Aggregate Real GNP

In sum, for the 1981–90 period the 1.8 average annual percentage rate of growth in total factor productivity and the 2.2 percent rate of increase in total factor inputs yield a 4.0 percent rate of economic growth in the private domesic business economy. In the following

decade, the projected deceleration in both total factor input and productivity results in a 3.2 percent growth rate.

The implied rates of growth in total real GNP are, of course, lower, given current official methods of measurement. In the non-business sectors, real gross product originating is measured in terms of real labor input without allowance for productivity change. Assuming that government labor inputs rise somewhat less rapidly than private economy labor input, total real GNP is projected to grow at average annual rates of 3.4 and 2.7 percent for the period 1981–90 and 1990–2000 periods respectively.

The Census Bureau's medium population projection indicates 0.9 and 0.7 percent average annual rates of increase over the two periods [39,4]. Thus, real GNP per capita may be expected to grow at 2.5 and 2.0 percent average annual rates, respectively. The latter rate is close to the trend that has prevailed for the past century [25,22].

Note that my projections are a bit above the BLS "moderate growth" projections for real GNP of 3.2 percent 1982 and 2.5 percent 1990–1995 at average annual rates [3,11–23]. In part, the difference reflects my stronger productivity growth projection.

The Implicit Price Deflator

Price projections are even more hazardous than those of real product, and margins of error in past price projections have been larger. To me, projecting the core rate of inflation from the productivity-wage-cost side is more practicable than a primarily monetary approach. Even in the former, however, the bridge from unit costs to prices involves some assumption about how loose or tight the monetary authorities will be in validating cost increases.

It seems clear that the 1980 and 1981–82 recessions broke the back of the wage-price spiral that began in 1966 and was aggravated by the OPEC price hikes of 1973 and 1979. Even more basically it was interrelated with the productivity slowdown. By this year increases in average hourly labor compensation had decelerated from near 10 percent in 1980 back down to near the 5 percent rate that had prevailed for the first two decades after World War II. Given the strong productivity gains of more than 3 percent, unit labor costs rose about 2 percent. The moderate 3.7 percent increase in the implicit price deflator, down spectacularly from double-digit in 1980, is now consistent with a smart profit recovery. Both wage and price increases are likely to remain moderate in 1984 as well (see Table II).

I do not expect any pressure for nominal wage rate increases to accelerate significantly until unemployment falls below 7 percent, which will not come until 1985. Even before then, productivity gains will be slowing cyclically. So unit labor cost increases may rise a little next year, and perceptibly so in 1985–86. Assuming that FRB does not accommodate a significant acceleration in unit costs, profit margins are likely to be squeezed, bringing on an economic contraction by 1986 or '87. This will help keep inflation moderate throughout the decade at a rate which I project to average 4 percent a year (see Table II).

If I am right that in the 1990s the economy will enter the slowing phase of a Kuznets long wave, the deceleration in productivity growth may well be associated with some acceleration of nominal wage rate gains, especially in view of slower growth in labor supply. The model developed by William Freund for the New York Stock Exchange to explain the inflation for the 1970s highlights an important relationship [33,21–7]. Due to the lag of wage adjustments, a retardation of productivity growth is not immediately reflected in nominal wage bargains, so unit labor cost increases accelerate. This carries over into price

Table II. Productivity, Labor Costs, and Prices. U.S. Private Domestic Business Economy Selected Periods 1948-82, and Forecast 1981-2000 by Selected Periods (Average annual percentage rates of change)

	Real gross product	Product per hour	Average hourly compensation	Unit labor costs	Implicit price deflator
			Actual		
1948-66	3.7	3.2	5.0	1.8	1.8
1966-73	3.6	2.3	6.9	4.5	4.2
1973-81	2.3	0.8	9.2	8.3	8.1
1981-82	−2.8	−0.1	7.7	7.9	5.4
			Projected		
1982-83	4.2	3.1	5.2	2.1	3.7
1983-84	5.5	3.0	5.5	2.5	4.0
1981-90	4.0	2.7	5.9	3.2	4.4
1990-2000	3.2	2.3	7.7	5.4	5.2

Source: Based on index numbers published by the Bureau of Labor Statistics, U.S. Department of Labor.

rises, which in turn further raise nominal wage-rates. Thus, the wage-price spiral begins and only ends when the central bank and the community-at-large are willing to pay the price for disinflation. I do expect the scenario to resemble the 1966–73 epoch more than 1973–81 which was distorted by the oil shocks. The rate of inflation in the general price level would average about 5.2 percent. This is a bit less than the acceleration in unit labor costs, since I assume that the FRB would be restraining inflation.

In nominal terms, GNP is projected to rise around 8 percent a year, on average, between 1981 and 2000. The increase averages a bit more in the 1990s than before since the acceleration of price inflation more than offsets slower real growth.

The biggest difference of my aggregate projection from that of BLS lies in the pattern of price inflation. BLS projects a higher rate to 1990—5.4 precent a year on average 1982–1990—and a deceleration to 3.3 perent 1990–95 [3,11–23]. I think the odds favor some acceleration in view of the reduced growth in the labor force and possibly a weakened resolve to combat inflation as the memory of double-digit numbers fades.

III. Projecting Economic Structure

Once the total GNP numbers have been established, the way is open to developing as much detail in the projections as resources permit. Since I do not have my own estimates of changes in composition of the gross national product, I shall discuss the methodologies used by BLS, and point out some of the problems revealed by subsequent evaluations. The initial policy assumptions and analyses of their effects are the basis for the broad division of GNP among personal consumption, gross private domestic investment, net exports, and purchases by governments. Our policy assumptions indicate, for example, that for the rest of this decade the investment proportion will increase somewhat.

Given the broad grouping of final demand, the detailed private outlays by type of product can be estimated by appropriate demand equations. BLS had reasonably good results in its 1975 projection for personal consumption expenditures by type using the Houthakker-Taylor model [30, 9–17]. Results for investment and foreign trade were not as good. Breaking down government purchases into a detailed bill of goods proved more successful than might be expected from extrapolations plus specific plans by some governmental units. For its 1995 projections, BLS has shifted to reliance on the macro-model from Chase Econometrics Associates [3,12]. The model comprises 275 identities, 312 behavioral equations, and 110 exogenous variables. It is too early to appraise the results, of course. But no matter how good the model, the further into the future one goes the greater the probable errors due to possible changes in income elasticities, unanticipated relative price changes, and shifts in tastes often associated with new product developments.

Once obtained, the bill of final goods and services is allocated by industry, and then BLS multiplies the industry numbers by the direct and indirect requirement coefficients from the BEA input-output matrix to obtain the total output on an industry basis. The major problem of industry projections, even assuming relatively accurate bills of final products for the target year, has been the out-dated I-O matrixes used as the basis for technical coefficients. The BLS projections for 1990, for example, were done based on a 1972 I-O table, with some updating through 1977. The technical coefficients can be modified for the target year based on extrapolation of trends adjusted by whatever engineering information is available on specific technological developments. Evaluation of the BLS projections for 1970 reveals that errors in the industry output estimates were due more to errors in the technical coefficients than to errors in the final demand detail. This finding was reversed in an evaluation of the 1975 projections, however, since the depressed economy compared with the assumed high employment pattern caused errors in the final demand distributions to be greater than in the 1970 projections.

BLS translates the industry output projections into employment terms by dividing the former by projections of labor productivity (and of average hours, if productivity is expressed as output per labor hour rather than output per person engaged in production). Errors in the BLS productivity projections have tended to be larger than those in industry output, but in the 1975 projections the errors were partially offsetting, which helped the employment projections. The latter averaged 15 percent for the 71 industries. When weighted, the average error fell to 8 percent since the largest percentage errors were in the industries with smallest employment.

BLS also makes projections of employment by occupational category as background for the Bureau's widely-used Occupational Outlook Handbook. For this, an industry-occupational matrix is used. Unfortunately, the industry data on staffing patterns, used for the 1980 projections, was out-of-date and the source of more error than the industry employment projections. The average error was almost 21 percent, but reduced to 14 percent when weighted. As with industry employment, the errors were proportionately greater in the occupations with fewer workers [9, 22–30]. The 1995 projections were based on much more recent survey data which it is expected will improve the results.

There is not time to get into the methodologies and problems involved in projecting financial flows by sector and type, as done by DRI, or breaking down national economic projections by region and even by county, as done by NPA and BEA. These are obviously more difficult to do than the aggregates, and subject to much wider margins of error.

IV. Improving Long-Range Projections

The foregoing review makes clear the tremendous complexity and many difficulties involved in long-range projections. In view of the importance of projections for the many uses mentioned earlier, we must continue trying to improve their accuracy. I have already mentioned the importance of continuing to improve the statistical base. Here, I suggest that another major avenue for improvement lies in the evaluation of past projections. Then I suggest one out of many substantive areas in which improved methodology is needed. Finally, I point out the need for coordination of the Federal government forecasting capabilities which are located in many different agencies.

Evaluating Past Projections

An obvious way of trying to improve projections is to compare actual and projected values of aggregates and components over a considerable period of time. This would reveal the major problem areas, and by going back of the forecast numbers, what the sources of the errors might have been. Such an evaluation provides an agenda for work to increase accuracy of the projections.

Evaluations are not always easy to do, even for the individual or organization responsible for a projection, since the background reasoning and even the methods employed are not always explicitly recorded or recalled. It is even more difficult for a third party to track numerous sets of projections, particularly to analyze sources of error in addition to measuring the magnitudes. But even the latter endeavor is worthwhile to determine which of alternative methods give better results, which individuals or organizations have better records, and whether there has been a trend in the goodness of projections.

Victor Zarnowitz of the National Bureau of Economic Research has evaluated the accuracy of published short-term forecasts over many years [44, 86–99]. It appears they are becoming a bit more accurate, on average; but that an average of the forecasts does consistently better than any one forecaster. Perhaps the same would be true of long-term projections, but these have not yet been systematically tracked *en masse*. In 1967 NPA evaluated its past projections [10], and in the November 1983 issue of *Looking Ahead* Terleckyj has updated the evaluations. Unfortunately, the evaluation relates only to aggregate real GNP. At this level the growth projections for 1960 and 1970 were 0.2 and 0.3 percentage point too high — not bad. But like other other long-term projections for 1980, the error was much greater: 1.2 percentage points. That it was not larger was due to that guardian angel of forecasters: offsetting errors. Though the productivity projection was substantially too high, the labor force projection was somewhat too low.

Ever since 1970 BLS has evaluated its long-term projections in great detail after each target year has passed. Based on the evaluations, BLS has taken a number of steps to improve its projections — for example, shifting from census to survey data to get better and more recent information on staffing patterns.

What is needed is for one person or a group to go back a couple of decades and evaluate in detail all the major public and private long-range projections. It would make a good topic for a dissertation if the sources of error were closely analyzed. But the evaluations should be continued indefinitely just as Zarnowitz has almost made a career of doing for the short-run efforts.

Substantive Areas

There are many areas in which better analysis and forecasting methods are needed. I shall quickly mention a few, and then concentrate on one in which investments to improve methodology would have a big pay-off.

Labor force projections have generally not been bad, but we need to analyze more carefully economic variables affecting labor force participation of various groups. Perhaps intention surveys would be helpful here, particularly of groups approaching the ages at which retirements increase. We also need to know more about migration patterns, and the influence of economic factors.

Although we already know quite a bit about saving propensities of the several sectors, and demand for the major types of capital goods, still more research on these matters can help in projecting the growth of real capital stocks and inputs.

Given the major aggregates, the demand equations for particular types of goods and services can be refined. In particular, if some way could be found to project relative price changes, this would be particularly helpful—a matter I return to shortly. In translating the final demand projections into industry output and employment by occupational groups, we need more up-to-date input-output tables and industry/occupational employment patterns.

If I were to pick out one area in which improvements would be most valuable for detailed long-range projections, it would be in projecting productivity by industry. This would immediately improve the employment projections which are gotten by dividing output by output per person. Since relative industry productivity changes are the most important element in relative price change in the long-run, good projections in this area would improve the demand estimates, and also help in projecting the composition of foreign trade. Finally, information about the technological developments that underlie productivity advance would help in projecting I-O technical coefficients and staffing patterns by industry.

To some extent regression analyses can explain past interindustry growth.[8] Some of the independent variables in the equations, such as capital per worker and the ratio of direct and indirect R & D outlays to sales, could be projected (based on surveys of business investment plans) to project the industry labor productivity numbers. Even more helpful would be the collaboration of industry specialists with knowledge of technological developments in their industries to provide informed judgments on prospective productivity trends and the impacts of the technological changes on related variables.

The Commerce Department industry specialists are an important resource that could be drawn on, although they do not provide input for the BLS projections. But the Department of Commerce has for some years published its own national and industry projections for one and five years ahead. Input-output analysis is used to translate the final demand projections into provisional industry shipments at two- and four-digit standard industrial classification levels. The industry specialists then adjust the projections to reflect specific industry developments, technological and otherwise, not taken into account by use of I-O. The sum of the revised industry projections is then reconciled with the aggregates before being finalized [40, XI-XIV].

8 In a recent study, I regressed 28 independent variables on industry rates of change in total factor productivity for the period 1948-79, and the subperiods 1948-66 and 1966-79 [27, 34-50].

This leads to my final point. There is a real need for a focal point within the Federal government to provide some direction and coordination to the several agencies involved in long-run projections. The most ambitious attempt so far at a cooperative set of projections within the government involving 12 agencies, *The Global 2000 Report to the President*, concluded:

> At present the Federal agencies are not always capable of providing projections of the quality needed for long-term policy decisions. While limited resources may be a contributing factor in some instances, the primary problem is lack of coordination. The U.S. Government needs a mechanism for continuous review of the assumptions and methods the Federal agencies use in their projection models and for assurance that the agencies' models are sound, consistent, and well documented. The improved analyses that could result would provide not only a clearer sense of emerging problems and opportunities, but also a better means for evaluating alternative responses, and a better basis for decisions of worldwide signficance . . . [11,4–5].

I concur, noting that this does not mean centralization of the projection function. Each of the agencies has its own special needs. But by a central focus some duplication could be avoided, releasing resources to improve the projections. The coordinating function would tap the expertise of each agency for the benefit of all since the broad cooperative projections would be of value in the preparation of the more specialized projections.

I recommend that a small staff be created in the Executive Offices of the President, possibly in the Council of Economic Advisers under the direction of one of the CEA members, for that purpose. I would also recommend that the staff be given responsibility for coordinating and developing policy options to promote long-term productivity growth and economic progress. Most of the attention of the present and past CEAs has been devoted to putting out fires, doing current economic analysis and short-term projections, and developing and explaining short-term policies. In some sense, I suppose that the long run is just the cumulation of successive short runs. But I do believe that attacking our immediate problems with a long view of probable developments, problems, and opportunities will make the future turn out better than it will if we fail to lengthen our perspectives.

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EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

November 12, 1985

MEMORANDUM FOR: T-2

FROM: T-3*

SUBJECT: A Rejoinder to "Evaluation of the 'Evaluation of the Mid-Session Growth Path'"

In a memo to T-2 dated November 4, Lincoln Anderson (LA) criticized our October 31st memo to T-2 in which we argued that the Mid-Session Review real GNP growth path was too high by 0.5 percentage point per year. We do not agree with his criticisms and present our rejoinder.

Productivity

Lower productivity growth than projected in the Mid-Session Review accounts for 0.4 percentage points of our lower real GNP growth rate. LA organized his criticism into three parts.

Causes of the recent slow productivity growth. -- LA argued that the recent slow labor productivity growth resulted from low growth rates in labor cost and a cost minimizing strategy, which led to large employment gains. He pointed out that the growth in real compensation per hour is at a record low for recoveries and that the growth in unit labor cost is also comparatively low. He expects this depressing effect on productivity to be temporary.

LA's chart 1 (for the nonfarm business sector) shows the growth in productivity, real compensation per hour, and unit labor cost for postwar economic recoveries. The relationships between these variables, taken as a whole, do not support LA's hypothesis that the recent slow productivity growth has been due to slow growth in real compensation per hour and unit labor cost.

LA's hypothesis is consistent with the most recent recovery but not with others. The recovery after 1961 had the lowest unit labor cost growth but the highest productivity growth. The recovery after 1958 had the second highest growth in real compensation per hour but the lowest productivity growth -- even lower than the present recovery.

*Ahmad Al-Samarrie, Robert Anderson, Robert Kilpatrick, James Russel, and Kemble Stokes

More systematically, we can calculate the Spearman rank correlation coefficients between productivity growth and the other variables. The rank correlation with unit labor cost is 0.03, rather than the significant positive value that would support LA's hypothesis; the rank correlation with real compensation per hour is -0.07, rather than the significant positive value implied by LA's hypothesis.

As an added note, it is not clear that the cost of labor has been growing more slowly than the cost of capital, as the latter has been reduced in nominal terms by the tax changes enacted in 1981 (with subsequent modifications), by declining interest rates, and by declining costs of equity funds. The ratio of the user cost of capital in the DRI model to compensation per hour (all series in nominal terms) registered a substantial decline since the end of 1980 for all three user cost terms: equipment, nonutility structures, and utility structures. During the period 1980-IV to 1982-IV, the ratio of DRI user cost to compensation per hour declined at a yearly rate of 9.6 percent for both equipment and nonutility structures; for the eleven quarters of recovery, these ratios declined at rates of 2.0 percent and 3.4 percent, respectively. Consequently, we conclude that a cost minimizing strategy would have substituted capital for labor, thus adding to productivity growth, contrary to LA's hypothesis.

We conclude that LA has not shown any reason to dismiss our argument that "this expansion provides no evidence of an improving trend."

Forecast growth accounting. -- Kendrick's growth accounting forecast is indeed more consistent with the Mid-Session forecast than with ours. We do not know whether Kendrick would still make the same forecast as he did in November 1983, now that we have had two years of disappointingly slow productivity growth. However, his forecast does not support the Mid-Session real GNP path as strongly as portrayed in LA's table (page 3).

LA's table shows growth of real GNP during 1981-90 of 3.4% under the Mid-Session path and 4.0% according to Kendrick. In fact, Kendrick's 4.0% growth was for the private domestic business economy. For real GNP he forecast 3.4% (see pages 956-57 of his article). This is the same as the Mid-Session path rather than being above it.

Trend growth. -- LA compares the trend of real GNP per employee (calculated from 1948 to 1981) with forecast values, alternatively assuming a constant 7.0% (or 7.1%) unemployment rate through 1990 (chart 2) and the Mid-Session path (chart 3, which

is for the nonfarm business sector). He shows that, at a constant 7.0% unemployment rate, real GNP per employee does not return to trend by 1990. He concludes that the continued shortfall from trend, even though greatly reduced, is an argument for believing that the Mid-Session forecast is reasonable and not too optimistic. (Under the Mid-Session path the real GNP per employee for the nonfarm business sector does return to trend and even surpasses it, but only slightly.)

We do not believe that the charts support this conclusion. The period from 1948 to 1981 encompassed years of very strong productivity growth before the late 1960's or early 1970's. This is necessarily reflected in a trend computed over the entire interval. Therefore, to use this trend as a guide to the future is to assume that the period of very strong productivity growth after World War II should have a large weight in predicting productivity growth over the next five years. In the absence of arguments to support this belief, we would prefer to consider more recent trends, which would portray a lower growth path. If real GNP is shown returning to a higher trend, as it is in these charts, it is shown growing too fast.

Moreover, LA's trends are estimated in terms of the level of productivity. That means that a projection that shows a return to trend from the depressed levels of the early 1980's implies a growth forecast above the strong average growth rate for the entire postwar period.

We would also note that charts 2 and 3 show no tendency for real GNP per employee to return rapidly to its trend. Over the estimation period from 1948 to 1981, real GNP per employee was above trend approximately from 1950 to 1980. Therefore, even if we agreed that the future trend is accurately predicted by the trend over 1948-81 (which we do not agree), we would not see any good reason to expect the trend to be reached by 1990 as it is in the Mid-Session path.

Bridge Between Household and Establishment Employment

LA raises two issues about the bridge between household and establishment employment: the respective growth rates of these measures during 1985-90, and the implication for real GNP if their ratio is what we project rather than the Mid-Session ratio.

Growth rates of household and establishment employment. -- In our memo we observed that the ratio of establishment to household employment reached a record of 91-1/2% in the summer of 1985. The Mid-Session assumes further growth by another 1 percentage point, whereas we projected it to level off.

In criticizing our assumption, LA apparently looked at a different ratio than we used -- one that excluded government

employment from the establishment series. Therefore, his comments about the expected growth of Federal, State, and local government employment are beside the point. Furthermore, in discussing the difference between household and establishment employment, he did not refer to self-employed workers, unpaid family workers, and conceptual measurement differences. Consequently, except for the farm sector, he has not given any reason for expecting that establishment employment will grow faster than household employment from now to 1990.

LA suggested that we look at private sector forecasts of this ratio. DRI, he said, forecasts private nonfarm establishment employment to grow 9.7% from 1985 to 1990, whereas civilian household employment grows 8.0%. This implies a rising ratio of establishment to household employment, as forecast in the Mid-Session path.

LA offered this DRI forecast as only one example of private forecasts, so in the following table we compare other private forecasts of the percentage change in employment from 1985 to 1990. For establishment employment we show percentage changes both for the series including government employment (as we used in our analysis and reported in our memo) and excluding government employment (as LA used in his memo).

	Establishment Employment		Civilian Household Employment
	With Government	Without Government	
DRI (TREND 25YR0985)	9.7%	9.7%	8.0%
Townsend-Greenspan (October 18)	--	11.9	9.1
Chase (Moderate Growth, September 11)	8.3	8.8	8.5 1/
Wharton (September)	5.3	5.1	6.9

1/ Total household employment.

While Townsend-Greenspan also forecasts establishment employment as growing faster than household employment, Chase shows the two measures growing at about the same rate and Wharton shows establishment employment growing slower. Therefore, this survey implies that private sector forecasts do not argue strongly in one direction or another.

Implications of a lower ratio of establishment to household employment. -- In our memo we compared the effects of holding this ratio constant rather than letting it rise according to the Mid-Session path. We said the result would be a reduction in the real GNP growth rate of 0.1-0.2 percentage points per year.

LA says that our result does not follow even if our assumptions about employment are correct (which he does not accept), but he seems to misunderstand what we did. He apparently believes that we lowered this ratio by increasing the employment of those categories that comprise the difference between the two measures. Instead, we implicitly kept those categories as they were and lowered the establishment employment. In this case, unlike the case LA evaluated, real GNP is unequivocally reduced.

Private Real GNP Forecasts

We do not believe that the Administration should necessarily accept the consensus forecast for economic growth of business economists. However, for purposes of comparison, we have tabulated several forecasts for the average rate of growth of real GNP between 1985 and 1990. As shown below, they all project an average growth rate that is below the Mid-Session path. They are all even lower than the modified path we proposed in our October 31st memo.

Forecast		Average Rate of Growth for Real GNP: 1985-1990
Mid-Session Review		3.9%
Mid-Session Review (as modified in our October 31st memo)		3.4
DRI	(September)	3.2
Chase Econometrics	(September)	3.0
Wharton	(September) 1/	3.0
Townsend-Greenspan	(October)	3.3
Blue Chip	(October)	3.1
N.A.B.E.	(November) 2/	3.0

1/ Forecast interval -- 1985-89. Wharton projects a recession in 1990.
2/ Forecast interval -- 1984-89.

Conclusion

We continue to stand by the conclusions of our October 31st memo.

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

November 12, 1985

MEMORANDUM FOR: T-2

FROM: T-3*

SUBJECT: Evaluation of the Mid-Session Inflation Path

This memorandum briefly analyzes the assumptions concerning the longer-term trends for inflation in the Mid-Session Review. It is a sequel to our October 31 memorandum, which focused on productivity and real economic growth.

The Mid-Session Review projects a modest increase in the rate of inflation for 1986. The rate of increase in the GNP deflator is assumed to rise to 4.3% during each quarter. In subsequent years, however, the inflation rate is assumed to decline by 0.2% to 0.3% a year until it reaches 3.2% in 1990. This is an optimistic assumption. The likelihood that inflation might actually follow such a path and trend down for the last four years of the decade does not appear to be great. This follows from three considerations: the unemployment rate will be near or below the natural rate of unemployment by 1990; further price shocks are not likely to be as favorable in the next few years as they have been in the past three years; and the trend rate of growth of M1 has recently increased.

By the end of the decade, if the rest of the Mid-Session projections are realized, the economy would have experienced eight years of uninterrupted economic growth (Q4/82 to Q4/90) averaging about 4% a year. The economy would have entered a zone of high employment. In the past, when it entered such a zone, upward pressures on prices were normal. The only other period in our postwar economic history when an economic expansion lasted this long occurred during the 1960s, and in the later stages of that expansion inflation accelerated, rather than declined. The 5.8% unemployment rate projected for 1990 is below the 6 to 6-1/2% unemployment rate range that is generally considered to be the natural rate of unemployment under current institutional conditions. The employment pressures would be almost as severe even if the lower growth rate assumed in our October 31 memorandum were used instead.

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The price path for the Mid-Session Review assumes no decline in the dollar, neither the 12% depreciation that has already occurred nor any further depreciation, although it does incorporate the lagged effects of the previous dollar appreciation. However, it is now official policy of the Administration to encourage an orderly depreciation of the dollar. In order to calculate the effects of a decline in the dollar on the rate of inflation as measured by the CPI, we used simulation results from the Board of Governors' Multi-Country Model which is representative of other econometric work on this topic. The attached table shows the effects on projected inflation (CPI) of the recent dollar depreciation plus an additional 20% depreciation from now through 1990. The annual inflation rate is raised by about 1% a year for the five-year period. By the fourth quarter of 1990, the CPI is 5.2% above the level shown in the Mid-Session path.

One major price factor that may counteract this effect and help to keep inflation in check is a continuing erosion of oil prices. The Mid-Session Review assumes a decline to $25/b by the fourth quarter of this year, an unchanged level for a year, and an increase with the rate of inflation thereafter. However, we believe the price per barrel could dip 10% next year and remain permanently 10% lower than the Mid-Session path. Such an oil price decline, as shown in the attached table, would offset almost half of the effects of the dollar depreciation over the next five years. (For simplicity, the combined effects shown in the table assume no interdependency between an oil price shock and the exchange rate.)

In the long run, the average rate of inflation depends on the average rate of increase in the money supply. In the past eleven months, M1 has grown extraordinarily fast -- 12.7% at a seasonally adjusted annual rate. Even if the Fed succeeds in slowing down the rate of monetary expansion, a gradual slowdown would leave the average increase in M1 for the period from 1985 to 1990 well above its recent trend. For example, if the growth rate of M1 declines by one percentage point a year for the next five years, its average growth rate for the period would be 9%. Assuming a growth rate of M1 velocity of 1% (which is significantly less than the traditional 3% average) would still yield an average growth rate for nominal GNP of 10% for the next five years. This would produce a significant acceleration of inflation to an average of around 6% to 6-1/2%.

Of course, a sharp decline in money growth to bring down inflation is possible, and this could produce an average rate of inflation as low as assumed in the Mid-Session Review. However, this might also produce an economic downturn. Should that occur, other aspects of the Mid-Session assumptions would need to be revised. On balance, it would appear that a rate of monetary

expansion that is rapid enough to support strong and continuous real economic growth over the next five years is likely to produce a somewhat higher rate of inflation than is assumed in the Mid-Session Review.

For these reasons, we conclude that a decelerating inflation path from 1986 to 1990, as projected in the Mid-Session Review, is not likely. A stable rate of inflation around 4% to 4-1/2%, or a moderately accelerating rate, is more consistent with the projected real path of the economy.

Attachments

CASE I: CPI CHANGES RESULTING FROM EXCHANGE RATE SHOCKS

	85Q4	86Q4	87Q4	88Q4	89Q4	90Q4	91Q4
WTD AVERAGE DOLLAR	129.7	119.3	112.2	106.6	102.3	100.2	100.2
EXCHANGE RATE CHANGE (%)	-11.9	-8.0	-6.0	-5.0	-4.0	-2.1	0.0
CHANGE IN INFLATION RATE (%)	0.0	0.8	1.0	1.2	0.9	0.7	0.5
CUMULATIVE CPI CHANGE (%)	0.0	0.8	1.9	3.1	4.0	4.7	5.2
MIDSESSION CPI LEVEL	323.9	337.8	351.6	365.0	377.8	389.9	401.2
MIDSESSION CPI INFLATION RATE (%)	3.8	4.3	4.1	3.8	3.5	3.2	2.9
ALTERNATIVE CPI LEVEL	323.9	340.6	358.2	376.3	392.9	408.2	422.1
ALTERNATIVE CPI INFLATION RATE (%)	3.8	5.2	5.2	5.0	4.4	3.9	3.4
ANNUAL DIFFERENCE (%)		0.9	1.1	1.2	0.9	0.7	0.5
CUMULATIVE DIFFERENCE (%)		0.8	1.9	3.1	4.0	4.7	5.2

CASE II: CHANGES IN CPI RESULTING FROM A TWO STAGE, 10%, DECLINE IN OIL PRICES

	85Q4	86Q4	87Q4	88Q4	89Q4	90Q4	91Q4
MID-SESSION REFINERS' ACQUISITION COST							
CRUDE OIL ($/BBL)	24.78	25.17	26.30	27.30	28.26	29.16	30.00
% CHG - Q4/Q4	-	1.6	4.5	3.8	3.5	3.2	2.9
ALTERNATIVE -- 2 STAGE REDUCTION -- 10% LOWER	23.54	22.65	23.67	24.57	25.43	26.24	27.00
% CHG - Q4/Q4	-	-3.8	4.5	3.8	3.5	3.2	2.9
RATIO ALTERNATIVE/MIDSESSION	95.0	90.0	90.0	90.0	90.0	90.0	90.0
LAGGED EFFECTS OF A 10% OIL PRICE CUT ON THE CPI	-	-0.9	-1.1	-1.2	-0.9	-0.4	0.0
MID-SESSION CPI LEVEL	323.9	337.8	351.6	365.0	377.8	389.9	401.2
MID-SESSION CPI INFLATION RATE (%)	3.8	4.3	4.1	3.8	3.5	3.2	2.9
ALTERNATIVE CPI LEVEL	323.9	337.1	349.2	360.5	371.2	381.9	392.5
ALTERNATIVE CPI INFLATION RATE (%)	3.8	4.1	3.6	3.2	3.0	2.9	2.8
ANNUAL DIFFERENCE (in %)	-	-0.2	-0.5	-0.6	-0.5	-0.3	-0.1
CUMULATIVE DIFFERENCE (in %)	-	-0.2	-0.7	-1.2	-1.7	-2.1	-2.2

CASE III: COMBINED EFFECT OF DEPRECIATION AND 10% OIL PRICE DECLINE

	85Q4	86Q4	87Q4	88Q4	89Q4	90Q4	91Q4
MID-SESSION CPI LEVEL	323.9	337.8	351.6	365.0	377.8	389.9	401.2
MID-SESSION CPI INFLATION RATE (%)	3.8	4.3	4.1	3.8	3.5	3.2	2.9
ALTERNATIVE CPI LEVEL	323.9	339.9	355.7	371.6	386.1	399.9	413.1
ALTERNATIVE CPI INFLATION RATE (%)	3.8	4.9	4.7	4.5	3.9	3.6	3.3
ANNUAL DIFFERENCE (in %)		0.6	0.6	0.7	0.4	0.4	0.4
CUMULATIVE DIFFERENCE (in %)		0.6	1.2	1.8	2.2	2.6	3.0

BWS

THE CHAIRMAN OF THE
COUNCIL OF ECONOMIC ADVISERS
WASHINGTON

December 10, 1985

MEMORANDUM FOR KATHRYN EICKHOFF, OMB

FROM: BERYL W. SPRINKEL

SUBJECT: Draft T2 Memo

We received your redraft of the subject memo late Friday. Thank you for providing numerical values for your preferred forecast options. We gave you the preliminary draft to eliminate any confusion over your numerical options. A redraft, incorporating your substantive and numerical changes is attached for comment. Where possible the redraft contains your suggested language changes. Please send your comments to me today and if possible fill in a provisional schedule at the end of the memo.

Attachment