FOR AGENDA

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CONTAINS CONFIDENTIAL INFORMATION

July 14, 1997

To: Members of the Executive Board

From: *The Secretary*

Subject: **United States—Selected Issues**

This paper provides background information to the staff report on the 1997 Article IV consultation discussions with the United States, which was circulated as SM/97/177 on July 7, 1997.

Mr. Dunaway (ext. 37343) or Mr. Leidy (ext. 38435) is available to answer technical or factual questions relating to this paper prior to the Board discussion.

Unless the Documents Preparation Section (ext. 36760) is otherwise notified, the document will be transmitted, in accordance with the procedures approved by the Executive Board and with the appropriate deletions, to the WTO Secretariat on Tuesday, July 22, 1997; and to the Food and Agriculture Organization (FAO), the Inter-American Development Bank (IDB), the Organisation for Economic Cooperation and Development (OECD), and the World Food Programme (WFP), following its consideration by the Executive Board.

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INTERNATIONAL MONETARY FUND

UNITED STATES OF AMERICA

Selected Issues

Prepared by S. Dunaway, J. Cole, B. González-Hermosillo, C. Kramer, M. Leidy, Y. Li, R. Salgado, S. Tokarick, and V. Valdivia

Approved by the Western Hemisphere Department

July 10, 1997

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I. Problems in the Measurement of Output and Prices [1]

1. In recent years, confidence in the ability of economists to clearly analyze developments in the U.S. economy has been questioned by growing awareness and perhaps growing problems in measuring output and prices. In particular, substantial statistical discrepancies have emerged in the national income and product accounts (NIPAs) in the alternative measures of the value of output. At the same time, considerable attention has been focused on problems in the measurement of prices, especially the consumer price index (CPI). In turn, these difficulties in measuring nominal output and in measuring key price deflators can create errors in the measurement of real output and other important statistical indicators, such as productivity, which are derived from real output estimates.

A. Income Versus Expenditure Measures of National Output

2. The value of national output can be measured as the sum of expenditures on currently produced final goods and services, or as the sum of incomes (wages and salaries, profits, proprietors' income, interest, and rental income) paid to factors of production used in the current production of goods and services. In principle, the two approaches represent different ways of measuring essentially the same thing, since the value of final production of goods and services is ultimately distributed as wages, profits, interest, and rent. Some minor definitional differences exist between the two approaches that principally relate to the coverage of transactions (most notably, indirect business taxes and business transfer payments, which are captured in the expenditure estimates but not in the income estimates since they do not represent returns to factors of production). Adjusting for these differences, the two measures should yield the same results. However, in practice, measurement difficulties typically result in these approaches yielding different estimates for the value of national output. The difference between the two estimates is referred to as the "statistical discrepancy" in the NIPAs. A negative (positive) statistical discrepancy indicates that the income estimate exceeds (is less than) the expenditure estimate.

3. Since the third quarter of 1994, the income measure of GDP has grown significantly faster than the expenditure measure. Consequently, since that time, gross national income has increased at an annual rate of 5.6 percent through the first quarter of 1997, while gross national expenditure increased at a 4.8 percent annual rate.[2] The statistical discrepancy was positive during most of the period since 1970, but it has become increasingly negative since the third quarter of 1995 (see Chart 1).

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[1] Prepared by Michael Leidy and Yutong Li.

[2] In real terms, gross national income increased at an annual rate of 3.4 percent from the third quarter of 1994 through the first quarter of 1997, while gross national expenditure increased at a 2.6 percent annual rate (Chart 1).

4. Although both types of estimates suffer from measurement problems, until recently economists had generally considered the expenditure estimates to be more reliable. On the expenditure side, measuring consumption of services presents the greatest difficulties, while on the income side certain components of nonwage income are especially difficult to measure, particularly proprietor's income. A number of analysts now suspect that the expenditure estimates of GDP have been seriously understated, and have suggested several reasons why recent income estimates might present a more reliable picture of developments in the value of national output.[3] In particular, the income estimates of nominal output are more consistent with the higher-than-expected personal income tax revenues collected in 1996 and 1997.[4] At the same time, the growth of real GDP over the last several years, as derived from the expenditure estimates of nominal output, has been roughly in line with potential, yet during this period, the unemployment rate has declined, counter to what would have been expected according to Okun's Law.[5] On the other hand, real GDP growth derived from the income estimates of nominal output has been higher than potential, which is consistent with the prediction of a falling unemployment rate under Okun's Law. In addition, labor productivity growth derived from the income estimates is more in line with developments in the real product wage than is productivity growth measured on the expenditure side. The real product wage is defined as hourly compensation divided by the prices received by producers. Typically, changes in the real product wage track labor productivity growth. Since 1995, the average annual rate of growth of the real product wage has been 1.5 percent, which is about equal to productivity growth derived from the income estimates, while it is well above the 0.5 percent annual rate of productivity growth derived from the expenditure estimates.

B. Sources of CPI Bias and Findings of the Boskin Commission

5. A commission was established at the behest of the U.S. Senate Finance Committee to investigate the issue of how well the CPI measures changes in the cost of living. The December 1996 release of the Final Report of the Advisory Commission on the Consumer Price Index (the Boskin Commission) has heightened interest in understanding the principal economic and policy implications of potential biases in the CPI.

6. The shortcomings of the CPI as a cost of living index (COLI) can largely be attributed to the simple fact that the CPI was not intended to measure changes in the cost of living. A

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[3]Peach (1996) and Council of Economic Advisers (1997).

[4]The strength of these tax receipts, however, suggest that even the income estimates might understate the value of national output.

[5]According to Okun's Law the unemployment rate remains stable when GDP grows at its potential rate, rises when GDP grows below potential, and falls when GDP grows faster than potential.

cost of living index (COLI) would measure changes in the minimum cost of consuming a basket of goods today at current market prices that would provide the *same level of satisfaction* (standard of living) as a representative basket of goods purchased in a base period.[6] In contrast, the CPI measures how much it would cost at current market prices to purchase the same basket of goods that was consumed in the base period. Hence, the composition and relative weights of the basket of goods measured by a COLI would change over time to reflect the effects of movements in relative prices on the basket of goods that inviduals consume, while the CPI's market basket remains fixed. As a result, relative to a COLI, the CPI has a ***commodity substitution bias,*** since it fails to pick up the effort of consumers to minimize the effects of price changes on their "level of satisfaction" by substituting relatively less expensive products for those goods whose prices have risen.[7] Also, in response to changes in relative prices, consumers will adjust their shopping patterns, shifting from higher-priced to lower-priced retail outlets. An ***outlet substitution bias*** in the CPI may result if such shifts are not picked up in the price surveys, or if new types of retail outlets develop and these are not surveyed. Both of these types of substitution bias would result in increases in the CPI overstating increases in the cost of living.

7. Other factors contribute to errors in the CPI (and its use in attempting to measure changes in the cost of living) owing to the mismeasurement of prices. ***Quality bias*** may arise because the attributes of goods change over time. When this occurs, unless the measured price changes properly reflect underlying quality changes, the price changes will be mismeasured. The Bureau of Labor Statistics (BLS) attempts to control for quality changes in the calculation of the CPI; however, because of the difficulties involved, these adjustments are generally regarded as insufficient to capture quality changes fully.[8] The direction of the overall quality bias in the CPI is not clear a priori. The Boskin Commission's report maintains that this bias

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[6]For a more detailed overview of problems associated with the CPI as an indicator of inflation and as a cost of living index see Armknecht (1996).

[7]Implicitly, the fixed-weighted CPI assumes a price elasticity of substitution of zero. Under the assumption that the price elasticity of substitution is one (implying expenditure shares across goods are constant), a well known solution to the problem of commodity substitution bias is to use a geometric mean index of the following kind:

$$CPI_{gm} = \Pi_{i=1}^{N}(P_{1,i} / P_{0,i})^{S_{0,i}},$$

where $S_{0,i}$ is the base-period expenditure share and $P_{1,i}$ and $P_{0,i}$ are current-period and base-period prices, respectively. The BLS began releasing an experimental CPI using a geometric mean in April 1997.

[8]See, for example, the discussion in Moulton (1996a). To give a sense of the extent to which quality changes already enter CPI calculations, Moulton (p.171) points out that the change in the new car component of the CPI from 1967 to 1994 would have been 80 percent higher if adjustments for quality improvements had not been made.

tends to overstate inflation (i.e., quality improvements are not fully accounted for and thus price increases are overstated), but other analysts have suggested that the reverse could be true, owing to reductions in the quality of some goods.

8. Along somewhat similar lines, the introduction of ***new goods*** may lead to a mis-measurement of prices. Over time, items in the CPI market basket may cease to be produced as new substitute products are introduced. Matching discontinued items in the market basket with the new products replacing them can introduce a bias, since the attributes of the two products are not likely to be identical, and the direction of this bias cannot be known a priori. In addition, another source of new goods bias associated with the CPI arises from the introduction of entirely new goods (for example, video tape recorders and cellular phones). These new goods tend to be included in the CPI market basket some time after they have been introduced, and as a result, the CPI routinely misses the reductions in their prices that typically takes place soon after their introduction.

9. The Boskin Commission's efforts to quantify these sources of CPI bias suggest that, while the bias may vary from year to year, the CPI has overstated the change in the cost of living on average by 1.1 percentage points per year. The total bias includes: (1) 0.6 percentage point owing to new products and quality changes; (2) 0.4 percentage point owing to commodity substitution effects; and (3) 0.1 percentage point owing to new outlet substitution bias. The Commission also identified a "plausible range" for the total CPI bias of 0.8 to 1.6 percentage points per year.[9] This plausible range is consistent with the range of estimates derived from other studies of the CPI bias (Table 1).

10. The Commission observed that procedural changes at the BLS have helped to reduce the substitution and quality biases in the CPI over the years in a number of important product categories.[10] In addition, changes scheduled to be implemented over the next three years are expected to reduce the CPI bias by roughly 0.3 percent per year beginning in 2000. These changes reflect steps to reduce substitution bias, including the introduction of an updated

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[9]This "plausible range" is not a statistical confidence interval. The "plausible range" as used in the Boskin Commission report amounts to a view on the reasonableness of the assumptions needed to generate estimates of the various types of CPI bias.

[10]The Commission observed, for example, that changes in BLS methodology "largely or entirely eliminated an upward bias in the CPI for new automobiles prior to the mid-1960s and a downward bias for apparel after the mid-1980s" (p.32). The Commission's report also discusses the various methods employed by the BLS to deal with quality changes for existing products (pp.36–38).

market basket and new computational techniques for aggregating the prices of the individual items in the various categories in the CPI market basket.[11]

C. Mismeasurement of Output and Productivity

11. Difficulties in measuring nominal expenditure or income and in measuring prices will lead to commensurate problems in measuring real output and, in turn, productivity. When the NIPAs were revised to report real GDP data based on chain-type weights in 1995, much of the substitution bias associated with fixed-weighted measurements was eliminated (box below).[12] However, biases in the measurement of prices remained, for example, reflecting quality changes and the introduction of new products. Because units of output, quality changes, and new products are less easily identified in service sectors, measuring output in these sectors is likely to be subject to greater measurement errors than output in goods-producing sectors. As the service sector has grown in importance over the past few decades, the potential for mismeasurement of output has thus increased significantly, and has given rise to speculation that some of the productivity slowdown that began in the mid-1970s may be attributable to measurement problems.

12. A paper by Slifman and Corrado (1996) provides indirect evidence of the mismeasurement of prices and real output.[13] The authors note that labor productivity growth in the U.S. private business sector averaged about 1¼ percent per year over the period from 1973–94. During the same period, labor productivity in the nonfarm, nonfinancial corporate business sector rose at a faster average annual rate of 1¾ percent. Since the latter subsector accounts for about two-thirds of the private business sector, this suggests that labor productivity growth in the rest of the private business sector was nearly flat on average for more than 20 years. Slifman and Corrado attempt to identify which industries account for the sluggish measured labor productivity growth in this part of the economy, and to see if the measured labor productivity performance in these industries appears plausible. They find that measured productivity growth in most service sectors has been flat to negative since the mid-1970s, and

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[11]For additional information on computation changes in the CPI that are being implemented, see Bureau of Labor Statistics (1996).

[12]This methodological change affected estimates of the magnitude of the productivity slowdown that began in the early 1970s. While the fixed-weight measure showed the average annual rate of real GDP growth slowing from 3.7 percent in 1959–72 to 2.4 percent in 1973–94, the chain-type weight measure shows the average annual growth in real GDP growth slowing from 4.1 percent to 2.5 percent over these two periods (BEA, 1995, p.35).

[13]The issue of downward bias in measuring real output and labor productivity, particularly in service-producing industries, is also addressed in Griliches (1992).

they conclude that, in view of the maintenance of profitability in these sectors, measured productivity growth (and hence output growth) must be understated.[14]

Fixed- Versus Chain-Weighted Measures of Real GDP

In principle, measuring real economic activity requires separating price changes from quantity changes and aggregating these quantity changes. One way of approaching this problem is to select prices from a single base year and then to value future production in each sector at these base year prices. The aggregate value of production of final goods and services across all sectors at base-year prices provides a "fixed-weighted" measure of real GDP. A problem with this approach is that, especially during periods of significant economic change, the resulting calculations are generally sensitive to the selected base year. When NIPAs are periodically moved to a new base year, the history of real GDP growth is then effectively rewritten. This occurs, for example, because those sectors in which production is rising relatively quickly also tend to be associated with prices that rise relatively slowly. Thus, when earlier base-year prices are selected those commodities experiencing relatively strong output growth tend to be assigned relatively greater weight than if later base-year prices were selected. Under such conditions, measured real GDP growth based on earlier base years will be higher than measured GDP growth based on later base years.

While this problem had been viewed as relatively insignificant, more recent developments (including, in particular, the secular decline exhibited in computer prices and the rising share of computers in expenditures) have led to increasing differences in fixed-weighted measures of real GDP depending on the choice of base year. To deal with this problem, a chain-weighted method of calculating real GDP was introduced in the NIPAs in December 1995. The chain-weighted procedure involves making two calculations of real GDP growth for each year and using an average of them as the estimate of real GDP growth. Specifically, real GDP growth for each period is calculated based on both previous period prices and current period prices. By using this method for every period, the effects of changes in relative prices on the measure of real GDP growth is eliminated.

13. Among the estimates of annual average growth in labor productivity across various sectors of the economy derived by Slifman and Corrado, legal and health services have experienced the greatest measured reductions in productivity since 1977 (Table 2). While it may be difficult to agree on an a priori judgement regarding productivity in legal services, continuously declining labor productivity in the health care industry would appear to be implausible, in view of the rapid technological advances that have been achieved in this sector.

14. Slifman and Corrado also point out that BLS data indicate that profitability in the nonfarm, noncorporate sector has remained in line with historical levels, even though labor productivity in the sector has been continuously declining (Chart 2). Firm-level profits are

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[14]It was necessary for Slifman and Corrado to deduce the sectoral decomposition of labor productivity estimates because the Bureau of Labor Statistics (BLS) does not produce such figures.

heavily determined by developments in unit labor costs, and rising real unit labor costs, ceteris paribus, would tend to imply falling profits. Thus, the coexistence of rising real unit labor costs implied by the declining indicators of productivity and favorable profitability figures would appear to be inconsistent.

15. This anomaly can be explained in one of three ways: (1) output prices in the nonfarm, noncorporate sector have risen, in fact, relatively rapidly;[15] (2) growth in nominal output in this sector has been continuously understated;[16] or (3) the increase in output prices in this sector have been overstated and the growth in output concomitantly understated.[17] Slifman and Corrado conclude that it is unlikely that nonfarm, noncorporate output prices rose significantly faster than in the rest of the nonfarm business sector. They also argue that it is not likely that there are significantly greater errors in measuring nominal output and hours worked in the nonfarm, noncorporate sectors than in other sectors. They conclude, therefore, that the mismeasurement of price inflation (and, hence, output and labor productivity) is the most compelling explanation for the apparently incompatible data on productivity, profitability, and price trends in the nonfarm, noncorporate sector. If instead of declining over the last two decades, labor productivity had remained flat in those two-digit service-producing industries with measured negative productivity growth, Slifman and Corrado calculate that aggregate labor productivity growth would have been nearly half a percentage point higher per year than the published data indicate; inflation, of course, would have been correspondingly lower.[18]

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[15]If prices in the nonfarm, noncorporate sector have risen relatively rapidly, continuing relative price increases could have been sufficient to maintain profitability even in the face of declining productivity.

[16]If nominal output has been underestimated, then the associated output and productivity estimates would also be underestimated. Given this mismeasurement, the fact that profitability has been maintained would no longer be surprising.

[17]If output prices have been overstated, then nominal output is over deflated and real output consequently is underestimated. Higher productivity figures based on accurate price measurement would be consistent with maintained profitability.

[18]Interestingly, although Slifman and Corrado approached the issue of price and output mismeasurement from a macroeconomic perspective, the overstatement of inflation implied by their hypothetical scenario is roughly in line with the Boskin Commission's estimate of the share of inflation bias attributable to difficulties in controlling for quality changes and the introduction of new products.

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Table 1. United States: Recent Estimates of Bias in the U.S. Consumer Price Index

(Percentage points)

Source	Point Estimate	Interval Estimate
Boskin Commission: Final Report (1996)	1.1	0.8 - 1.6
Boskin Commission: Preliminary Report (1995)	1.0	0.7 - 2.0
Boskin (1995)	1.5	1.0 - 2.0
Congressional Budget Office (1994)	--	0.2 - 0.8
Darby (1995)	1.5	0.5 - 2.5
Diewert (1995)	--	1.3 - 1.7
Gordon (1995)	1.7	--
Greenspan (1995)	--	0.5 - 1.5
Griliches (1995)	1.0	0.4 - 1.6
Jorgenson (1995)	1.0	0.5 - 1.5
Klumpner (1996)	--	0.3 - 0.5
Lebow, Roberts, and Stockton (1994)	--	0.4 - 1.5
Pakes (1995)	0.8	--
Shapiro and Wilcox (1996)	1.1	0.7 - 1.6
Wynne and Sigalla (1994)	< 1.0	--

Source: Moulton (1996) and Report of the Advisory Commission on the Consumer Price Index (the Boskin Commission), December 4, 1996.

Table 2. United States: Real Gross Product Originating per Hour, 1977–94

(Percent change at an annual rate over period indicated)

Industry	1977–94	1980–90	1990–94
Nonfarm business sector, excluding housing (BLS)	1.0	1.1	1.1
Nonagricultural private industries (excluding housing)	0.9	1.2	1.0
Mining	2.6	5.0	4.6
Construction	-1.0	-0.7	0.8
Manufacturing	2.5	3.2	2.2
Durables	2.8	3.6	3.1
Nondurables	2.0	2.7	1.0
Transportation and utilities	1.5	1.3	2.6
Transportation	0.6	-0.1	2.3
Communications	4.5	4.0	5.2
Public utilities	0.7	1.2	2.8
Trade	2.1	2.5	2.4
Wholesale trade	3.3	3.3	5.4
Retail trade	1.3	2.0	0.6
Finance, insurance, real estate (excluding housing)	0.2	0.1	0.9
Services	-0.6	-0.5	-1.1
Hotels and lodging	-1.5	-1.5	0.4
Personal services	-0.9	-0.5	-0.7
Business and other services	-0.4	-0.2	-1.1
Auto repair	-1.3	-1.0	-1.9
Miscellaneous services	-0.2	-1.2	-3.5
Motion pictures	1.7	1.7	-1.1
Amusement services	1.0	2.6	-4.8
Health services	-1.8	-1.8	-2.5
Legal services	-2.8	-2.6	-3.
Education services	0.0	-0.5	0.2
Membership organizations and social services	-0.2	-0.1	0.5
Private households	2.2	3.7	2.1

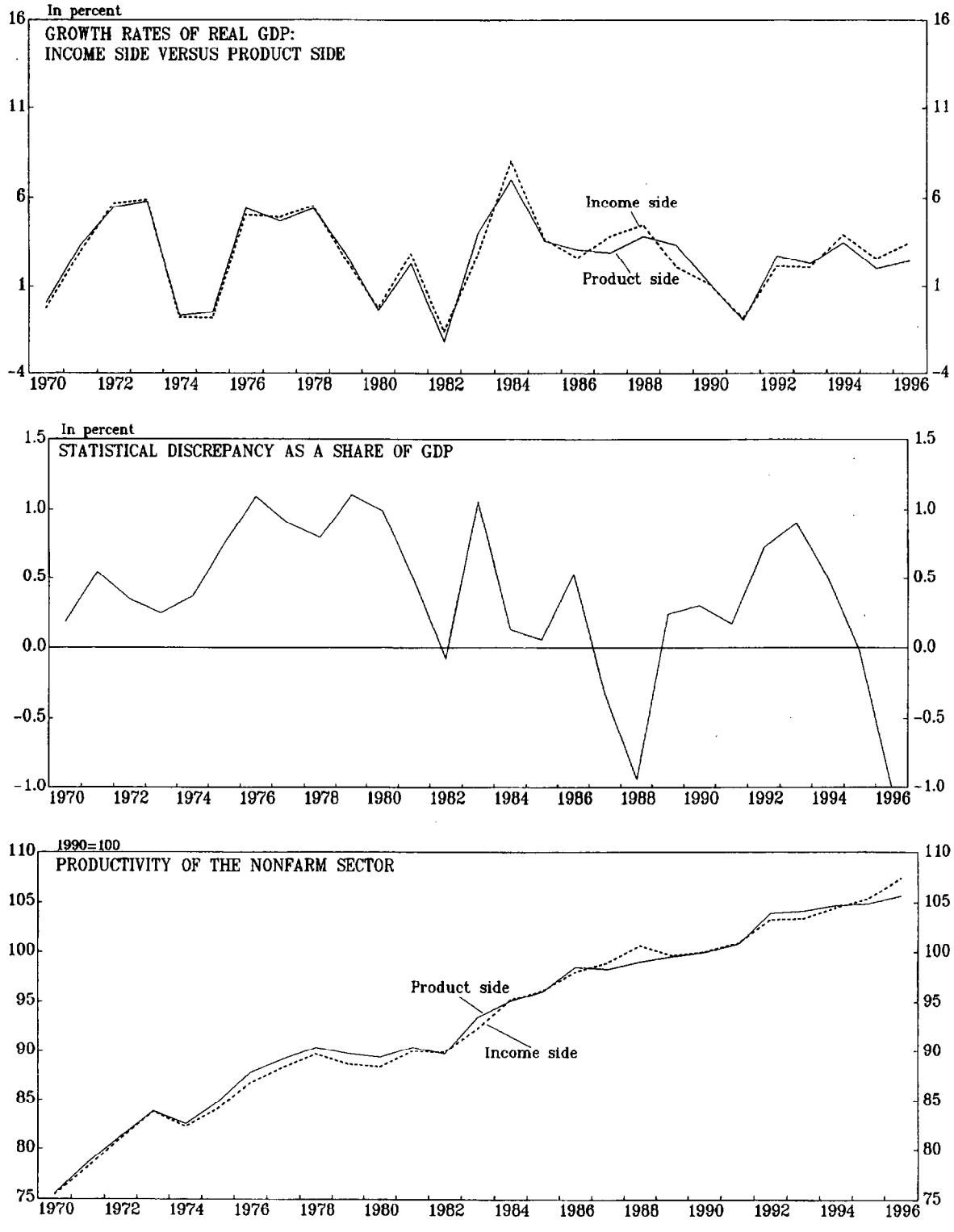
Source: Slifman L., and C. Corrado, "Decomposition of Productivity and Unit Costs", Board of Governors of the Federal Reserve Sytstem (November 18, 1996).

Notes: Hours of all persons in these calculations differ from hours of all persons as defined by the BLS because the calculations presented here include nonprofit institutions and private households. These calculations assume that self-employed workers in each industry work the same number of hours annually as full-time wage and salary employees.

CHART 1

UNITED STATES

ALTERNATIVE MEASURES OF PRODUCTIVITY, GDP, AND THE STATISTICAL DISCREPANCY

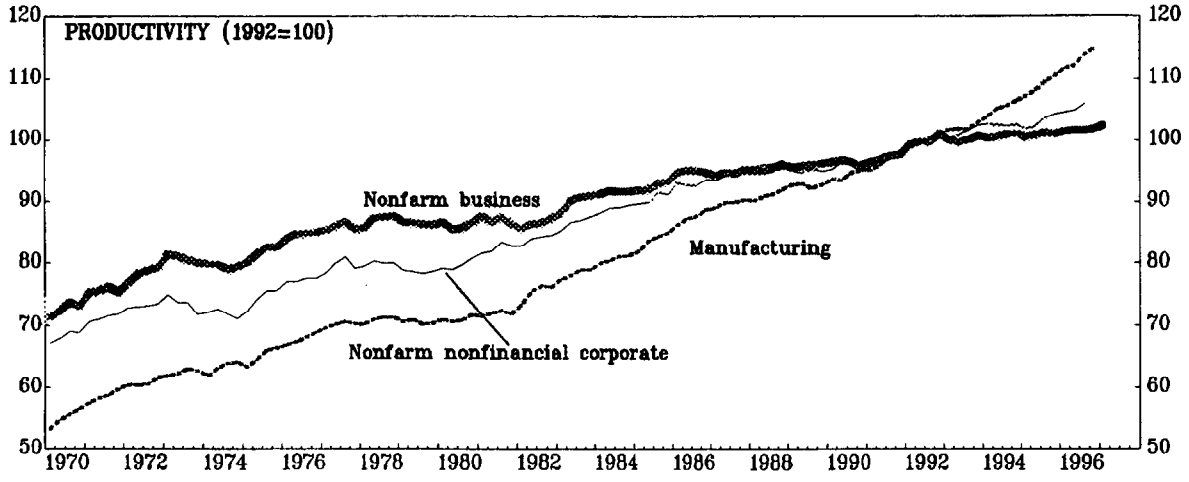


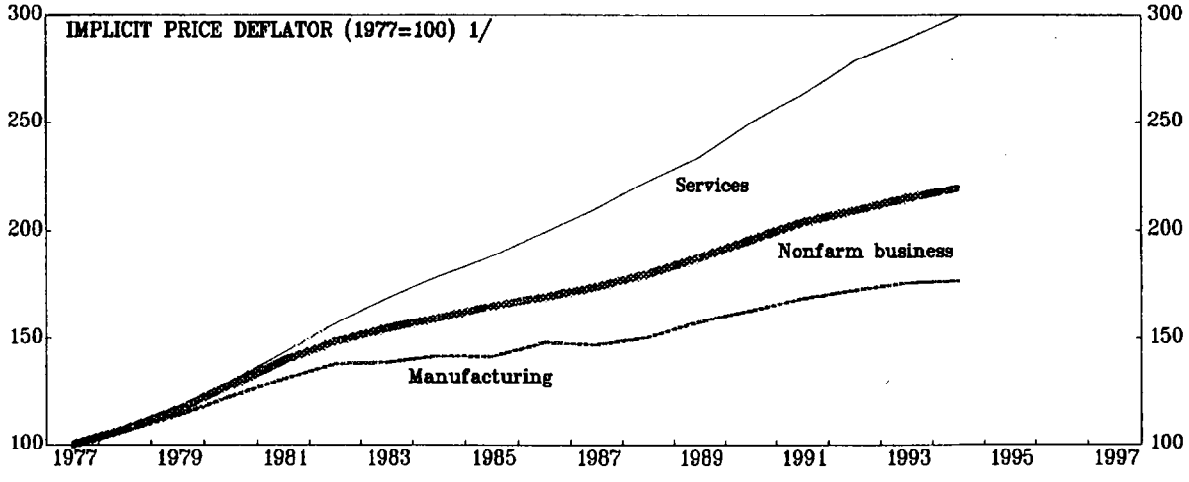
Sources: Bureau of Labor Statistics, U.S. Department of Labor; Bureau of Economic Analysis, U.S. Department of Commerce, and Fund staff estimates.

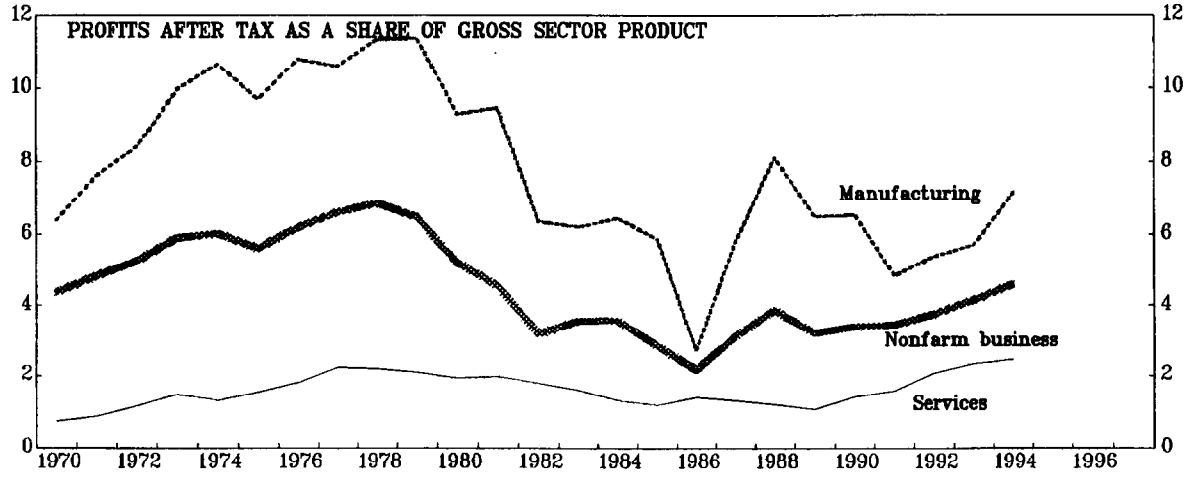
CHART 2

UNITED STATES

PRODUCTIVITY, PRICE INFLATION, AND PROFITABILITY BY INDUSTRY







Sources: Bureau of Labor Statistics, U.S. Department of Labor; Bureau of Economic Analysis, U.S. Department of Commerce, and Fund staff estimates.

1/ Derived from nominal and real GDP (chained-1992 dollar) by industry.

II. Job Uncertainty and the Phillips Curve[1]

1. Relatively low rates of increase in wages and prices have been recorded in recent years despite declines in the unemployment rate to levels that in the past have been associated with rising inflationary pressures (Chart 1). It has been suggested that the recent behavior of wages and prices may reflect workers' increased concerns about job prospects, which limited their demands for wage increases.[2] To test this proposition, some empirical measures of job insecurity are used to augment a simple Phillips curve model, and this model is tested to see if it provides a better forecast for inflation performance during 1995 and 1996. The results suggest that job uncertainty does not help to explain the recent behavior of prices and wages.

2. Chart 2 shows a cross-plot of inflation and unemployment over the 1990–97 period. The positive co-movements of unemployment and inflation since the end of 1992 indicate that more than a simple Phillips curve relationship must be at work. In the standard Phillips curve equation estimated here, inflation (the annualized rate of increase of the core CPI (Π)) is expressed as a linear function of lagged inflation and the unemployment gap (U_{gap}), which is measured as the difference between the actual unemployment rate and a time-varying estimate of the natural rate.[3] Table 1 shows the results for an equation estimated using quarterly data over the period 1984–94.[4] The static version of the equation is:

$$\Pi = 3.9 - 0.89\, U_{gap}$$

Chart 3 presents an out-of-sample forecast for 1995–96 from the estimated Phillips curve. The equation predicts an increase in the rate of inflation over the forecast period, with inflation rising to about 4 percent during 1996; in the event, inflation declined during the period to around 2½ percent.

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[1]Prepared by Charles Kramer and Yutong Li.

[2]See Greenspan (1997).

[3]The time-varying estimate of the natural rate used here is taken from Thomas (1996). Alternative specifications and functional forms for the Phillips curve are discussed in Debelle and Laxton (1996); Gordon (1997); and Staiger, Stock, and Watson (1997).

[4]Results for regressions using the GDP deflator or the deflator for personal consumption expenditure to measure inflation were similar, as were results using the output gap (the difference between actual and potential output) in place of the unemployment gap. Regressions including the change in the unemployment gap gave mixed results; the change in the output gap was not significant when added to equations that included the level of the output gap. Also, a few experiments with the results did not yield evidence of nonlinearities in the Phillips curve relationship.

3. One possible explanation for the sharp difference between actual and forecast inflation is that the natural rate of unemployment is overestimated (and the unemployment gap underestimated). However, inserting the inflation and unemployment rates observed in recent quarters (about 2½ percent and around 5 percent, respectively) into the above equation implies a natural rate of about 3¾ percent, which is extremely low in comparison to other estimates and below the lower bound of estimated confidence intervals.[5]

4. The potential role played by job uncertainty in explaining the recent behavior of wages and prices also was examined. There are a variety of possible indicators of job uncertainty. Some relevant measures have been suggested by Greenspan (1997) and Valletta (1996 and 1997). Greenspan (1997) emphasizes survey measures of uncertainty, low wage increases in collective bargaining arrangements, and low levels of work stoppages as potentially important factors in explaining recent low levels of inflation (though he expresses doubts that any one measure predominates). Valletta (1996) suggests that the distinction between employer- and employee-initiated job separations is important. For the same unemployment rate, a higher rate of employer-initiated separations (e.g., layoffs, as opposed to voluntary quits) would imply greater job uncertainty and less pressure on wages and hence on prices. Valletta also presents data suggesting that over the last few decades, employers have become more likely to shed employees through permanent dismissals rather than layoffs and that dismissals have become more sensitive to the business cycle, which would add to job insecurity. Valletta (1997) also shows that displaced workers as a share of total employment has remained high in recent years because of corporate downsizing.[6]

5. Table 2 lists various measures of job uncertainty, and Chart 4 shows the evolution of each measure in the period 1984–96. Chart 5 compares the path of each job-uncertainty measure over the current economic expansion with its path during the previous expansion. Most measures are close to their levels at the same point in the previous expansion. The exception is the unemployment rate among job leavers, which currently is relatively low. Also, the number of job leavers as a percent of civilian employment has been stagnant in the current expansion, while it increased dramatically in the previous one. These facts suggest some continuing reluctance of workers to leave their current jobs to search for new work.

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[5]See for example, Staiger, Stock, and Watson (1997). The authors have a central estimate for the natural rate of 5.8 percent, with a 95 percent confidence interval of 4.5–6.9 percent.

[6]Displaced workers are persons who lost or left jobs because of the closure or relocation of a plant, because of insufficient work, or because their position or shift was eliminated. Valletta argues that the implications for wages of an increase in the number of displaced workers are likely to be limited since the trend toward higher displacement rates in the 1990s largely affected white-collar workers, and this group of workers represented only a small portion of the labor force.

6. Augmented Phillips curves were estimated over the period 1984–94 including the variables measuring job uncertainty. Table 3 summarizes these results. The percent of days idle due to work stoppages (WSTOPP) and the NABE survey measure of falling employment (NABEMF) were significant; however, in both cases, the coefficient had the wrong sign. Regressions using the change in job uncertainty, rather than the level, performed no better.[7]

7. Alternatively, in line with Chairman Greenspan's conjecture that multiple measures may be needed, equations were estimated with more than one measure of job uncertainty. The job-uncertainty variables in these equations also were not significant, possibly because of the inclusion of many variables in a fairly short sample period. For this reason, some regressions using principal components of the job-uncertainty variables were performed (results are shown in the last four rows of Table 3).[8] These regressions showed mixed results for the job-uncertainty variables. Only in one case was job uncertainty significant; however, in every case, equations incorporating the principal components for job uncertainty had implausibly large coefficients on the unemployment gap variable.

8. In using the various equations for forecasting inflation over the period 1995–96, only the equation with the unemployment rate among job losers (LRJL) produced a decline in inflation during the forecast period. However, the coefficient on LRJL was insignificant. Typical results showed a forecast for core inflation increasing to about 3.5–4 percent over 1995–96, about the same results as derived from the standard Phillips curve.

9. None of the ten measures of job uncertainty helps to explain why lower rates of inflation have been associated with lower rates of unemployment in the past few years. There is no consistent relationship between measures of job uncertainty and inflation in the standard Phillips curve equations estimated. It may be that job uncertainty is simply not at high levels, despite anecdotal evidence, which would be consistent with the impression given by the data in Chart 5. Indeed, Valletta (1997) notes that most recently displaced workers are quickly finding jobs.

10. Underlying the standard Phillips curve are two equations: one that relates wage inflation to the unemployment gap (a wage Phillips curve) and another that relates price inflation to wage inflation (a markup equation). To examine whether the source of the forecasting errors in the standard Phillips curve is wage or pricing behavior, a wage Phillips curve was

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[7]Estimation of the effect of job uncertainty directly on the natural rate of unemployment, following the method used in Thomas (1996), showed qualitatively similar results: the effect of job uncertainty on the natural rate was rarely significant, and when it was significant, it had the opposite of the expected effect.

[8]The principal components are composite indexes formed from multiple time series. In this context, they are indexes of the common forces driving the job-uncertainty variables. Greene (1990, pp. 283–5) provides technical details.

estimated. Wage inflation (as measured by the change in the wages and salaries component of the employment cost index) was expressed as a linear function of the unemployment gap and lagged price inflation (as a proxy for inflationary expectations), with an equation estimated over the period 1984–94 (Table 4).

11. A forecast of wage inflation for 1995–96 produces more accurate results than a forecast of price inflation from the standard Phillips curve reported above (Chart 6). While the standard-error bands are wide and wage inflation varied substantially over the period, the actual data are well within two standard errors of the forecast and the root mean squared error (RMSE) of the forecast is 0.5 compared to 1.1 for the forecast from the standard Phillips curve. The addition of the job-uncertainty variables to the wage Phillips curve equation generally did not add significantly to the equation's explanatory power, or forecasting ability. The exception was when a principal component of the job-uncertainty variables was used. In this equation, the principal component was significant, but the RMSE of the forecast was slightly higher (0.484 compared with 0.482).

12. These results suggest that in large part the recent favorable performance of inflation may be attributable to factors influencing production costs other than wages and salaries, and to the pricing behavior of firms for a given increase in costs. In particular, firms have moved aggressively to rein in benefits costs in recent years, successfully slowing the growth in their total labor costs (Chart 7). Since the end of 1994, the employment cost index has increased at an average annual rate of around 2¾ percent; while increases in wages and salaries have risen to an annual rate of 3½ percent during this period, the rise in benefits costs has slowed to well below the rate attained at the same point in the previous expansion. At the same time, labor productivity growth may be higher than measured, holding down the rate of increase in unit labor costs and helping to account for the subdued behavior of prices.[9] Moreover, materials costs have been held down by the appreciation of the U.S. dollar and general weakness in commodity prices, owing in part to sluggish economic activity in other major industrial countries. In addition, the pricing behavior of firms may have been restrained by the competitive effects of the dollar's appreciation and more broadly by the ongoing process of globalization of markets. However, the rise in the profitability of U.S. firms would seem to suggest that competitive pressures may not have had a substantial restraining effect on prices.

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[9]Estimates of labor productivity growth derived from the income side measure of GDP suggest that productivity has grown at roughly a 1½ percent annual rate over the past two years, compared to the traditional expenditure-side measures of output which show annual productivity growth of a little more 1 percent. See Section I of this selected issues paper for additional information on problems in the measurement of output.

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Table 1: Standard Phillips Curve Specification

Regression of core CPI inflation on lagged inflation and the lagged unemployment gap 1/

Sample: 1984:1 to 1994:4

Variable	Coefficient	T-Statistic
Constant	3.02	1.8
Inflation (-1)	-0.46	-2.2
Inflation (-2)	0.42	2.1
Inflation (-3)	0.28	1.9
Unemployment gap (-1)	-0.69	-2.2
Lagged error term	0.61	3.8

R^2 0.68 Adjusted R^2 0.64

1/ The annualized rate of increase in the core CPI is calculated as the change in the natural logarithm of the index multiplied by 400 to put it in annual percentage terms. The unemployment gap is defined as the civilian unemployment rate less the estimated time-varying natural rate of unemployment from Thomas (1996), in units such that 1 equals 1 percent. The annual data for the natural rate of unemployment were interpolated to quarterly frequency. A lagged error term was included to avoid the need for many lags of inflation. Some experiments with eight lags of inflation and no lagged error term yielded qualitatively similar results.

Table 2. Measures of Job Uncertainty 1/

Mnemonic	Variable/Source	Frequency
WSTOPP (-)	Work stoppages: days idle as a percent of estimated working time (includes agricultural and government employees but excludes household, forestry and fishery employees) (U.S. Department of Labor)	Annual
EHN (+)	Survey: Percentage of responses that jobs are hard to get (The Conference Board)	Monthly
EFJN (+)	Survey: Expectations that there will be fewer jobs in six months (percent of respondents) (The Conference Board)	Monthly
LRJL/LRJLV (+/-)	Unemployment rate among job losers/leavers (U.S. Department of Labor)	Monthly
LUJLP/LUJLVP (+/-)	Job losers/leavers as percent of civilian unemployment (Department of Labor)	Monthly
NABEMF (+)	Survey: Percent of respondents with falling employment (National Association of Business Economists)	Quarterly
WF1A/WL1A (-/-)	First year/average over contract life of wage changes in collective bargaining settlements, all industry (Department of Labor)	Quarterly (series discontinued, end in 1995)

1/ All data are converted to quarterly frequency by either averaging or interpolation. Figures in parentheses below mnemonic (+ or -) indicates the expected relation of the variable to job uncertainty (positive or negative). For example, a higher level of work stoppages may indicate more confidence among workers and lower job uncertainty.

Table 3. Regression Results: Augmented Standard Phillips Curve 1/

Measure of Job Uncertainty	C	$\pi(-1)$	$\pi(-2)$	$\pi(-3)$	$U_{GAP}(-1)$	Job Uncertainty	ρ	Adjusted R^2
(None)	3.0*	-0.5*	0.4*	0.3	-0.7*	...	0.6*	0.64
WSTOPP	4.2*	-0.6*	0.3	0.3	-0.9*	-15.8*	0.7*	0.68
EHN	1.9	-0.5*	0.4	0.3	-1.1*	0.04	0.6*	0.64
EFJN	1.0	0.8	0.3	-0.2	-0.1	-0.01	-0.6	0.61
LRJL	-2.2	0.6	0.3	-0.3	-1.2	1.3	-0.5	0.65
LRJLV	-0.5	0.8	0.3	-0.3	-0.1	1.7	-0.5	0.63
LUJLP	0.9	-0.5*	0.4	0.2	-0.9*	0.05	0.6	0.63
LUJLVP	0.0	0.8	0.3	-0.3	0.0	0.06	-0.6	0.60
NABEMF	2.7	-0.6*	0.4*	0.3	-0.9*	0.03*	0.7*	0.68
WF1A	3.3	-0.6*	0.4	0.3	-0.7*	0.14	0.7	0.65
WL1A	2.9	-0.5*	0.4	0.3	-0.7*	0.10	0.6*	0.64
PC1 2/	4.5*	-0.6*	0.3	0.2	-1.3*	-0.61	0.7*	0.66
PC1B 3/	4.6*	-0.6	0.3	0.2	-1.4*	0.66*	0.7*	0.67
PC2 4/	4.1*	-0.5*	0.3	0.2	-1.3*	-0.57	0.7*	0.66
PC2B 5/	4.3*	-0.5*	0.3	0.2	-1.4*	0.62	0.7*	0.66

1/ Asterisk indicates significance at the five percent level. ρ denotes the coefficient on the lagged error term.

2/ First principal component. The principal components serve as composite indexes of the common forces driving the job-uncertainty variables. The first principal component explains more of the common variation among the series than any other single principal component (see Greene (1990), pp 283–5 for technical details).

3/ First principal component, excluding work stoppages (WSTOPP).

4/ First principal component, excluding collective bargaining variables (WF1A and WL1A).

5/ First principal component, excluding collective bargaining variables (WF1A and WL1A) and work stoppages.

Table 4: Wage Phillips Curve Specification

Regression of wage inflation (wages and salaries in the Employment Cost Index) on lagged core CPI inflation and the lagged unemployment gap 1/

Sample: 1984:1 to 1994:4

Variable	Coefficient	T-Statistic
Constant	1.59	1.9
Inflation(-1)	0.34	1.6
Inflation(-2)	0.19	1.3
Inflation(-3)	-0.03	-0.1
Unemployment gap 2/	-0.26	-1.4
Lagged error term	0.24	1.6

R^2 0.42 Adjusted R^2 0.35

1/ The annualized rate of increase in the Employment Cost Index for wages and salaries is calculated as the change in the natural logarithm of the index multiplied by 400 to put it in annual percentage terms. The unemployment gap is defined as the civilian unemployment rate less the estimated time-varying natural rate of unemployment from Thomas (1996), in units such that 1 equals 1 percent, with annual data for the natural rate interpolated to quarterly frequency.

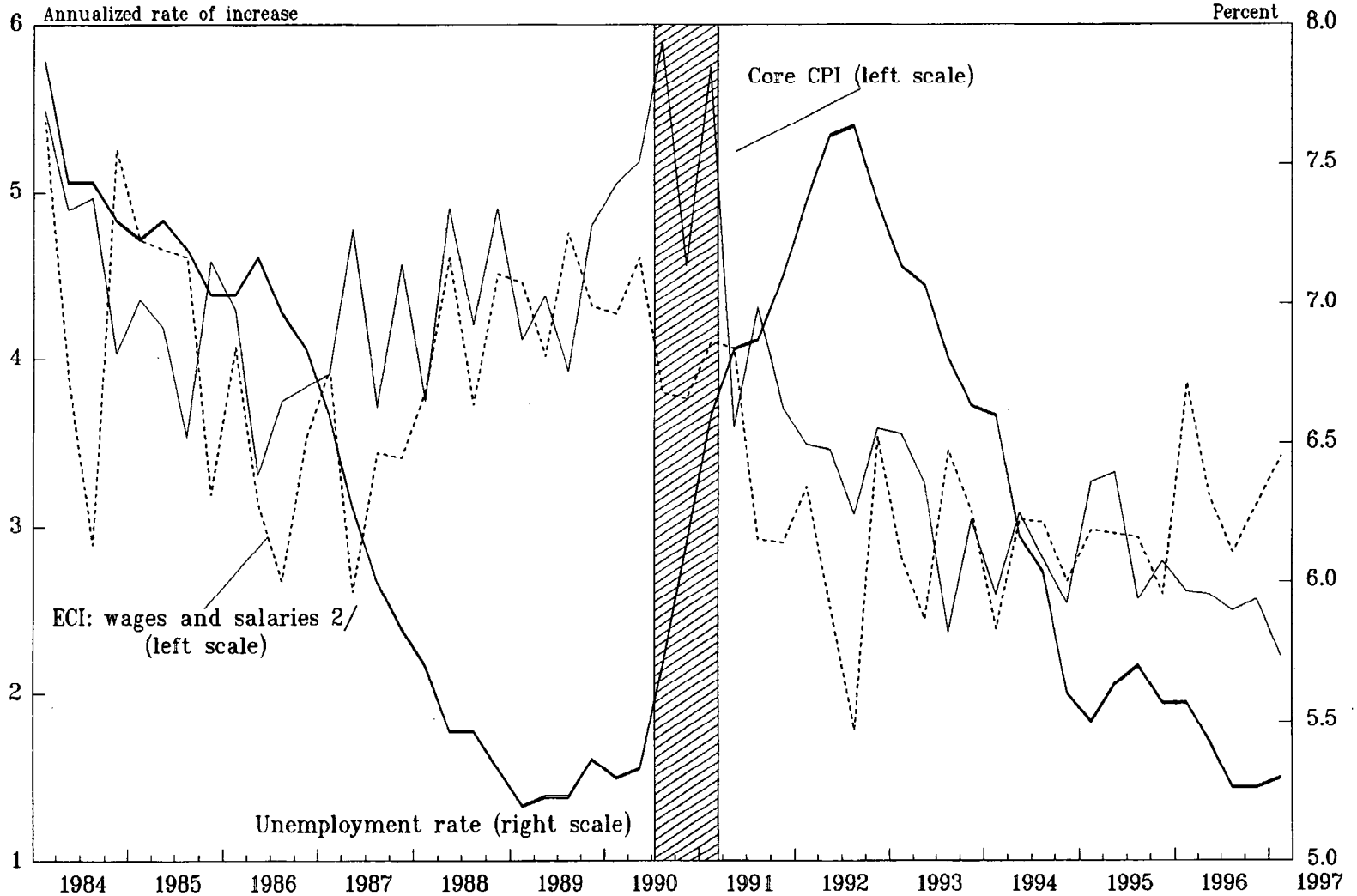
2/ The coefficient on the unemployment gap is significant at the ten percent level when the lagged error term is omitted.

CHART 1

UNITED STATES

UNEMPLOYMENT RATE, CORE CPI, AND WAGES 1/

(In percent)



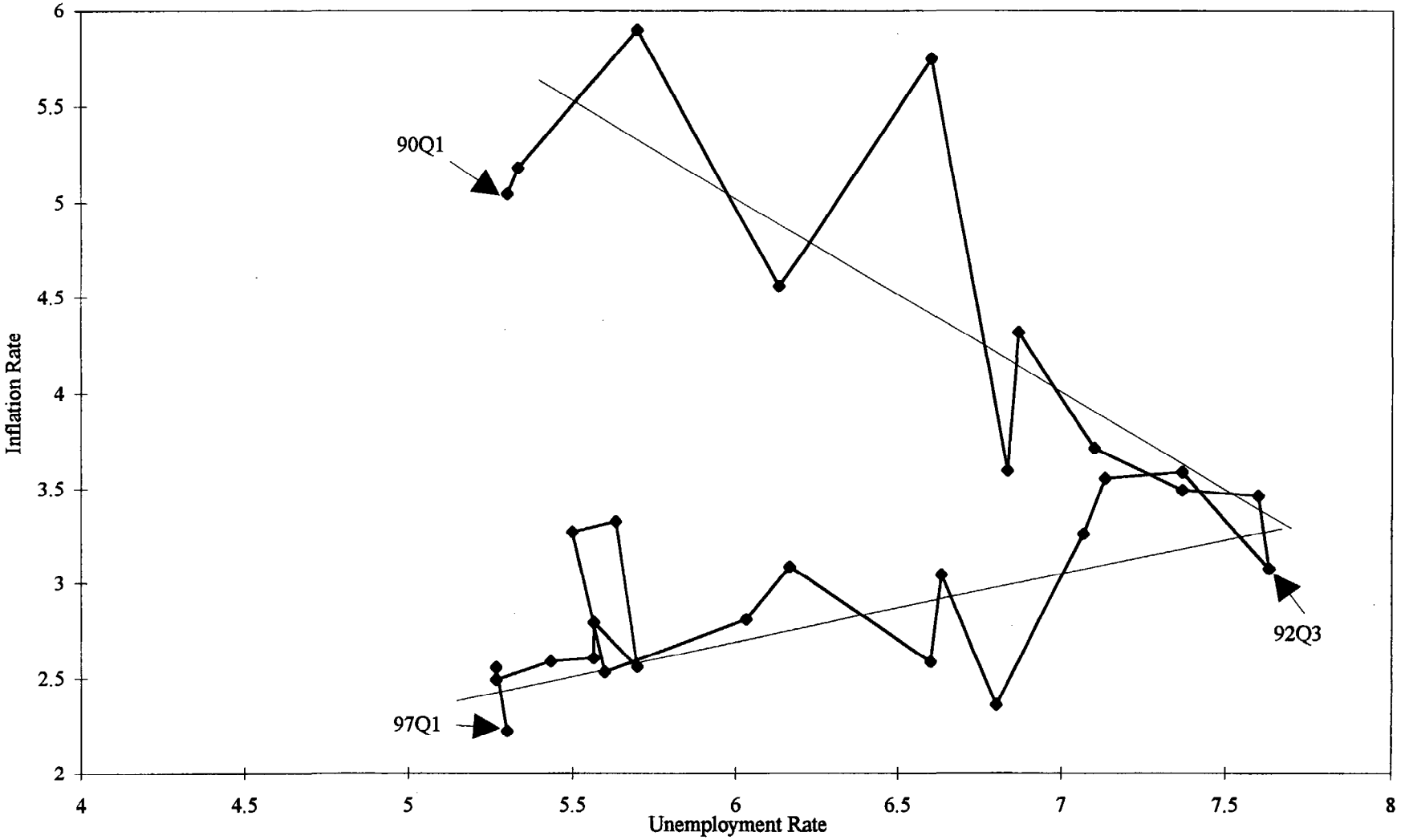
Source: Bureau of Labor Statistics, U.S. Department of Labor.

1/ Shaded area reflects recession.
2/ Employment cost index for civilian workers.

CHART 2

UNITED STATES

CROSS PLOT OF INFLATION AND UNEMPLOYMENT RATE



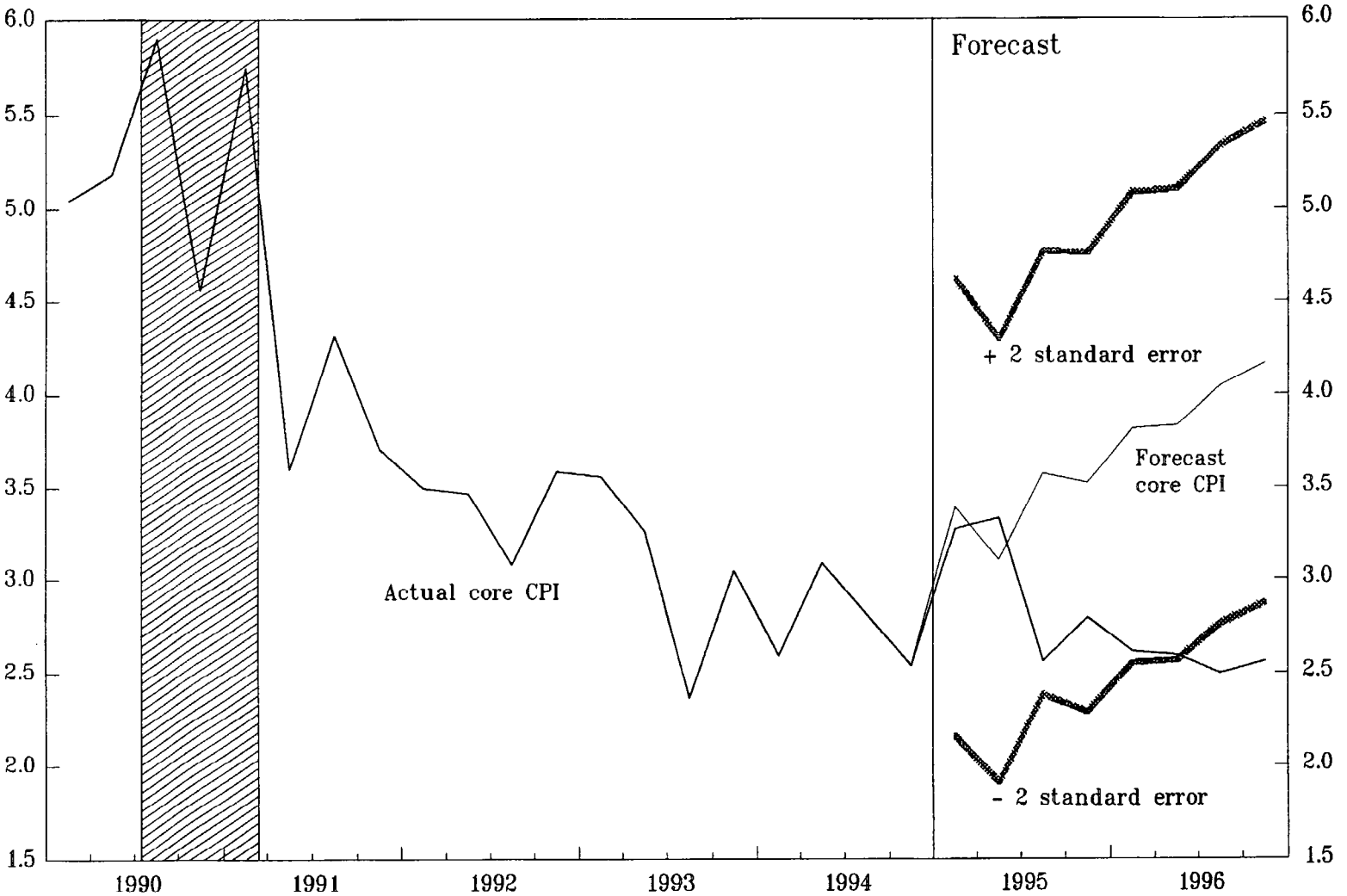
Source: Bureau of Labor Statistics, U.S. Department of Labor.

CHART 3

UNITED STATES

ACTUAL AND FORECAST CORE CPI 1/

(In percent)



Source: Bureau of Labor Statistics, U.S. Department of Labor; and Fund staff estimates.

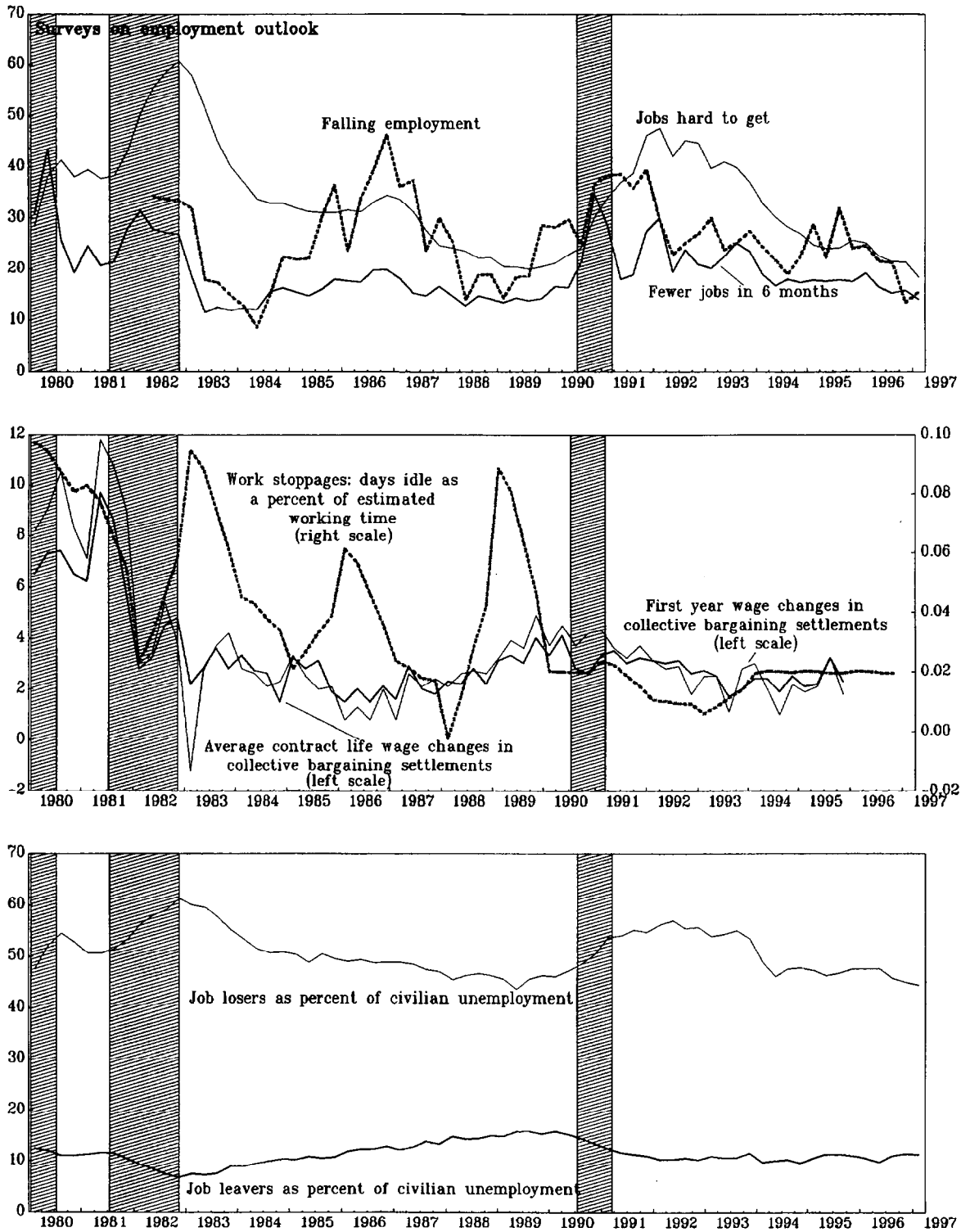
1/ Shaded area reflects recession.

CHART 4

UNITED STATES

MEASURES OF JOB UNCERTAINTY

(In percent)



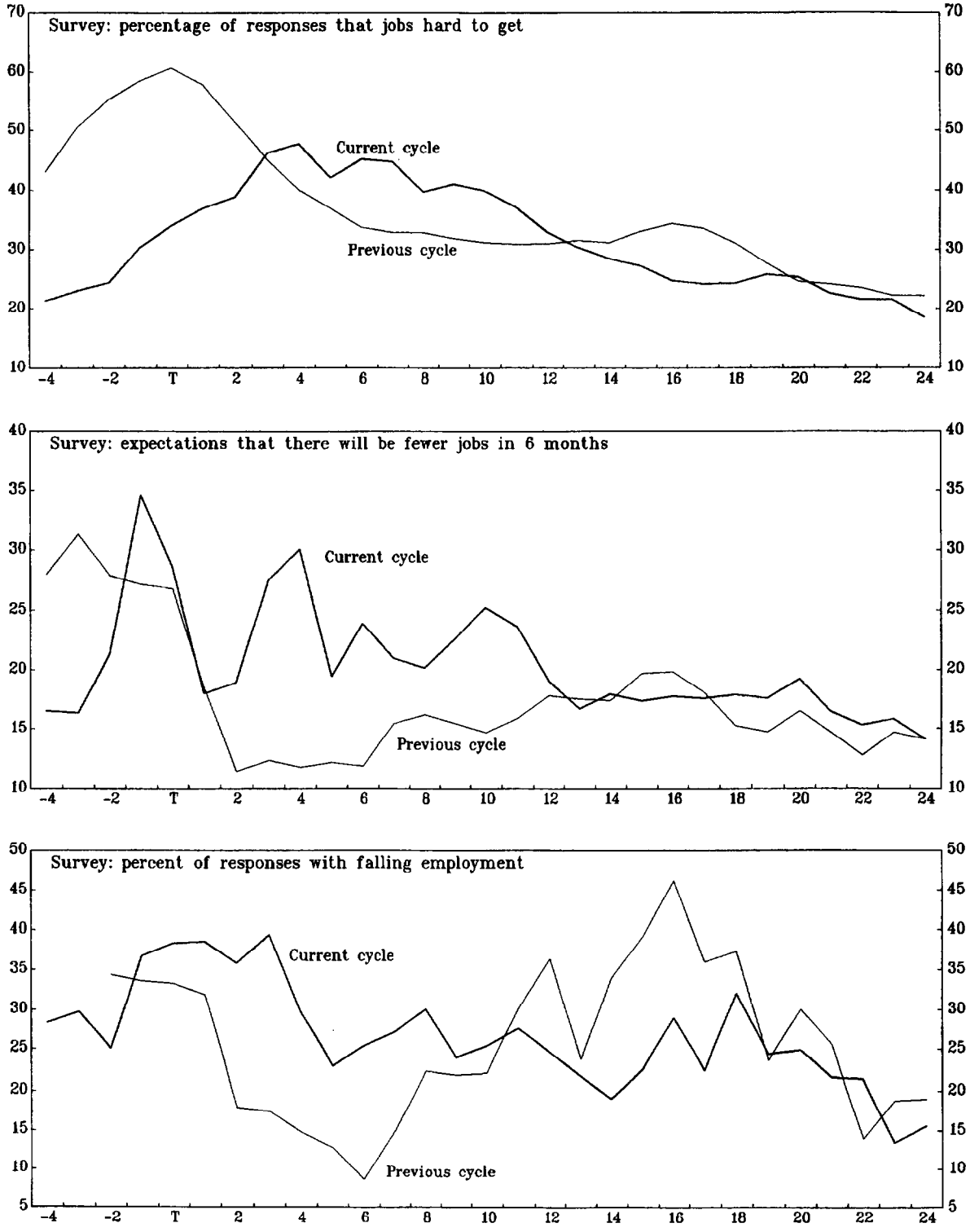
Sources: Bureau of Labor Statistics, U.S. Department of Labor; Conference Board; and National Association of Business Economists.

CHART 5a

UNITED STATES

JOB UNCERTAINTY 1/

(In percent)



Sources: Bureau of Labor Statistics, U.S. Department of Labor; Conference Board; and National Association of Business Economists.

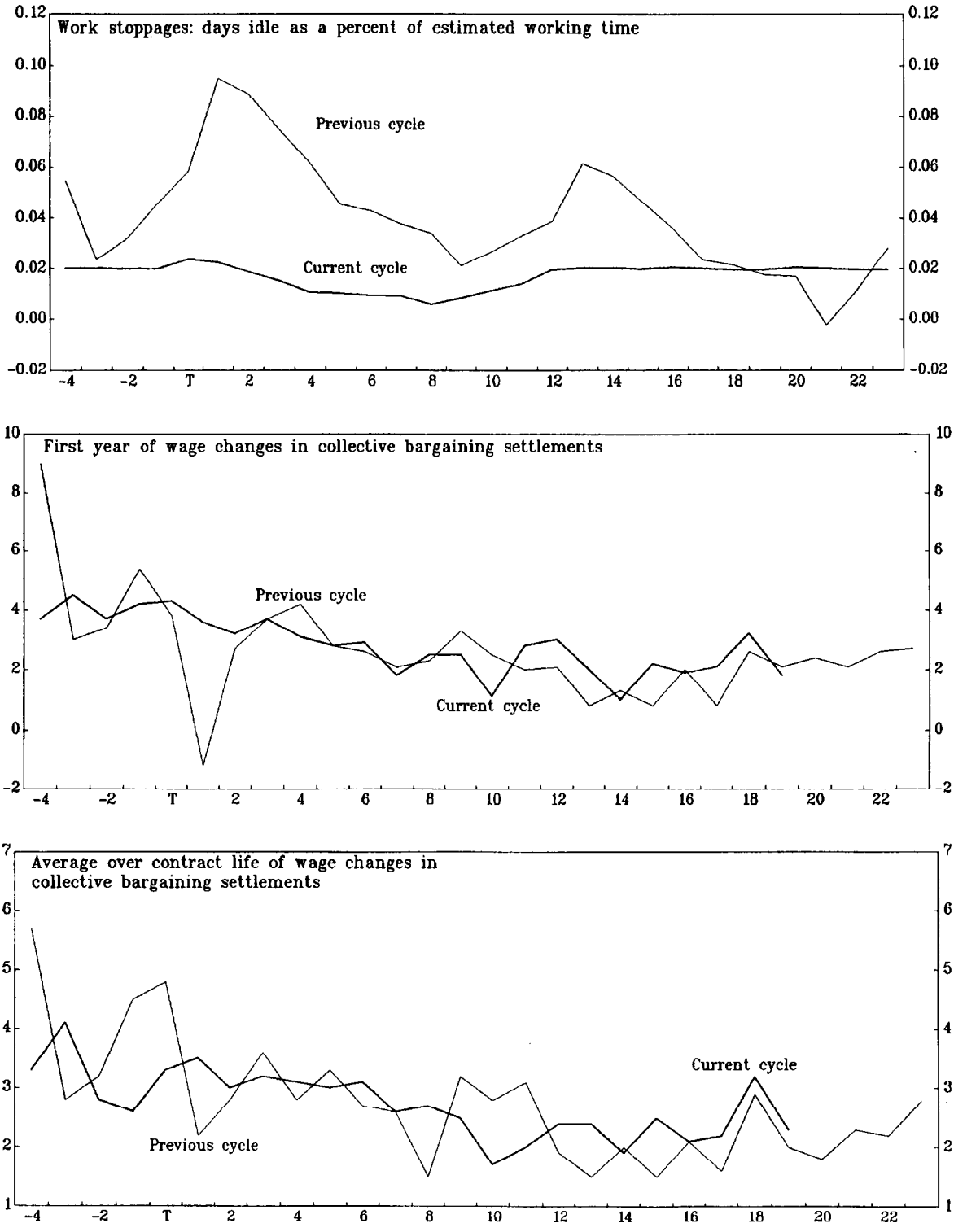
1/ T represents the troughs of the cycle; positive (negative) numbers represent quarters after (before) the troughs. The trough of the current cycle occurred in 1991Q1, and the trough of the previous cycle occurred in 1982Q4.

CHART 5b

UNITED STATES

JOB UNCERTAINTY 1/

(In percent)



Sources: Bureau of Labor Statistics, U.S. Department of Labor; Conference Board; and National Association of Business Economists.

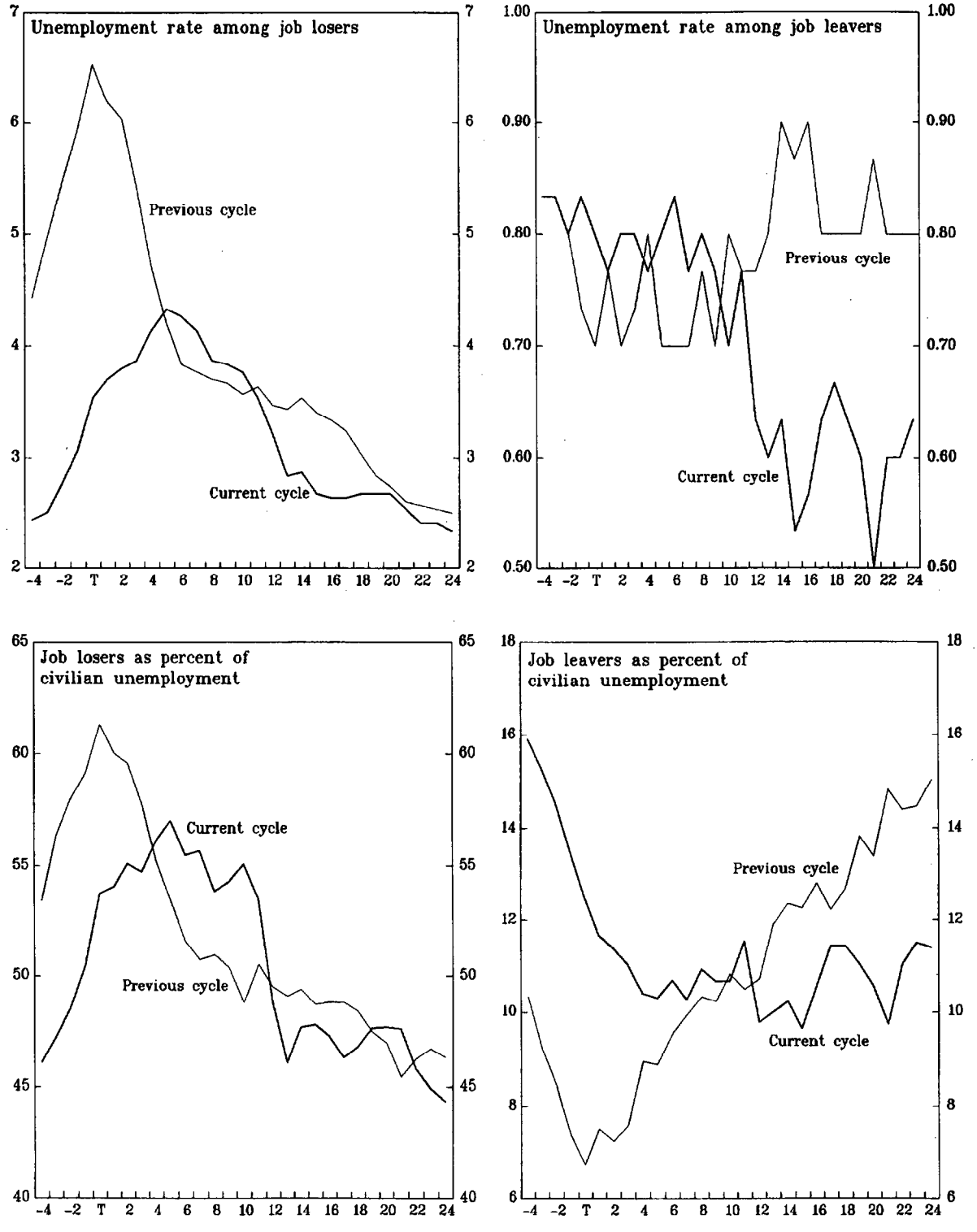
1/ T represents the troughs of the cycle; positive (negative) numbers represent quarters after (before) the troughs. The trough of the current cycle occurred in 1991Q1, and the trough of the previous cycle occurred in 1982Q4.

CHART 5c

UNITED STATES

JOB UNCERTAINTY 1/

(In percent)



Sources: Bureau of Labor Statistics, U.S. Department of Labor; Conference Board; and National Association of Business Economists.

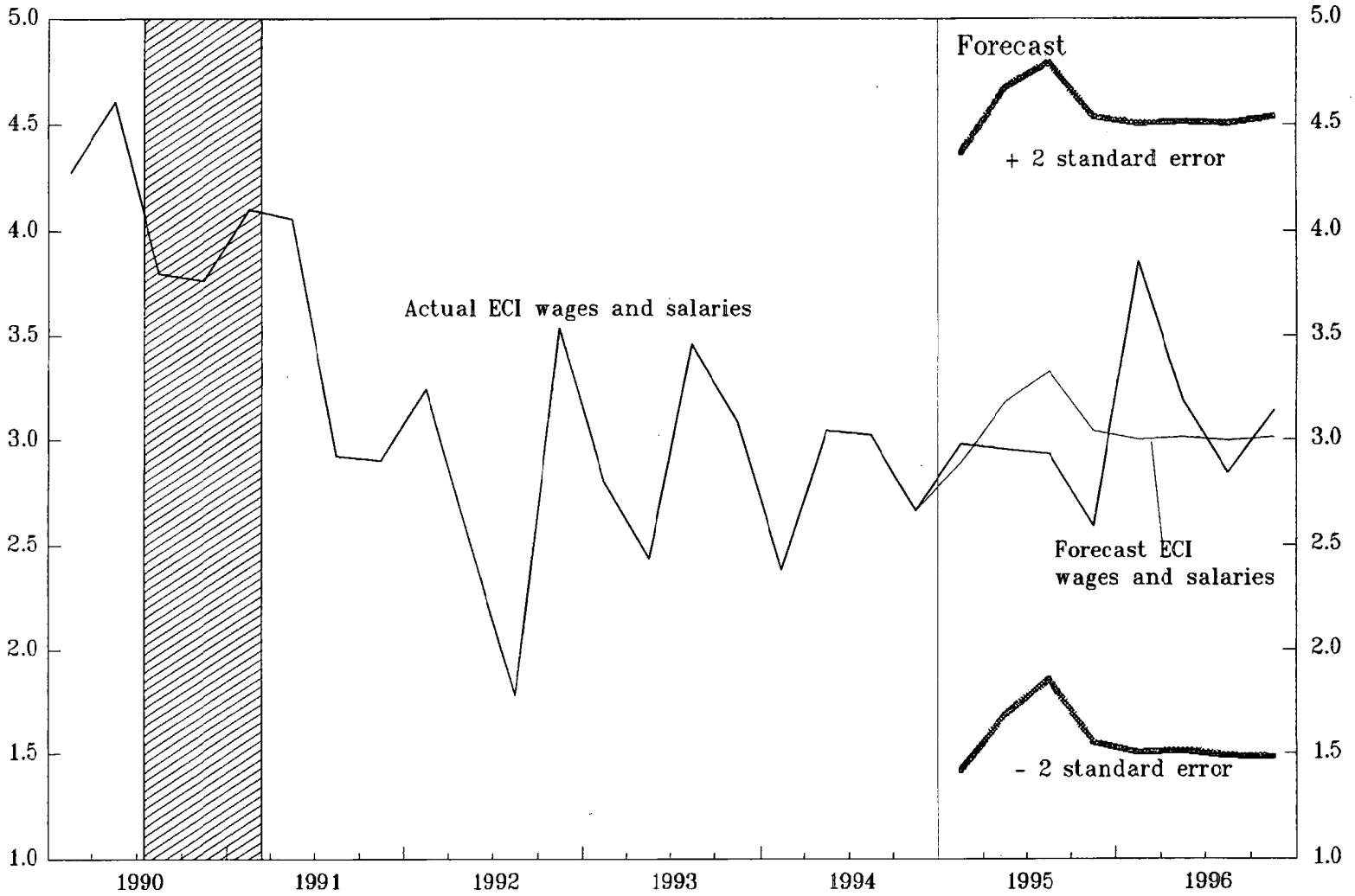
1/ T represents the troughs of the cycle; positive (negative) numbers represent quarters after (before) the troughs. The trough of the current cycle occurred in 1991Q1, and the trough of the previous cycle occurred in 1982Q4.

CHART 6

UNITED STATES

ACTUAL AND FORECAST ECI WAGES AND SALARIES

(In percent)



Source: Bureau of Labor Statistics, U.S. Department of Labor; and Fund staff estimates.

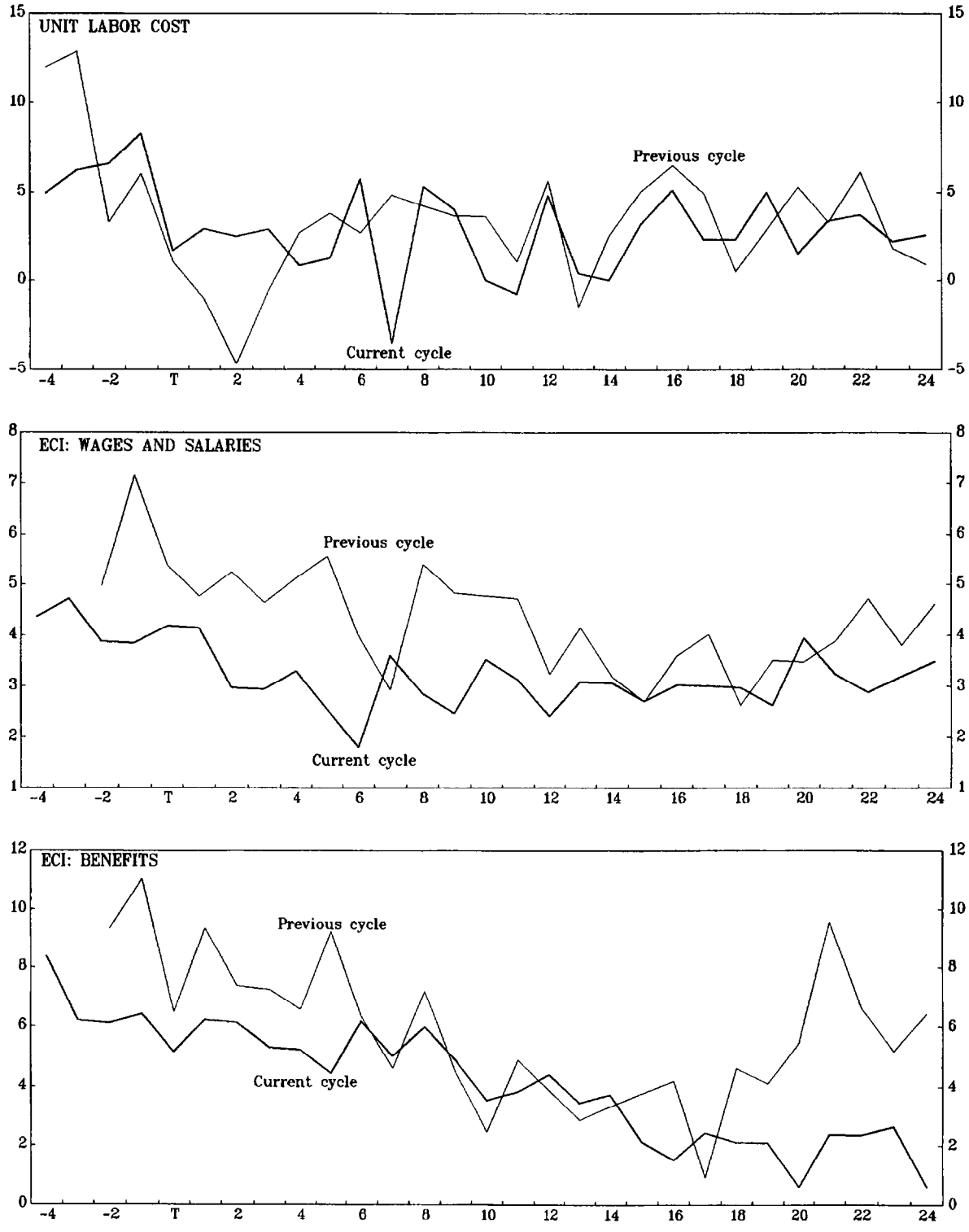
1/ Shaded area reflects recession.

CHART 7

UNITED STATES

UNIT LABOR COST AND EMPLOYMENT COST INDEXES

(Annualized growth rate)



Sources: Bureau of Labor Statistics, U.S. Department of Labor; Bureau of Economic Analysis, U.S. Department of Commerce.

1/ T represents the troughs of the cycle; positive (negative) numbers represent quarters after (before) the troughs. The trough of the current cycle occurred in 1991Q1, and the trough of the previous cycle occurred in 1982Q4.

III. Developments in Productivity Across Industries in the United States[1]

1. Since the mid-1970s, aggregate real output and productivity growth in the United States have slowed significantly. From 1960 to 1973, real GDP grew at an average annual rate of 3.8 percent, and business labor productivity rose by 2.6 percent a year; however, from 1973 through 1996, average annual real GDP and business labor productivity growth have declined to 2.5 percent and 1.2 percent, respectively. Studies of the U.S. economy have attributed the slowdown to several causes: an intersectoral shift of output and labor toward services and industries with lower productivity growth; a lack of technological progress in several mature industries; an increase in the obsolescence of capital owing to the regulatory environment and structural changes in the economy; a reduction in the benefits from increasing scale; and a decline in the growth rate of the capital-labor ratio.[2] In addition, Griliches (1994), Gordon (1996), and Slifman and Corrado (1996) emphasize that measured output and productivity growth may be biased downward, and therefore, the slowdown may not be as large as suggested by the data.[3] Moreover, since 1993, income-based measures of output have grown more rapidly than product-based measures, and thus, product-based measures may further underestimate recent output and productivity growth.

2. This paper examines the recent growth performance of the U.S. economy at various levels of aggregation. In particular, it focuses on the slowdown in aggregate productivity growth that began in the mid-1970s and examines whether this slowdown has continued in recent years and is common across industries. The paper assesses the extent to which the slowdown in productivity growth is concentrated in the services sectors and whether alternative measures of productivity (including total factor productivity) produce similar results. The analysis suggests that the slowdown in the growth of both aggregate labor productivity and total factor productivity after 1973 can primarily be explained by the rising share of the services sector in total output.

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[1] Prepared by Ranil Salgado.

[2] See, for example, Baily (1982), Morrison (1992), Griliches (1994), and Gordon (1996).

[3] Griliches (1994), in particular, notes that the share of total output accounted for by the sectors in which output is easily measured (i.e., agriculture, mining, manufacturing, transportation, and utilities) has declined from 49 percent of U.S. GDP in 1947 to 31 percent in 1990. Gordon (1996) discusses the sources of bias in aggregate price indices, as well as other measurement problems affecting specific industries, particularly services. Slifman and Corrado (1996) question whether the ongoing measured slowdown in real growth in the services sector is an actual slowdown or reflects problems measuring output in the sector.

A. Measuring Productivity Growth

3. Two measures of productivity are commonly estimated, labor productivity and total factor productivity. Productivity reflects the efficiency of combining resources to produce output. It is usually measured by calculating the ratio of a weighted index of output to a weighted index of inputs. Labor productivity is calculated as the ratio of value-added GDP to homogenous labor hours. Because labor productivity measures output per unit of labor instead of output per unit of all inputs combined, growth in labor productivity may reflect growth in output due to the improved efficiency of all inputs (including labor) and an increase in the use of other productive inputs relative to labor. In other words, labor productivity measured in this way is a function not only of efficiency (which includes technology and the organization and management of the production process) but also of other inputs such as land, other natural resources, and physical and human capital.

4. Total factor productivity (TFP) attempts to account for the efficiency of all inputs in the production process. In practice, however, TFP is usually calculated as the ratio of value-added GDP to a weighted index of homogenous labor hours and physical capital. Hence such a measure of TFP may include as part of productivity growth changes in inputs other than labor and physical capital.[4]

B. Aggregate and Sectoral Productivity

5. Estimates of labor productivity growth for 12 sectors, including five private goods-producing sectors (agriculture, forestry, and fishing; mining; manufacturing; electricity, gas, and sanitary services; and construction), six private services-producing sectors (wholesale and retail trade; hotels and other lodging places; transportation; communication; finance, insurance, and real estate; and community, social, business, and personal services) and a government services sector, and four aggregate categories (goods-producing sectors, the services-producing sectors, private industries, and all domestic industries) are presented in Table 1. The first column shows averages for the period 1960–93, while the second, third,

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[4]To calculate TFP, the growth accounting methodology (which attributes output growth to the growth in inputs and the growth in productivity) is employed:

$$\Delta TFP = \Delta \ln Y - \alpha \Delta \ln H - (1-\alpha)\Delta \ln K \qquad (1)$$

where Y, K, H, and α are, respectively, output, capital services, labor services, and labor's share of value-added output (which can be calculated by dividing labor compensation by output). Implicit in these calculations are assumptions of constant returns to scale, perfect competition, and profit maximization.

and fourth columns provide average growth rates for 1960–73, 1973–81, and 1981–93, respectively.[5]

6. Labor productivity growth slowed in all but one of the sectors and all four of the aggregate categories after 1973. The only sector for which the slowdown did not occur was government services.[6] Since 1981, however, labor productivity growth has recovered in most of the sectors. In fact, average labor productivity growth rates after 1983 in four sectors (agriculture, forestry, and fishing; mining; construction; and hotels and other lodging places) are significantly higher than the corresponding average growth rates prior to 1973. For two other sectors (communication and wholesale and retail trade), average growth rates after 1981 are about equal to those before 1973, while for three other sectors (manufacturing; electricity, gas, and sanitary services; and transportation) average growth rates since 1981 are lower than those before 1973 but higher than those during 1973–81. For the remaining two sectors (finance, insurance, and real estate and community, social, business, and personal services), average growth rates since 1981 are even lower than those in the 1970s.

7. It is noteworthy that the average labor productivity growth rate after 1981 of the goods category is only marginally lower than its average rate prior to 1973, while the average growth rate of the services category is substantially lower in the later period. Although labor productivity growth for services was only slightly lower than that for goods during 1960–73, it was significantly lower during 1981–93.[7]

8. Tables 2 and 3 provide the average annual TFP growth rates using the growth accounting methodology. In Table 2, TFP is calculated using the gross capital stock, while in Table 3, TFP is calculated using net capital stock.[8] The trends for TFP growth are similar to those for labor productivity growth. Other than for government services, generally, there is a slowdown in TFP growth between the periods 1960–73 and 1973–81. The exceptions are agriculture, forestry, and fishing; communication; and finance, insurance, and real estate when net capital stock is used. In addition, all sectors, other than finance, insurance, and real estate;

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[5] The rationale for dividing the post-1973 period into two periods is to abstract from the demand-induced slowdown due to the energy-price shocks of the 1970s.

[6] Prices for government services are generally computed based on the cost of inputs, and thus, real output in the sector tends to grow with real inputs. Therefore, it is not surprising that labor productivity did not slow in this sector because changes in TFP (as noted below) and in the capital-labor ratio have been relatively small and stable since 1960.

[7] These results are consistent with the findings of Slifman and Corrado (1996), among others.

[8] Gross capital stock is defined as accumulated investment less accumulated discards (or scraps), and net capital stock is defines as accumulated investment less accumulated depreciation.

community, social, business, and personal services; government services; and the services aggregate category have higher average annual growth rates after 1981 than during the period 1973–81. In fact, the four sectors which have higher labor productivity growth in 1981–93 compared to 1960–73 have higher TFP growth in the later period as well. For communication, government services, and the goods category, average TFP growth rates are also higher in 1981–93 than in 1960–73 for both measures of the capital stock. In addition, when TFP is calculated using net capital stock, average TFP growth rates of wholesale and retail trade and transportation are higher in 1981–93 than in 1960–73.

9. In general, the gap between labor productivity growth and TFP growth has narrowed over time. The difference between these growth rates is equal to the growth rate of the ratio of capital services to labor, multiplied by the capital share coefficient. Therefore, in part, some of the slowdown in output growth and labor productivity growth can be attributed to the *slowdown in the accumulation of capital relative to the growth of labor.*

C. Factors Explaining the Slowdown in Aggregate Productivity Growth

10. There are two potential explanations for the slowdown in aggregate productivity growth: the intersectoral shift of output and labor towards services and a slowdown in capital accumulation relative to labor force growth. The relative contribution of intersectoral shifts in the productivity slowdown can be estimated by decomposing measured productivity growth into the additional growth that would have taken place if the initial shares in total output of the various sectors had remained constant at their original levels and the productivity of the services sector had recovered to TFP growth rates that occurred during 1960–73.[9] This contribution can be further attributed to the lagging recovery in services or to the services sector having lower productivity than the goods sector, by decomposing measured productivity growth into the additional growth that would have taken place if the initial shares of the sectors had remained constant at their original levels, while actual services sector productivity declined in 1981–93 relative to 1960–73. The relative contribution of the slowdown in the growth of the capital services to labor ratio can be measured by taking the difference between labor productivity and TFP growth.

11. These calculations show that intersectoral shift accounts for almost all of the slowdown in aggregate labor productivity growth between 1960–73 and 1981–93 (tabulation below), with most of this reflecting the measured slow recovery of productivity in services. A reduction in the growth of the capital services to labor ratio between the two time periods

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[9] Note that TFP growth rates for the goods category and the government services sector are higher in 1981-93 than 1960-73. For labor productivity, the sectoral share is equal to the sectoral share of labor in the economy. For TFP, the sectoral share is equal to the weighted sectoral shares of labor and capital in the economy, where the relative weights are given by the labor and capital shares of sectoral compensation.

accounts for the remaining slowdown in labor productivity growth. The slowdown in TFP growth between 1960–73 and 1981–93 is equivalent to the slowdown in aggregate labor productivity growth less the slowdown in the ratio of capital services to labor. In the case of TFP growth, intersectoral shifts more than account for the slowdown.

Factors Explaining Productivity Slowdown Between 1960–73 and 1981–93

(In percentage points)

	Gross Capital Stock Basis		Net Capital Stock Basis	
	Labor Productivity	Total Factor Productivity	Labor Productivity	Total Factor Productivity
Total slowdown	0.98	0.62	0.98	0.29
Due to capital services to labor ratio	0.36	...	0.69	...
Due to intersectoral shifts	0.93	0.68	0.64	0.41
Of which: slow recovery in TFP growth of services sector	0.65	0.63	0.37	0.35

12. The measured slow recovery in service-sector total factor productivity after 1973 could reflect several factors other than a slowdown in efficiency or productivity growth specific to this sector. These other factors include relative changes in the average level of labor skills (for example, due to new entrants into services sector jobs in recent years), in the underutilization of resources (for example, due to labor hoarding or incorrectly measuring capacity utilization), and in the obsolescence of capital. However, because the productivity slowdown is concentrated in the services sector and this is the sector for which output is the most difficult to measure, the measured slowdown could be a result of mismeasurement, particularly because profitability in this sector has remained high.[10]

[10]See Slifman and Corrado (1996).

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Table 1. United States: Growth in Labor Productivity

(Annual averages, in percent)

Sectors	1960-93	1960-73	1973-81	1981-93
Agriculture, forestry, and fishing	3.62	3.65	2.26	4.50
Mining	1.30	3.17	-8.86	6.03
Manufacturing	2.51	3.35	0.73	2.79
Electricity, gas, and sanitary services	1.58	3.79	-2.22	1.73
Construction	-1.57	-2.10	-2.58	-0.32
Wholesale and retail trade	2.70	3.19	1.46	3.01
Hotels and other lodging places	*0.35*	*0.71*	*-2.50*	*1.85*
Transportation	2.31	3.10	1.06	2.29
Communication	4.62	4.72	4.22	4.79
Finance, insurance, and real estate	-0.42	0.22	-0.65	-0.96
Community, social, business, and personal services	-0.04	1.39	-0.43	-1.33
Producers of government services	0.36	0.27	0.47	0.40
Private goods industries	1.94	2.77	-0.18	2.45
Private services industries	1.83	2.67	1.37	1.21
Private industries	1.70	2.60	0.58	1.46
Domestic industries	1.53	2.31	0.56	1.33

Table 2. United States: Growth in Total Factor Productivity 1/ 2/

(Annual averages, in percent)

Sectors	1960-93	1960-73	1973-81	1981-93
Agriculture, forestry, and fishing	1.87	0.29	0.22	4.69
Mining	-0.25	0.81	-7.30	3.31
Manufacturing	1.62	2.53	-0.36	1.96
Electricity, gas, and sanitary services	0.95	2.65	-1.65	0.85
Construction	-1.54	-2.28	-2.67	0.01
Wholesale and retail trade	1.30	1.73	0.23	1.55
Hotels and other lodging places	0.08	0.16	-2.42	1.65
Transportation	2.58	3.16	0.79	3.13
Communication	2.79	2.64	2.51	3.14
Finance, insurance, and real estate	-1.15	-0.48	-0.66	-2.21
Community, social, business, and personal services	-0.50	0.60	-0.79	-1.49
Producers of government services	0.24	0.14	0.37	0.28
Private goods industries	1.09	1.85	-1.31	1.87
Private services industries	0.91	1.69	0.47	0.36
Private industries	0.90	1.68	-0.39	0.90
Domestic industries	0.88	1.51	-0.12	0.89

1/ Capacity utilization adjustment made only for mining and quarrying; manufacturing; and electricity, gas, and water using Federal Reserve Board measure.

2/ Using gross capital stock.

Table 3. United States: Growth in Total Factor Productivity 1/ 2/

(Annual averages, in percent)

Sectors	1960-93	1960-73	1973-81	1981-93
Agriculture, forestry, and fishing	2.09	0.01	0.56	5.37
Mining	0.26	1.24	-8.19	4.82
Manufacturing	1.66	2.43	-0.31	2.13
Electricity, gas, and sanitary services	1.17	2.54	-1.23	1.29
Construction	-1.54	-2.40	-2.56	0.07
Wholesale and retail trade	1.24	1.43	0.38	1.60
Hotels and other lodging places	0.12	-0.13	-2.03	1.83
Transportation	2.56	3.00	0.71	3.33
Communication	3.07	2.69	2.83	3.65
Finance, insurance, and real estate	-1.14	-1.07	-0.21	-1.84
Community, social, business, and personal services	-0.47	0.53	-0.59	-1.46
Producers of government services	0.27	0.11	0.44	0.32
Private goods industries	1.17	1.78	-1.24	2.12
Private services industries	0.83	1.25	0.64	0.49
Private industries	0.90	1.45	-0.27	1.10
Domestic industries	0.92	1.34	0.03	1.05

1/ Capacity utilization adjustment made only for mining and quarrying; manufacturing; and electricity, gas and water using Federal Reserve Board measure.

2/ Using net capital stock.

IV. Investment and Productivity in the Major Industrial Countries[1]

1. Since the early 1960s, the United States has consistently lagged behind the other major industrial countries in terms of the share of national income that is invested. Nevertheless, real output per capita in the United States has remained significantly higher than in these other countries, particularly when measured on a purchasing power parity basis. Also, the gap between real per capita income in the United States and other major industrial countries has not narrowed appreciably during this period, as factors of production (primarily capital and labor) generally have continued to be used more efficiently in the United States (Chart 1). Recent studies find that this productivity gap may largely reflect structural and institutional factors.

2. As a ratio to GDP, nominal gross investment in the United States over the period 1960–95 was on average nearly 13 percentage points of GDP lower than in Japan, and it was 2 ½–4 ½ percentage points lower than in Canada, France, Germany, and Italy (Table 1 and Chart 2).[2] Only in the United Kingdom was the nominal investment/GDP ratio consistently lower than in the United States. The generally faster rate of investment in other major industrial countries compared with the United States has been reflected in movements in relative capital/labor ratios. In the United States, this ratio has risen modestly since 1960, while it has increased substantially faster in all other major countries. By 1994, the capital/output ratio in the United States was lower than in Canada, France, and Italy, while the ratio in the other major countries had risen to close to the U.S. level (Chart 3).[3]

3. With the relatively faster rise in capital/labor ratios in the other major industrial countries, labor productivity has increased more rapidly than in the United States, and as a result, labor productivity across the major countries has steadily moved toward the U.S. level (Table 2).[4] At the same time, capital productivity has declined in the other major countries

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[1] Prepared by Ranil Salgado.

[2] Net investment may be a more appropriate measure for the purposes of this exercise because it represents net additions to the capital stock; however, capital consumption (or depreciation) is measured differently across countries, and therefore, net investment may not be comparable. See Hayashi (1986) and Lipsey and Kravis (1987) for more discussion on this point.

[3] Note that prior to reunification (1990), Germany had a higher capital to labor ratio than the United States. Data through June 1990 apply to the (former) Federal Republic of Germany, and data after that date refer to (unified) Germany.

[4] Labor input here is measured using total employment. Although it would be more appropriate to derive labor productivity based on hours worked, these measures were not available for all seven countries on an aggregate basis. Bernard and Jones (1996) and Van Ark and Pilat

(continued...)

relative to the United States, in part reflecting the more intensive use of capital relative to labor in these countries. However, the relatively more efficient use of all factors of production combined by the United States is reflected in relative movements in total factor productivity (TFP). After moving rapidly toward convergence during the 1960s and 1970s, differences in TFP between the United States and other major industrial countries subsequently have tended to persist.

4. TFP attempts to take into account contributions from all inputs. In practice, however, TFP is calculated as the ratio of GDP to a weighted index of homogenous labor and capital. TFP also is generally calculated using the growth accounting methodology, which implicitly assumes perfect competition, profit maximization, and constant returns to scale. Specifically,

$$TFP=\frac{Y}{L^{\alpha}K^{1-\alpha}}$$

where Y, L, K, and α are, respectively, GDP, employment, the capital stock, and labor's share of output. As measured in this way, TFP would reflect changes in such factors as human capital, technology, and the organization and management of the production process. Measured TFP may also reflect changes in the intensity of use of labor (since employment is used as the measure of labor input) and capital (since no adjustment is made for capacity utilization). Moreover, the assumptions implicit to growth accounting may not hold, and the calculation of TFP may reflect the effects of economies of scale, the structure and competi-tiveness of the economy, and distortions in factor and product markets.

5. Economic theory would predict a convergence in TFP among similar economies over time, as countries would tend to adopt similar production technologies. The observed recent slowdown in TFP convergence may be explained by differences in the composition of investment, in the quality of labor, in the structure of firms, and in the incentives provided in product and factor markets.

6. Because capital is not homogenous, it is possible that certain forms of investment may be more productive than others. De Long and Summers (1991 and 1992) argue that some investments (specifically, those in machinery and equipment) yield external benefits, and Maddison (1987) finds that residential and nonresidential capital make different contributions to growth. Higher productivity in the United States, therefore, may be a result of the composition of investment relative to the other major industrial countries. In each country, the largest

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[4](...continued)
(1993) used hours worked instead of employment for the manufacturing sector in some of these countries and found similar results to those presented in this paper. To the extent that hours worked per employee follow different trends in the different countries, the labor productivity and total factor productivity convergence results presented here will be inaccurate.

category of investment is machinery and equipment (Tables 3, 4, 5, and 6). However, by the 1990s, nominal and real equipment investment in the United States was a higher percentage of total (or private) investment than in the other economies except for Canada. It is possible that the relatively higher share of machinery and equipment investment in the United States has led to higher aggregate productivity. However, Adams and Chadha (1992) find that the long-run growth performance of the U.S. economy is consistent with the neoclassical growth model, which assumes no external benefits from investment, and Auerbach and others (1993) contend that the De Long-Summers result is not robust.[5]

7. Van Ark and Pilat (1993) note that labor quality explains some of the difference in productivity among Germany, Japan, and the United States, although as the differences in education and skills have narrowed among the countries, the effect of changes in human capital has been reduced. Maddison (1987) finds that the slowdown in improvements in labor quality since 1973 explains part of the slowdown in productivity growth in Germany and Japan relative to the United States.

8. Examining productivity at the sectoral level, Bernard and Jones (1996) argue that productivity convergence has stopped in manufacturing but continues in other sectors, particularly services. They explain these developments by noting that a larger fraction of manufactured goods are traded, and that in the tradeable-goods sectors, comparative advantage can lead to specialization. Therefore, while technology diffusion may lead to productivity convergence for nontradeable products, it need not lead to convergence for tradeable goods. Van Ark and Pilat (1993) and Maddison (1987) find that differences in plant size, structure, and economies of scale explain differences in productivity levels among countries, and continued differences in economies of scale also explain the slowdown in convergence in recent decades.

9. Analyzing productivity at the aggregate, industry, and firm level in Germany, Japan, and the United States, the McKinsey Global Institute (1996) contends that the differences in productivity among these three countries in the 1990s are mainly due to the different incentives given managers by product and factor markets. Greater competition in product markets encourage managers in the United States to improve productivity and cut costs, to provide customized products and pricing schemes to employ capacity more effectively, and to source material and intermediate consumption goods globally. Greater competition is also achieved in the United States by having a more open, less regulated market. When regulations are required, such as for public utility monopolies, U.S. regulators have tighter price controls, often enforcing price caps, which induce managers to improve productivity to increase profits. Furthermore, when monopolies are publicly owned, as in many other countries, governments may provide managers mixed incentives, not necessarily focused on productivity.

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[5] Using the De Long-Summers data, Auerbach and others find no evidence of external benefits when the OECD countries are analyzed in isolation.

10. Factor markets, in particular capital markets, also may play a major role in explaining the disparity in productivity, according to the McKinsey Global Institute (1996). The U.S. capital market is perceived as penalizing underperformers and fostering "creative destruction" to a greater extent than the capital markets in Japan and Germany. In large part, the differences in these markets reflect the structure of corporate ownership in these countries. In the United States, ownership is more diffuse and "outsider-oriented," and firms are more susceptible to mergers and acquisitions. Japanese and German firms also rely more on bank lending as a source of capital. The banks, which generally maintain long-term relationships with the firms and can have significant loans at risk, may be more willing to provide funds to less efficient firms for a longer period than the capital markets in the United States.

11. According to the McKinsey Global Institute (1996), labor markets play a secondary role in explaining productivity differences. For example, labor shortages in Japan may have induced firms to invest too heavily in areas such as automation. Maddison (1987) argues that the inflexibility of labor markets, particularly in Japan and to a lesser extent in Germany, have contributed to the productivity slowdown in those countries because employers may be hesitant to trim unproductive workers.

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Table 1. United States: Capital Formation Across Major Industrial Countries

	1960-95	1960s	1970s	1980s	1990-95
	(In percent of GDP)				
Nominal gross capital formation					
Canada	22.3	23.6	23.9	21.5	18.9
France	23.2	25.5	25.5	20.9	19.5
Germany	22.9	25.3	23.4	20.4	22.4
Italy	23.9	26.3	25.7	22.9	18.9
Japan	32.5	34.6	34.5	29.5	30.4
United Kingdom	18.4	19.1	19.9	17.5	16.1
United States	19.7	20.6	20.2	19.8	16.9
Real gross capital formation					
Canada	20.1	19.2	19.2	20.9	21.8
France	23.4	23.4	25.9	21.8	21.5
Germany	23.8	26.8	24.5	20.7	22.9
Italy	23.3	27.3	24.4	20.8	19.3
Japan	28.8	25.4	31.2	28.4	31.0
United Kingdom	18.4	19.0	19.2	17.5	17.8
United States	17.2	17.5	17.1	17.4	16.8
	(In percent of NDP)				
Nominal net capital formation					
Canada	12.2	13.6	14.5	11.2	7.6
France	13.7	18.4	16.6	9.6	7.6
Germany	13.1	17.7	14.1	8.9	10.8
Italy	14.0	17.6	16.1	12.3	7.7
Japan	21.9	25.3	24.7	18.4	17.7
United Kingdom	9.0	11.6	10.5	6.5	6.2
United States	9.6	11.7	10.4	8.9	6.3
Real net capital formation					
Canada	10.7	10.9	11.5	10.9	8.9
France	13.5	16.3	16.9	10.2	8.5
Germany	13.7	18.7	14.8	9.1	11.2
Italy	13.4	17.7	14.9	10.8	7.8
Japan	18.9	17.5	22.0	17.6	18.2
United Kingdom	8.9	11.5	10.1	6.6	6.9
United States	7.9	9.2	8.2	7.5	6.3

Sources: OECD National Accounts; and Bureau of Economic Analysis, U.S. Department of Commerce.

Table 2. United States: Productivity Convergence 1/

(Index: U.S. = 100)

	1960	1965	1970	1975	1980	1985	1990	1995 2/
Labor productivity 3/								
Canada	77.8	75.9	74.9	78.8	80.1	81.4	80.7	81.1
France	...	57.5	67.6	74.6	82.3	84.0	90.7	92.7
Germany	54.9	57.4	66.5	72.2	79.3	79.9	84.4	79.2
Italy	45.4	51.9	66.5	71.2	81.8	82.7	90.5	96.2
Japan	25.5	31.6	46.7	54.2	61.4	64.5	72.4	72.0
United Kingdom	56.3	53.7	58.1	60.9	64.0	67.5	69.8	74.5
United States	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Capital productivity								
Canada	79.4	81.1	79.3	83.0	78.1	72.8	67.9	62.1
France	...	74.9	77.9	75.9	71.8	66.3	66.5	62.7
Germany	96.6	82.2	78.9	72.4	69.9	63.8	65.7	76.0
Italy	81.9	74.0	79.9	76.2	78.6	70.0	68.2	63.3
Japan	238.5	174.2	154.5	118.0	100.0	88.3	82.4	71.3
United Kingdom	109.6	101.0	94.8	90.1	83.1	80.9	82.0	84.9
United States	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total factor productivity 3/								
Canada	78.4	77.7	76.4	80.3	79.4	78.2	75.9	73.8
France	...	63.2	71.1	75.0	78.4	77.3	81.3	80.8
Germany	67.0	65.2	70.6	72.3	75.9	73.8	77.2	77.1
Italy	56.0	58.8	71.0	72.9	80.7	77.9	81.9	81.4
Japan	56.3	57.8	71.3	71.4	73.0	72.1	75.8	71.4
United Kingdom	71.3	67.1	69.1	69.9	70.2	72.0	73.9	78.1
United States	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: OECD National Accounts; Bureau of Economic Analysis, U.S. Department of Commerce; and staff estimates.

1/ Converted to U.S. dollars at constant prices on purchasing power parity basis.
2/ For capital and total factor productivity, data from Germany, Italy, and Japan is for 1994.
3/ Labor input measured by total employment (not aggregate hours worked).

Table 3. United States: Components of Nominal Gross Capital Formation 1/

(In percent of GDP)

	1960-95	1960s	1970s	1980s	1990-95
Residential structures					
Canada	5.9	5.2	6.3	6.0	6.0
France	6.3	6.2	7.6	6.1	5.0
Germany	6.6	7.2	6.6	5.9	6.6
Italy	6.9	8.1	7.4	6.1	5.2
Japan	5.8	5.1	7.0	5.4	5.2
United Kingdom	2.6	2.2	2.5	2.9	2.8
United States	4.5	4.6	5.0	4.4	3.8
Nonresidential structures					
Canada	5.9	6.3	6.1	6.0	4.6
France	7.0	8.2	7.5	5.9	5.8
Germany	7.2	8.5	7.6	6.1	6.5
Italy	6.1	7.6	6.7	5.3	4.4
Japan 2/	...	...	...	...	...
United Kingdom	5.9	5.8	6.4	5.7	5.4
United States	3.8	3.7	3.9	4.4	2.9
Machinery and equipment					
Canada	9.9	10.8	10.3	9.4	8.3
France	8.9	9.0	9.0	8.7	8.7
Germany	8.7	9.1	8.4	8.4	9.0
Italy	9.7	9.6	10.1	10.1	8.7
Japan 2/	...	...	...	...	...
United Kingdom	8.3	8.5	8.8	8.1	7.5
United States	6.7	6.0	6.9	7.3	6.6
Inventories					
Canada	0.7	1.3	1.0	0.1	0.0
France	1.1	2.1	1.4	0.3	0.0
Germany 3/	0.6	2.5	0.9	0.1	0.3
Italy	1.2	1.1	1.5	1.5	0.6
Japan	1.4	3.0	1.4	0.5	0.3
United Kingdom	0.5	1.1	0.7	0.0	-0.1
United States	0.7	1.0	0.8	0.4	0.3

Sources: OECD National Accounts; and Bureau of Economic Analysis, U.S. Department of Commerce.

1/ For the United States, components include only private capital formation; for other countries, the components include private and public investment. Numbers may not add up to total because of unavailable data and/or rounding.
2/ For Japan, data were not available for nonresidential structures and machinery and equipment.
3/ For Germany, inventory data were available only after 1967.

Table 4. United States: Components of Real Gross Capital Formation 1/

(In percent of GDP)

	1960-95	1960s	1970s	1980s	1990-95
Residential structures					
Canada	5.9	5.8	6.1	5.9	5.5
France	6.8	7.0	8.0	6.3	5.3
Germany	7.6	9.6	7.7	6.2	6.5
Italy	7.9	11.1	8.3	6.0	5.2
Japan	6.0	5.5	7.5	5.5	5.2
United Kingdom	3.4	3.5	3.5	3.4	3.0
United States	4.6	5.1	5.1	4.1	3.7
Nonresidential structures					
Canada	5.9	6.5	5.9	5.9	4.8
France	7.4	8.7	7.8	6.2	6.6
Germany	7.5	8.9	7.9	6.3	6.5
Italy	7.2	10.3	7.7	5.1	4.4
Japan 2/	...	...	...	...	...
United Kingdom	6.3	6.9	6.4	5.8	6.7
United States	3.8	4.1	3.8	3.9	2.8
Machinery and equipment					
Canada	7.6	5.5	6.0	9.0	11.5
France	8.5	7.3	8.8	8.8	9.4
Germany	8.3	8.0	8.1	8.1	9.4
Italy	8.0	7.0	7.5	8.7	9.1
Japan 2/	...	...	...	...	...
United Kingdom	7.4	6.9	7.3	7.5	7.7
United States	5.3	3.8	5.0	6.1	6.7
Inventories					
Canada	0.7	1.4	1.1	0.1	0.1
France	0.7	0.5	1.3	0.5	0.1
Germany 3/	0.6	1.3	0.9	0.1	0.5
Italy	0.5	-0.4	0.9	1.0	0.5
Japan	0.8	1.4	1.0	0.4	0.4
United Kingdom	0.4	0.9	0.6	0.1	-0.1
United States	0.5	0.8	0.6	0.3	0.3

Sources: *OECD National Accounts*; and Bureau of Economic Analysis, U.S. Department of Commerce.

1/ For the United States, components include only private capital formation; for other countries, the components include private and public investment. Numbers may not add up to total because of unavailable data and/or rounding.
2/ For Japan, data were not available for nonresidential structures and machinery and equipment.
3/ For Germany, inventory data were available only after 1967.

Table 5. United States: Composition of Nominal Gross Capital Formation 1/

(In percent of total)

	1960-95	1960s	1970s	1980s	1990-95
Residential structures					
Canada	26.5	22.3	26.6	27.8	31.6
France	27.4	24.3	29.7	29.0	25.8
Germany	28.7	28.6	28.3	28.7	29.4
Italy	28.6	30.9	29.0	26.5	27.5
Japan	17.8	14.9	20.6	18.2	17.2
United Kingdom	15.1	12.4	13.8	17.4	17.9
United States	28.7	30.2	29.8	26.7	27.7
Nonresidential structures					
Canada	26.5	26.7	25.8	28.1	24.5
France	29.9	32.2	29.3	28.2	30.0
Germany	31.4	33.5	32.2	29.8	29.2
Italy	25.5	28.8	26.0	23.0	23.2
Japan 2/	...	...	...	...	...
United Kingdom	34.0	33.1	34.8	34.0	34.4
United States	24.2	24.1	23.8	26.7	21.2
Machinery and equipment					
Canada	44.2	45.7	43.4	43.9	43.8
France	38.6	35.3	35.4	41.5	44.6
Germany	38.1	35.9	35.9	41.2	40.1
Italy	41.0	36.4	39.4	44.1	46.2
Japan 2/	...	...	...	...	...
United Kingdom	48.3	48.5	47.8	48.7	48.0
United States	43.0	39.1	42.0	44.3	48.9
Inventories					
Canada	2.7	5.3	4.2	0.2	0.2
France	4.1	8.2	5.5	1.2	-0.4
Germany 3/	2.3	9.8	3.5	0.3	1.3
Italy	5.0	4.1	5.7	6.3	3.0
Japan	4.1	8.7	3.8	1.6	1.0
United Kingdom	2.6	6.0	3.6	-0.1	-0.3
United States	4.0	6.6	4.3	2.3	2.2

Sources: OECD National Accounts; and Bureau of Economic Analysis, U.S. Department of Commerce.

1/ For the United States, components include only private capital formation; for other countries, the components include private and public investment. Numbers may not add up to 100 because of unavailable data and/or rounding.
2/ For Japan, data were not available for nonresidential structures and machinery and equipment.
3/ For Germany, inventory data were available only after 1967.

Table 6. United States: Composition of Real Gross Capital Formation 1/

(In percent of total)

	1960-95	1960s	1970s	1980s	1990-95
Residential structures					
Canada	29.4	30.5	32.1	28.3	25.2
France	29.0	29.7	30.9	28.9	24.8
Germany	31.7	36.0	31.2	29.9	28.5
Italy	33.2	40.7	34.0	28.7	27.0
Japan	20.8	21.4	24.0	19.5	16.7
United Kingdom	19.4	19.9	19.6	20.4	17.1
United States	33.7	40.1	36.2	28.6	27.3
Nonresidential structures					
Canada	29.5	33.7	30.9	28.3	22.1
France	31.8	37.5	30.1	28.6	30.8
Germany	31.3	33.4	32.1	30.2	28.5
Italy	29.9	37.8	31.5	24.6	22.9
Japan 2/	...	...	...	...	...
United Kingdom	36.4	37.9	36.0	34.7	38.6
United States	27.6	32.1	27.3	27.5	20.9
Machinery and equipment					
Canada	37.4	28.7	31.5	43.0	52.6
France	36.6	31.1	34.0	40.1	44.1
Germany	35.2	29.7	33.1	39.2	41.0
Italy	35.3	25.5	31.2	42.1	47.5
Japan 2/	...	...	...	...	...
United Kingdom	42.5	37.7	41.2	44.8	44.6
United States	38.3	29.5	36.1	42.5	49.7
Inventories					
Canada	3.6	7.0	5.5	0.5	0.2
France	2.6	1.7	5.0	2.3	0.3
Germany 3/	2.3	4.8	3.6	0.7	1.9
Italy	2.2	-1.6	3.4	4.6	2.7
Japan	3.0	5.4	3.1	1.5	1.1
United Kingdom	1.7	4.5	3.2	0.0	-0.4
United States	3.8	6.1	4.0	2.2	2.2

Sources: OECD National Accounts; and Bureau of Economic Analysis, U.S. Department of Commerce.

1/ For the United States, components include only private capital formation; for other countries, the components include private and public investment. Numbers may not add up to 100 because of chain-weighted data, unavailable data and/or rounding.

2/ For Japan, data were not available for nonresidential structures and machinery and equipment.

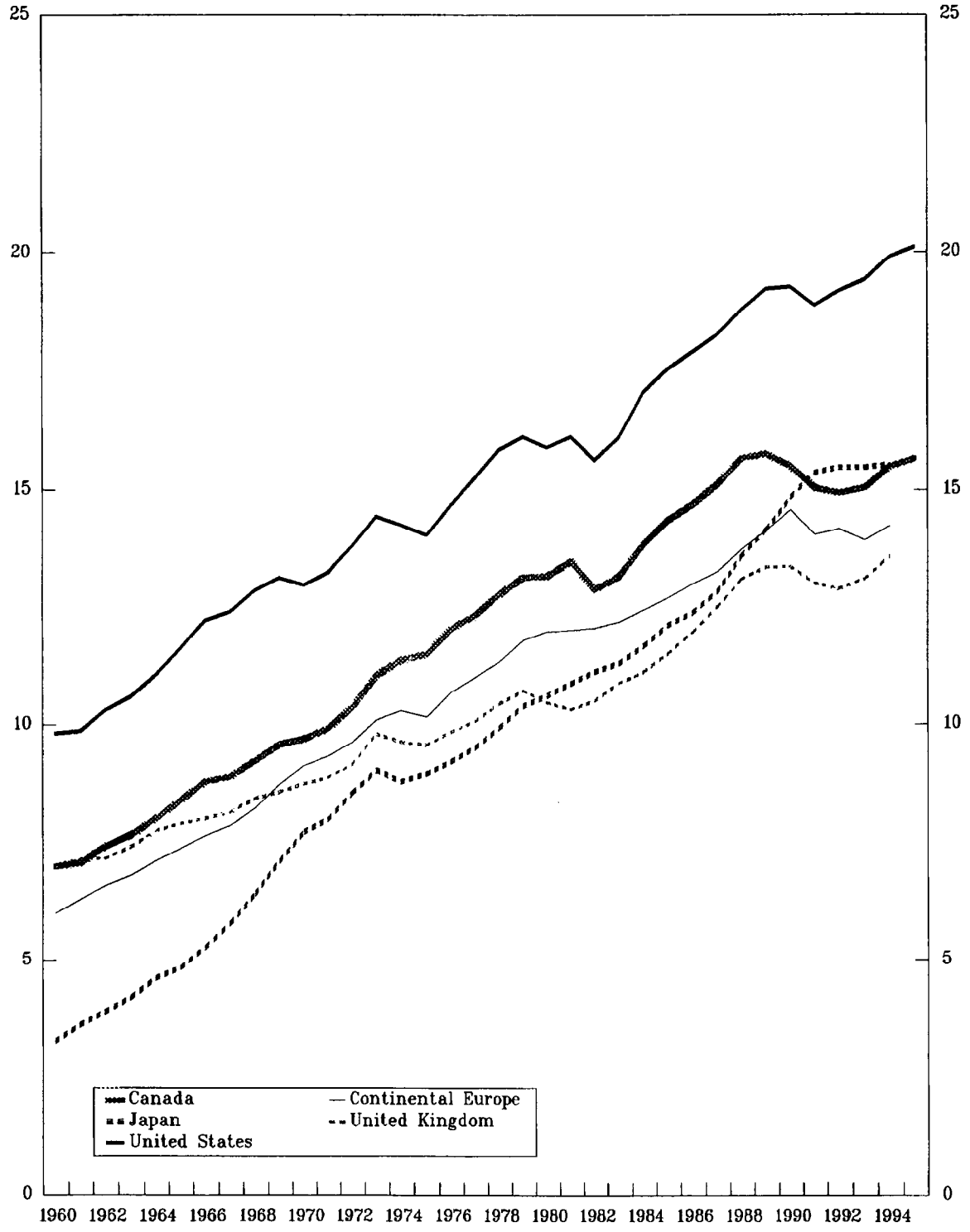
3/ For Germany, inventory data were available only after 1967.

CHART 1

UNITED STATES

GDP PER CAPITA 1/ 2/

(In thousands of US dollars)



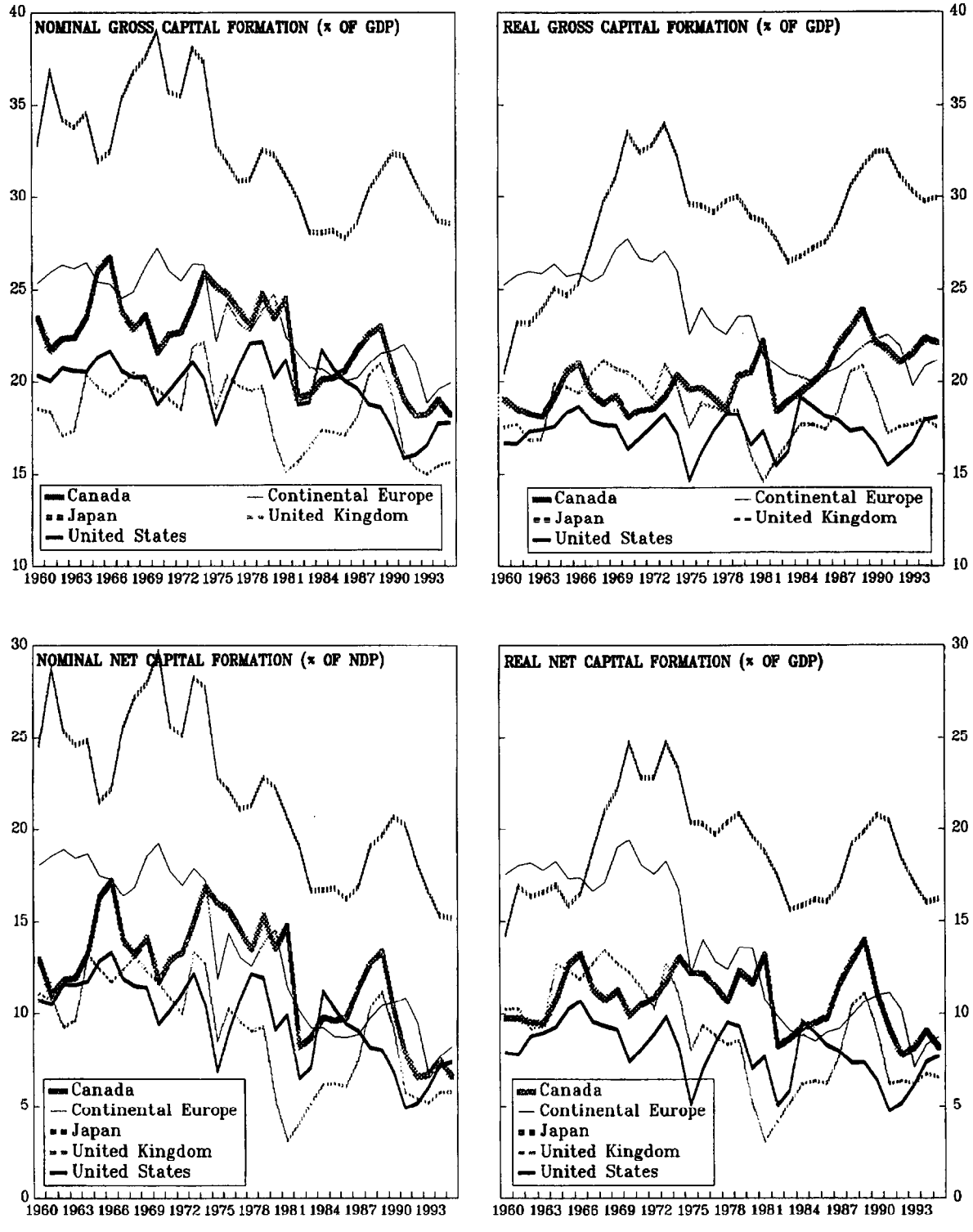
Sources: OECD National Accounts; and Bureau of Economic Analysis, U.S. Department of Commerce.

1/ Continental Europe includes France, Germany, and Italy.
2/ Measured in constant 1985 US$ (using 1985 purchasing power parity weights) per total population.

CHART 2

UNITED STATES

NOMINAL AND REAL INVESTMENT 1/



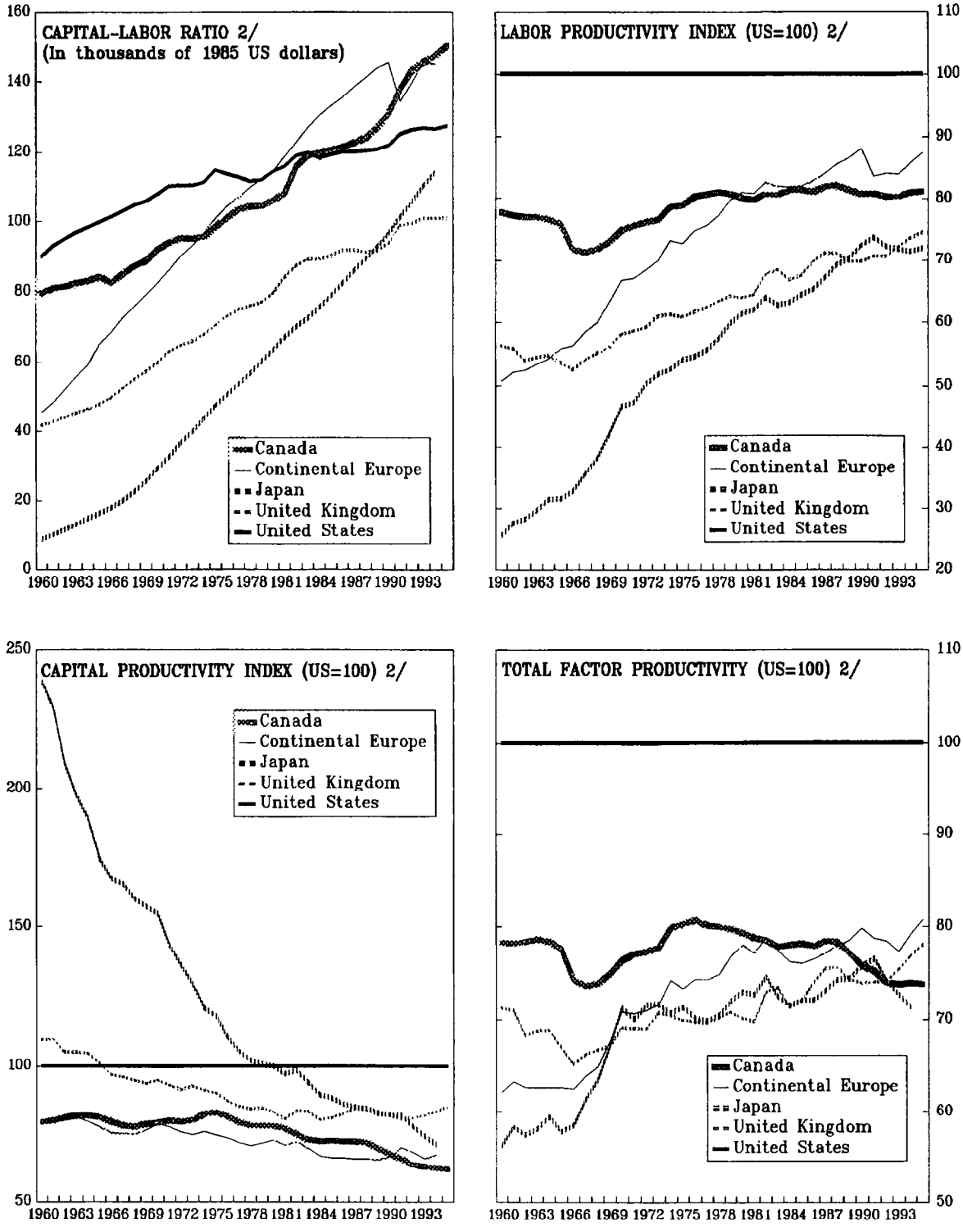
Sources: OECD National Accounts; and Bureau of Economic Analysis, U.S. Department of Commerce.

1/ Continental Europe includes France, Germany, and Italy.

CHART 3

UNITED STATES

PRODUCTIVITY 1/



Sources: OECD National Accounts; and Bureau of Economic Analysis, U.S. Department of Commerce.

1/ Continental Europe includes France, Germany, and Italy.
2/ Measured in constant 1985 US$ (using 1985 purchasing power parity weights) per total population.

V. Demographic Change, Personal Saving, and Medical Expenditure [1]

1. A variety of perspectives have been used to explain the decline in U.S. personal saving since the early 1960s.[2] Recently, one area of increased interest has been the effects of changes in demographics on saving. The life-cycle model of consumption suggests that such demographic shifts should contribute to a decline in saving as the population ages, but empirical studies thus far have not suggested that demographics alone have played a significant role in explaining the saving decline. However, there has been a substantial redistribution of income to the elderly through programs such as Social Security and Medicare, and it may be through such resource transfers from groups with higher propensities to save to groups with lower propensities that population aging has played an important role in reducing the personal saving rate. In particular, medical expenditure as a share of disposable income has risen sharply over this period, closely matching the decline in saving, and it can be shown that this rise in medical spending may be linked to demographic factors (Chart 1).

2. The life-cycle model suggests that saving rates follow a "hump-shaped" profile over individuals' lifetimes. Earnings are expected to rise with age up to retirement, and decline subsequently. The model predicts that individuals will borrow against future labor income when young, become net savers later in their earning years, and spend their accumulated savings (dissave) during retirement. In fact, estimated savings profiles by age group show just such a "hump shape,"with a peak in the individual's saving rate at around age 60 (Table 1).[3]

3. The life-cycle model clearly implies that an economy with a large proportion of households nearing the end of their life cycles would have a lower aggregate saving rate than one with a small proportion. Empirical research also points to the existence of different propensities to save across age groups. Nevertheless, beyond these two basic points, there is little agreement on precisely how saving may have been affected by demographic changes. The broad conclusion from the empirical literature is that population aging by itself cannot explain a significant part of the decline in saving, mainly because the shift in the age distribution of the population thus far has been too small and because average propensities to save do not differ

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[1]Prepared by Charles Kramer, Victor Valdivia, and Jeffrey Cole.

[2]The decline in saving is described in *United States—Recent Economic Developments* (September 1996: IMF Staff Country Report No 96/93). The focus here is on aggregate data from the national income and product accounts; perspectives from microeconomic data may differ somewhat (see Browning and Lusardi (1996)).

[3]Extensions to the basic life-cycle model are required in order to explain additional features of the data such as the positive saving rate of the elderly (Kotlikoff and Summers (1981), Hurd (1989)).

sufficiently across age groups.[4] Indeed, Gokhale, Kotlikoff and Sabelhaus (1996) show that applying the age distribution from earlier years to the data for 1987–90 could result in either a lower or higher saving rate, depending on the time period from which the age distribution is chosen.

4. Even though the increase in the relative number of the elderly is not enough to account for the decline in saving, Gokhale, Kotlikoff and Sabelhaus (1996) find that a redistribution of resources (in particular, in the form of transfers) toward the elderly may account for the decline in saving. The impact of this shift in resources from age groups with a high saving rate (the young) to those with a low saving rate (the old) can be understood by noting that the overall saving rate can be expressed as,

$$\frac{S}{Y} = \frac{Y_{young}\ s_{young} + Y_{old}\ s_{old}}{Y_{young} + Y_{old}}$$

where Y denotes income and s the saving rate out of income. If s_{young} is greater than s_{old}, transferring a dollar of income from a young to an old person reduces the numerator, but does not reduce the denominator, and so reduces the overall saving rate.

5. This effect would be even larger for in-kind transfers such as Medicare payments, since the elderly cannot save out of such transfers.[5] Chart 2 shows how Medicare transfers have grown in importance over time. Since 1970, transfers from those under age 65 in the form of Medicare taxes to those age 65 and over in the form of Medicare payments for medical services have grown substantially, both in real terms and in terms of disposable income.[6] Over this period, these transfers have grown from about 1 percent to about 3–3½ percent of disposable personal income. Chart 3 shows the importance of these transfers in real income per person. The transfers have significantly raised the trend in real income for those aged 65 and over, and also raised the percentage of total income accounted for by the elderly by an increasing amount over time.

6. Examination of the components of medical expenditure can shed light on the sources of the increase in medical expenditure per capita (Chart 4). Over the period 1970–96, total

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[4]See Browning and Lusardi (1996).

[5]Gokhale, Kotlikoff and Sabelhaus (1996) do not capture the effect of Medicare payments in their results because the data that they used (the Consumer Expenditure Survey) count only out-of-pocket medical expenditures.

[6]These data do not include transfers for medical services to the indigent elderly that are made through the Medicaid program and their associated financing from general revenues.

expenditures on medical care as a percentage of disposable income more than doubled, from about 8 to more than 16 percent of disposable income (see Chart 1). Much of the increase was accounted for by an increase in hospital and nursing home expenses, although other categories such as expenditures on physicians' services registered significant percentage increases. In addition, increases in the price of medical care have significantly raised current-dollar expenditures on medical care, in light of the low elasticity of such expenditures with respect to price.[7]

7. There is empirical evidence suggesting that, aside from the effects of rising Medicare spending, population aging more generally has been an important factor driving the increased expenditure on health care. For example, Fuchs (1984) shows that real health care expenditures by those aged 65 or older rose by an average of 8 percent a year over the period 1965–81, compared with an average of 5.3 percent a year for those aged less than 65. Public health care expenditures per elderly person rose by an average of 10.5 percent a year over the same period, compared with an average of 7.2 percent for nonelderly persons. Fuchs also found that per-capita hospital expenditures by the elderly rose by 6.8 percent a year over that period, compared with 5.8 percent for the nonelderly. In a cross-country study, O'Connell (1996) found that population aging contributed significantly to the relatively high level of health expenditure in the United States.

8. To further explore whether demographic changes associated with population aging can explain the increase in medical expenditures, simple regressions were estimated. Table 2 shows the estimated relationships between real medical expenditures per capita, some economic determinants of medical expenditures (relative prices, real income, and real wealth), transfers (real Medicare expenditures per person aged 65 or older), and three demographic variables: the proportion of the population over 65 years of age, life expectancy, and the proportion of the elderly who are over 75 years of age. Transfers are included to measure the effects of intergenerational transfers. Analyses of this kind traditionally include the proportion of the population older than 65 to capture the effects of demographics on the demand for medical care, but other measures are included here since progress in medical technology makes it difficult to interpret the significance of the elderly ratio. In particular, the average 65-year old in 1996 was likely to be much healthier than his or her counterpart in 1960. For this reason, the proportion of the relatively old among the elderly and life expectancy are also included. In addition, the "older" elderly are more likely to suffer from long-term illnesses that are expensive to treat.

9. The results of the regressions are presented in Table 2. In all cases, as would be expected, the demand for medical services is relatively price inelastic. Real income per capita is also important in determining the trend in medical expenditures (real wealth is not as important, possibly because of liquidity constraints). Real Medicare expenditures per person

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[7]There are important issues with regard to the measurement of the price and quantity of medical services. For example, Cutler and others (1996) show the difficulties in computing medical care cost indexes using data on heart-attack treatments.

over age 65 are also significant in each case. Life expectancy and the proportion of the older elderly in the population appear to be more significant than the elderly ratio (percent of the population over 65), perhaps reflecting trends in medical technology and demands for medical services with age. It is clear in any case that demographics and transfers appear to have played an important role in the increase in real medical expenditure per capita.

10. Although significant direct effects on personal saving resulting from the aging of the U.S. population are difficult to find in the data, there appears to be an indirect link through the effects of government transfers, which have shifted resources between demographic groups. In particular, in-kind-transfers from younger to older age groups through programs like Medicare may have played a key role in explaining the decline in the savings rate since the early 1960s. The sharp rise in medical expenditures over this period, which coincides with the decline in saving, is related both to increases in Medicare and more generally to shifts in the age distribution of the population. The approaching surge in the population eligible for benefits under the main government transfer programs for senior citizens as the baby-boom generation begins to retire provides added reasons for dealing with the financial problems of these programs to mitigate possible further substantial declines in personal savings.

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Table 1. United States: Savings Rates, by Age, Selected Years

(In percent)

Age	25–34	35–44	45–54	55–64	65+
Savings ratio, 1972/73	9.5	12.1	16.8	22.9	14.9
Savings ratio, 1982/85	9.6	8.6	10.5	15.8	11.5

Sources: Browning and Lusardi (1996); and Consumer Expenditure Survey.

Table 2. United States: Explaining Per-Capita Real Medical Expenditures

Dependent variable: log (real medical services expenditures per capita).

	Independent Variables						
C	Log Relative Price	Log Real Disposable Income Per Capita	Log Real Medicare Generosity	Life Expectancy	Prop. of Elderly 75+	Log Real Wealth Per Capita	Prop. of Population 65+
-4.9*	-0.72*	0.60*	0.12*	0.12*	0.08*	0.004	...
-3.5*	-0.48*	0.85*	0.16*	0.12*	0.07*	...	-0.07
0.8	0.23	1.57*	0.24*	0.15*	...	...	-0.23*
-4.9*	-0.69*	0.62*	0.12*	0.11*	0.08*	...	...

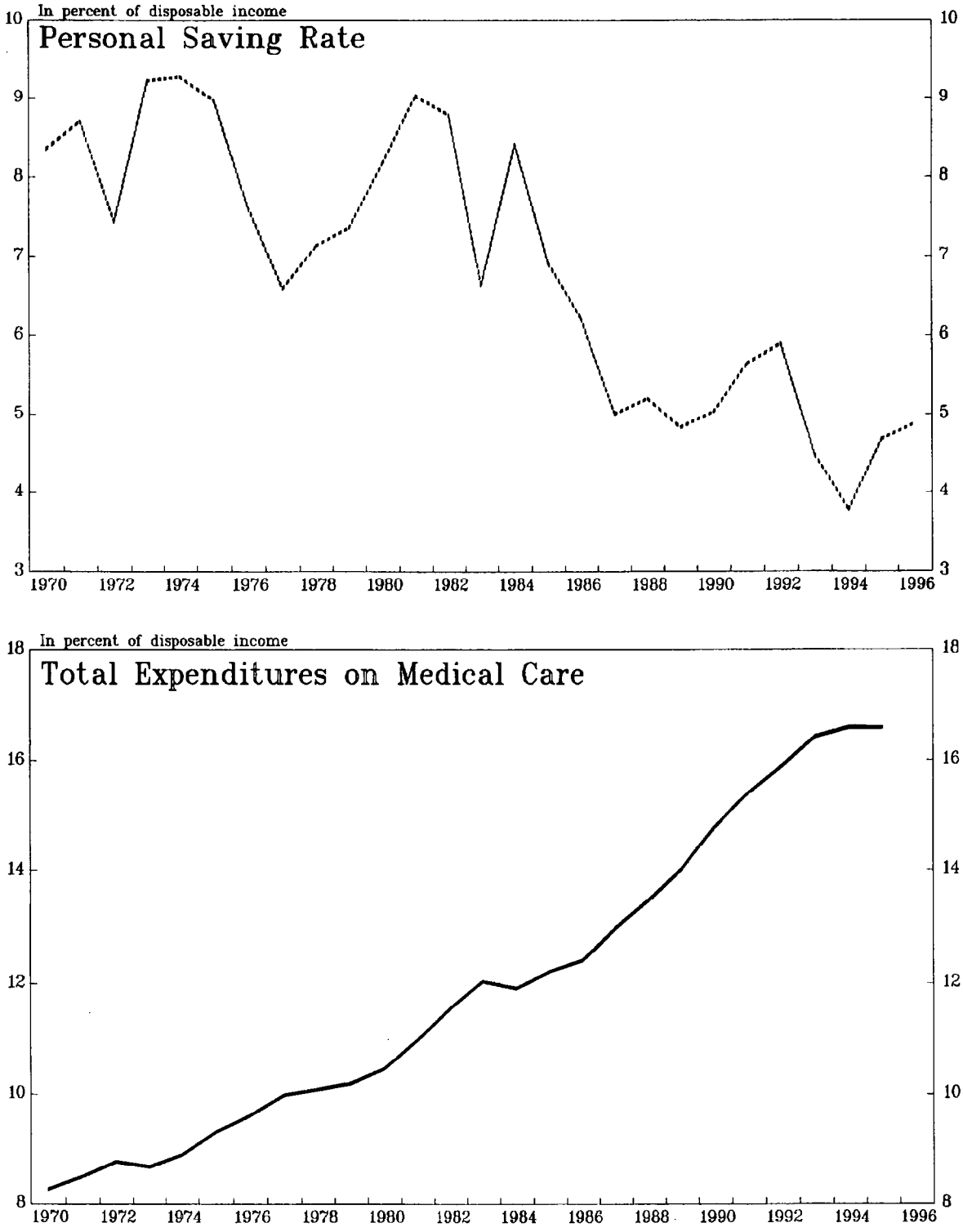
Annual data, 1959–96. Regressions estimated using Phillips-Hansen fully modified OLS (Phillips and Hansen (1990)). An asterisk denotes significance at the 5 percent level. Variables are:

Relative price: price deflator for consumption of medical services divided by the GDP deflator
Real disposable income per capita: based on NIPA data.
Medicare generosity: real Medicare expenditures (deflated by NIPA price index for consumption of medical services) per person 65 and over.
Life expectancy: expected remaining years of life for a person aged 65 (simple average of rates for male and female).
Prop. of elderly 75+: number of persons aged 75 and older as a percentage of persons 65 and older.
Real wealth per capita based on Flow of Funds data.

CHART 1

UNITED STATES

PERSONAL SAVING RATES AND MEDICAL EXPENDITURES

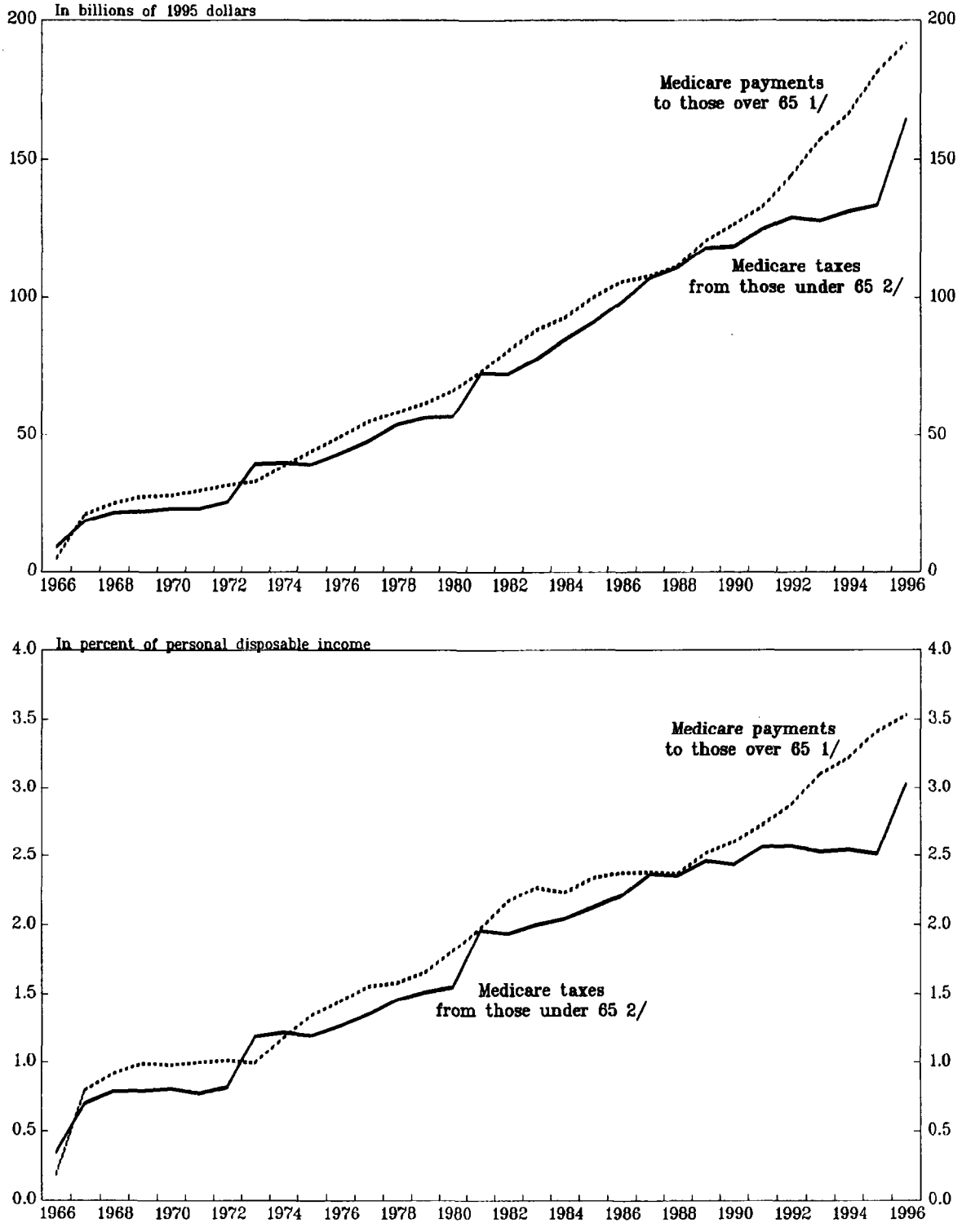


Source: Bureau of Economic Analysis, U.S. Department of Commerce, National Income and Product Accounts.

CHART 2

UNITED STATES

MEDICARE GENERATIONAL TRANSFERS



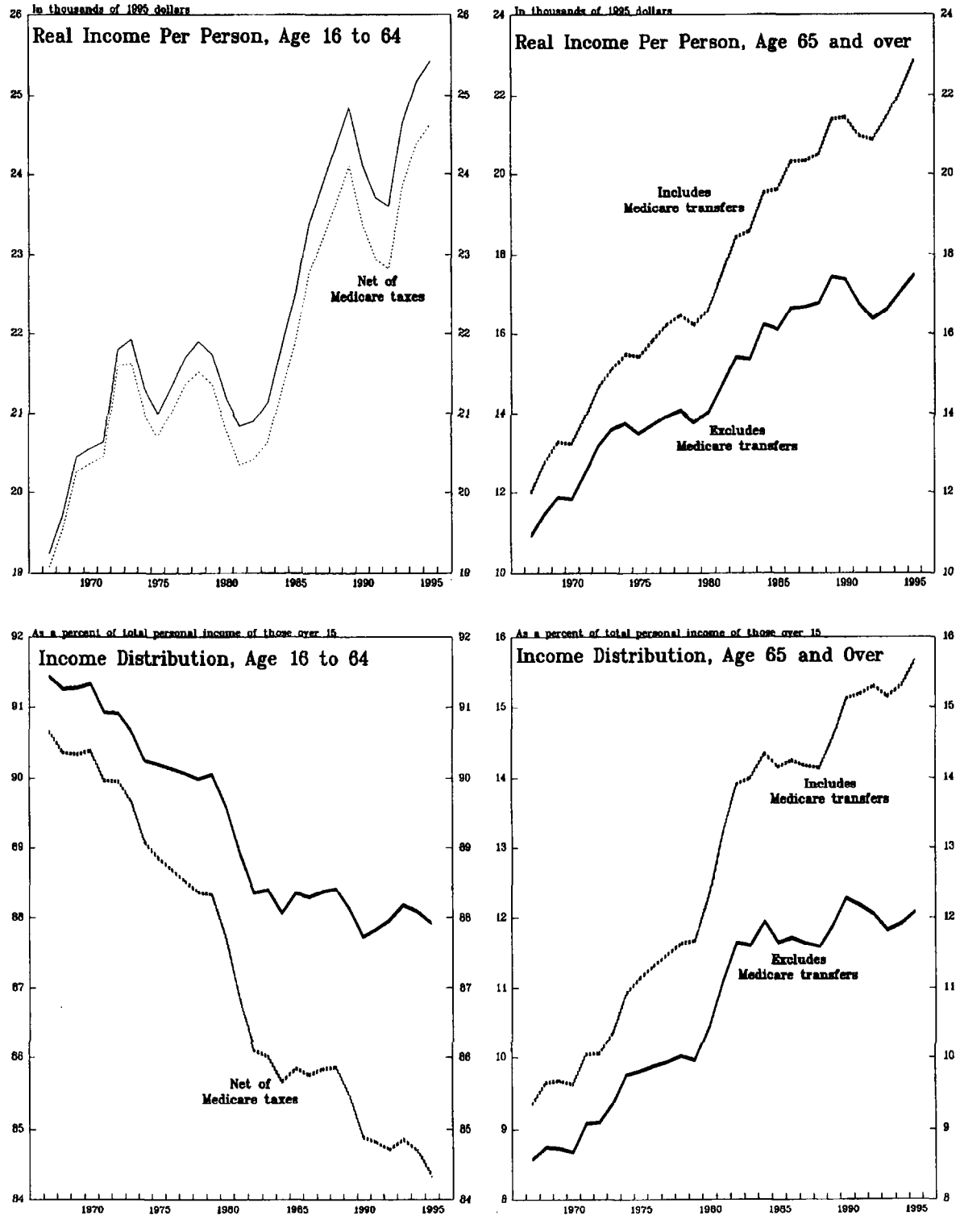
Source: The Medicare Trustees' Annual Reports; Bureau of Economic Analysis, U.S. Department of Commerce; and Fund staff estimates.

1/ Estimated as total Hospital Insurance (HI) and Supplementary Medical Insurance (SMI) benefits received by Medicare enrollees.
2/ Estimated as the sum of total HI payroll taxes and SMI revenues taken from the federal government treasury (assuming those under 65 account for 90 percent of federal government tax revenues).

CHART 3

UNITED STATES

INCOME AND THE MEDICARE GENERATIONAL TRANSFER 1/



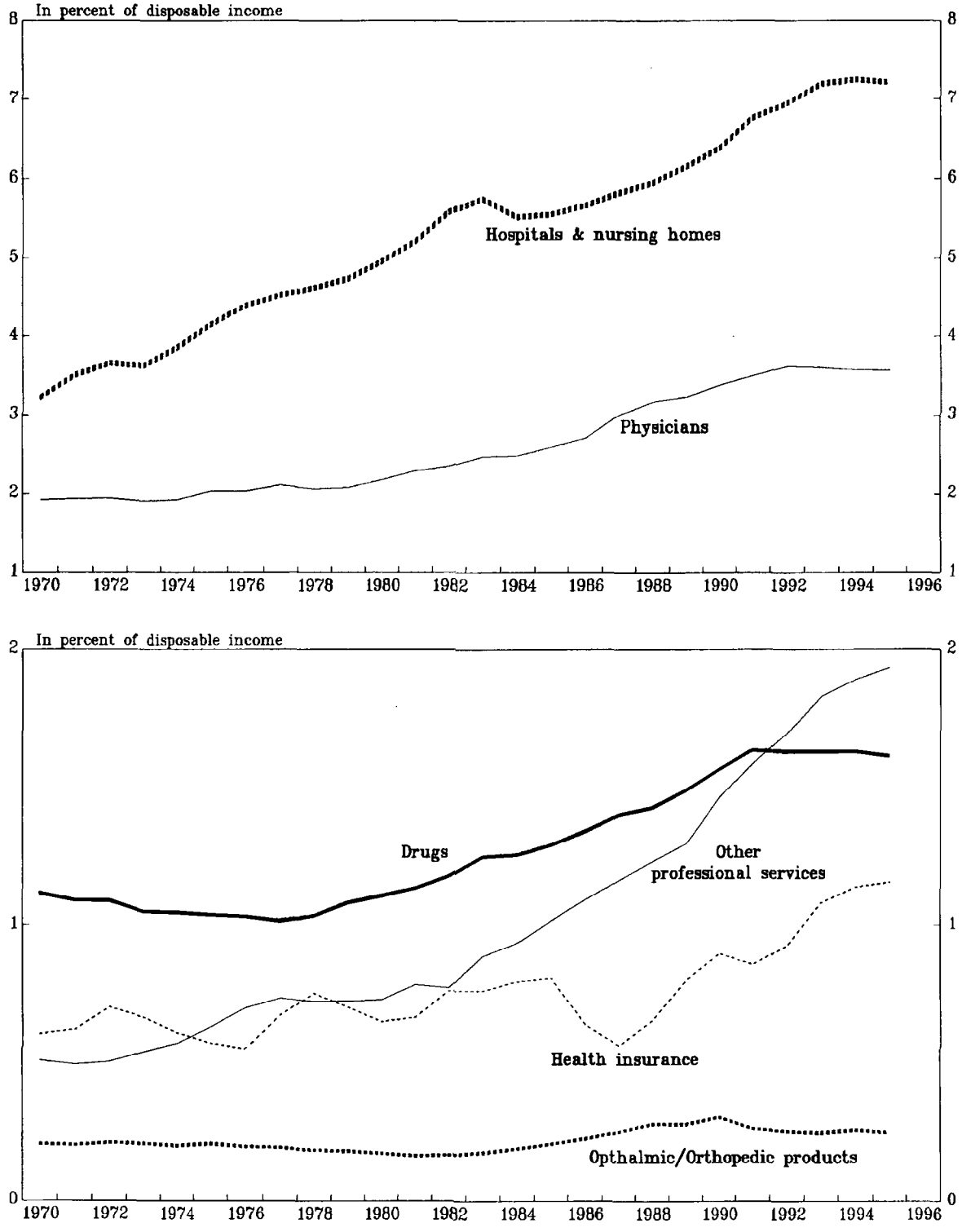
Source: Current Population Survey, Bureau of the Census, U.S Department of Commerce; and Fund staff estimates.

1/ Total income by age group was found by multiplying national population estimates for each age group by the mean income for each age group, as estimated by the Current Population Survey.

CHART 4

UNITED STATES

SELECTED TYPES OF MEDICAL EXPENDITURES



Source: Bureau of Economic Analysis, U.S. Department of Commerce, National Income and Product Accounts.

VI. THE RECENT BEHAVIOR OF STOCK PRICES[1]

1. Stock market prices have risen sharply over the past two years, reaching all-time highs and raising concerns that "irrational exuberance has unduly escalated asset values."[2] With the rise in prices, price/earnings ratios have moved out of line with historic averages and dividend/price ratios (also referred to as dividend yields) have fallen to historic lows, suggesting that stock prices are high relative to economic fundamentals (Chart 1). To examine this question, a simple model explaining the dividend/price ratio in terms of fundamental factors was estimated, and the model's ability to predict the movements in the dividend yield over the period 1995–96 was analyzed. One version of the model can account for most of the decline in the dividend yield over the last two years.

2. The dividend/price ratio reflects the market's forecast of future dividend growth and risk premia.[3] Thus, variables that either forecast future dividends or are related to risk premia should help explain changes in the dividend yield. In addition, substantial net purchases of mutual funds have taken place in the past few years. These mutual fund inflows may reflect a change in longer-term fundamentals that is not captured in the other economic variables. Hence, two models for the dividend yield are estimated: a basic version, and an augmented one that includes a measure for mutual fund inflows.

3. Research suggests that variables like the yield curve, real interest rates, inflation, and the default premium are related to future economic activity, discount rates, and risk premia.[4] In the basic model, the log of the dividend yield (LDP) is related to the slope of the yield curve (YC) (which represents the difference between long-term and short-term interest rates); the default premium (DEF) (measured as the difference in yields on corporate and government bonds); the (ex-post) real rate of interest on three-month Treasury bills (RTB); and the CPI inflation rate (PI). In the augmented version of the model, net purchases of mutual funds (MUFI) from the Investment Company Institute is added as an explanatory variable.

4. For each version, a model was estimated with two lags of the log dividend yield and a contemporaneous value and two lags of each explanatory variable. Each model was fitted to

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[1]Prepared by Charles Kramer.

[2]Remarks by Federal Reserve Board Chairman Alan Greenspan at the American Enterprise Institute, December 5, 1996.

[3]For a complete explanation of the theoretical model used in this analysis and its empirical specification and estimation, see Kramer (1996).

[4]These variables are often used in empirical studies of asset pricing, and they forecast dividend growth rates and stock returns out of sample.

the period March 1984 to December 1994.[5] Forecasts were then derived from the two models for the period January 1995 to February 1997. The long-run version of each model is as follows (standard errors in parentheses):

Basic model:

log(D/P) =	0.36	+ 0.07 DEF	+ 0.10 PI	+ 0.09 RTB	+ 0.08 YC
	(0.12)	(0.06)	(0.01)	(0.01)	(0.02)

Augmented model:

log(D/P) =	0.77	- 0.04 DEF	+ 0.06 PI	+ 0.06 RTB	+ 0.07 YC	- 0.21 MUFI[6]
	(0.29)	(0.10)	(0.02)	(0.02)	(0.02)	(0.11)

In the dynamic versions of both models, each variable except DEF was statistically significant at the 1 percent level (when testing for the significance of all lags). DEF was significant at the 6 percent level in the first model, and at the 11 percent level in the second.

5. Charts 2 and 3 show the forecast performance of each model over the January 1995–February 1997 period.[7] As can be seen, the basic model does not perform well in explaining recent movements in the dividend yield. Although the basic model forecasts a decline in the yield, the actual decline was much larger over the forecast period (the root mean square error (RMSE) of the forecast was 0.22). In particular, after mid-1995, actual values for the dividend yield lie outside the two-standard error confidence interval for the forecast. In contrast, the augmented model closely tracks the movements in the dividend yield (the RMSE of the forecast was 0.07). The actual dividend yield is generally within the two-standard error band for the forecast (Chart 3). These results imply that mutual fund inflows are important in explaining the decline in the dividend yield in the recent period.[8]

6. A forecast attribution was performed using the augmented model. The intent was to measure how much each variable contributed to the change in the forecast, and by implication

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[5]The data on mutual-fund inflows are not available before 1984.

[6]The coefficient and standard error for MUFI are multiplied by 10^4 for ease of presentation.

[7]The forecasts presented here are dynamic forecasts, while those in Kramer (1996) are one-step-ahead static forecasts.

[8]The difference between the forecasts from the basic and augmented models is not accounted for by differences in the coefficients on the common variables in the two models. If the mutual fund inflow variable is held constant at its December 1994 value over the forecast horizon, the forecast from the augmented model is similar to the one from the basic model.

to estimate how important each variable was in explaining the actual decline in the dividend yield.[9] The table below shows the forecast attributions. Most of the variables other than mutual-fund inflows have fairly low explanatory power in the forecast. The basic model, which excludes mutual fund inflows, can explain only about 15 percent of the decline in the log dividend yield, while the augmented model explains about 80 percent of the decline. In the augmented model, the mutual fund inflows variable explains nearly 75 percent of the change in the dividend yield.

Forecast Attribution

(In percent)

		Forecast From		Forecast From Augmented Model				
		Basic Model	Augmented Model	YC	DEF	RTB	PI	MUFI
Change in LDP	-0.42	-0.06	-0.34	-0.31	-0.33	-0.29	-0.34	-0.03
Contribution		15.3	80.3	7.2	1.8	11.8	-1.7	73.9

7. The inflow of money into mutual funds may reflect a shift in portfolio allocations by individual investors. The development of mutual funds in recent years has made it easier for individuals to hold a diversified portfolio of stocks and has significantly lowered transactions costs. Historically, stock holdings have been highly concentrated among a relatively small number of wealthy households. More recently, however, more households have been participating in the stock market, particularly through mutual funds.[10] The previously highly concentrated holdings of stocks could have depressed stock prices relative to what they would have been if holdings were more uniformly distributed.[11] If the increase in mutual-fund inflows represents a shift of portfolios toward a less-concentrated allocation, then the recent rise in

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[9]The contribution of each variable is calculated as the effect on the forecast of the change in the dividend yield that results from allowing the variable to vary over the forecast period, expressed as a percent of the actual change in the dividend yield. The contributions do not add to 100 percent because of the lags in the independent variables and because part of the change in the forecast is explained by historical residuals.

[10]See Frost (1996) and Laderman (1997).

[11]Such a phenomenon is consistent with the "equity premium puzzle" that historical stock returns have been too high to be consistent with standard equilibrium models (see Basak and Cuoco (1997)).

prices and decline in yields may represent a move to a different equilibrium, rather than a departure from equilibrium. Alternatively, if expectations of future returns on the scale of those experienced in the last two years have motivated recent inflows to mutual funds, then the evidence in this paper might be consistent with "irrational exuberance."

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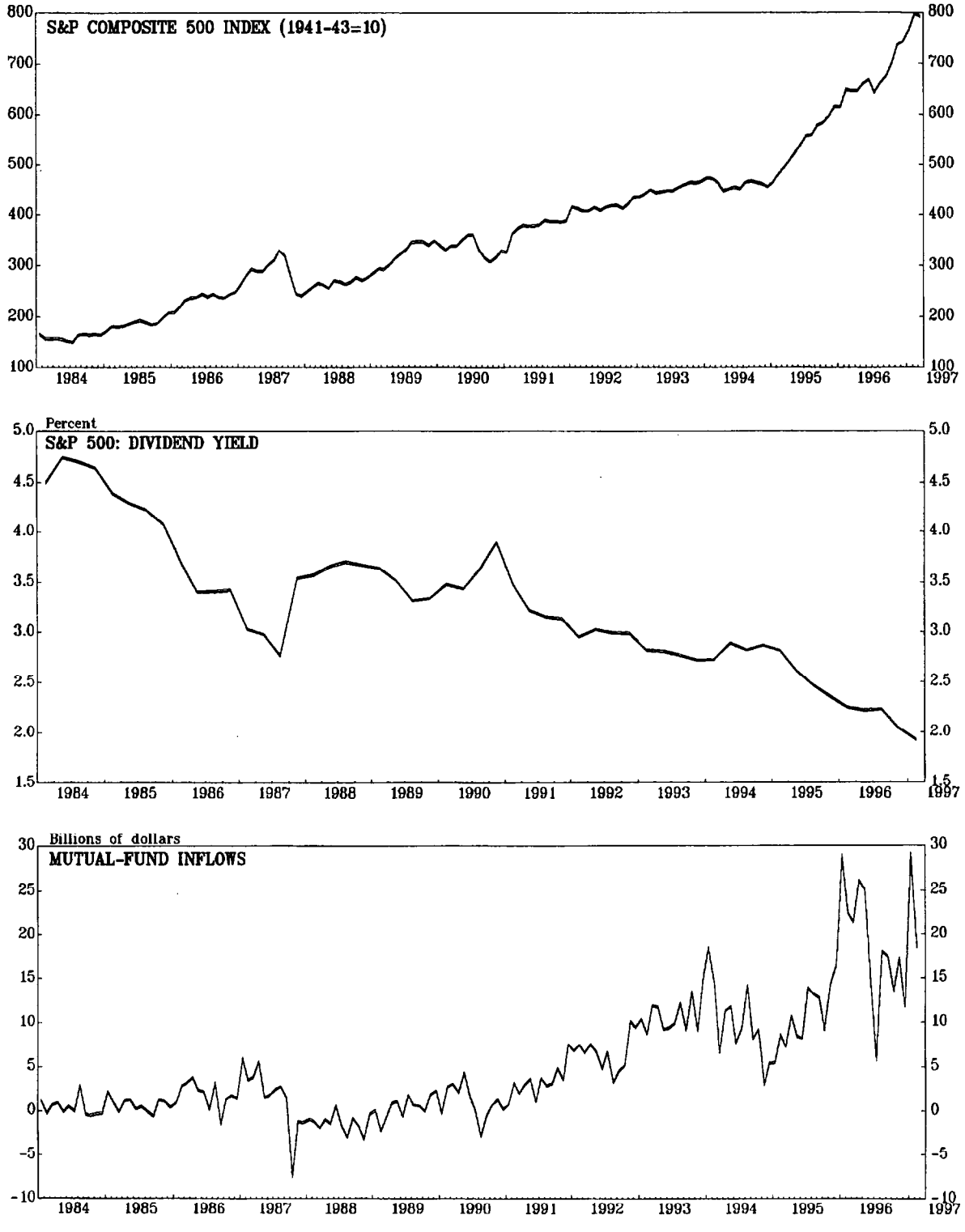
CHART 1

UNITED STATES

STOCK PRICES, DIVIDENDS, AND MUTUAL-FUND INFLOWS

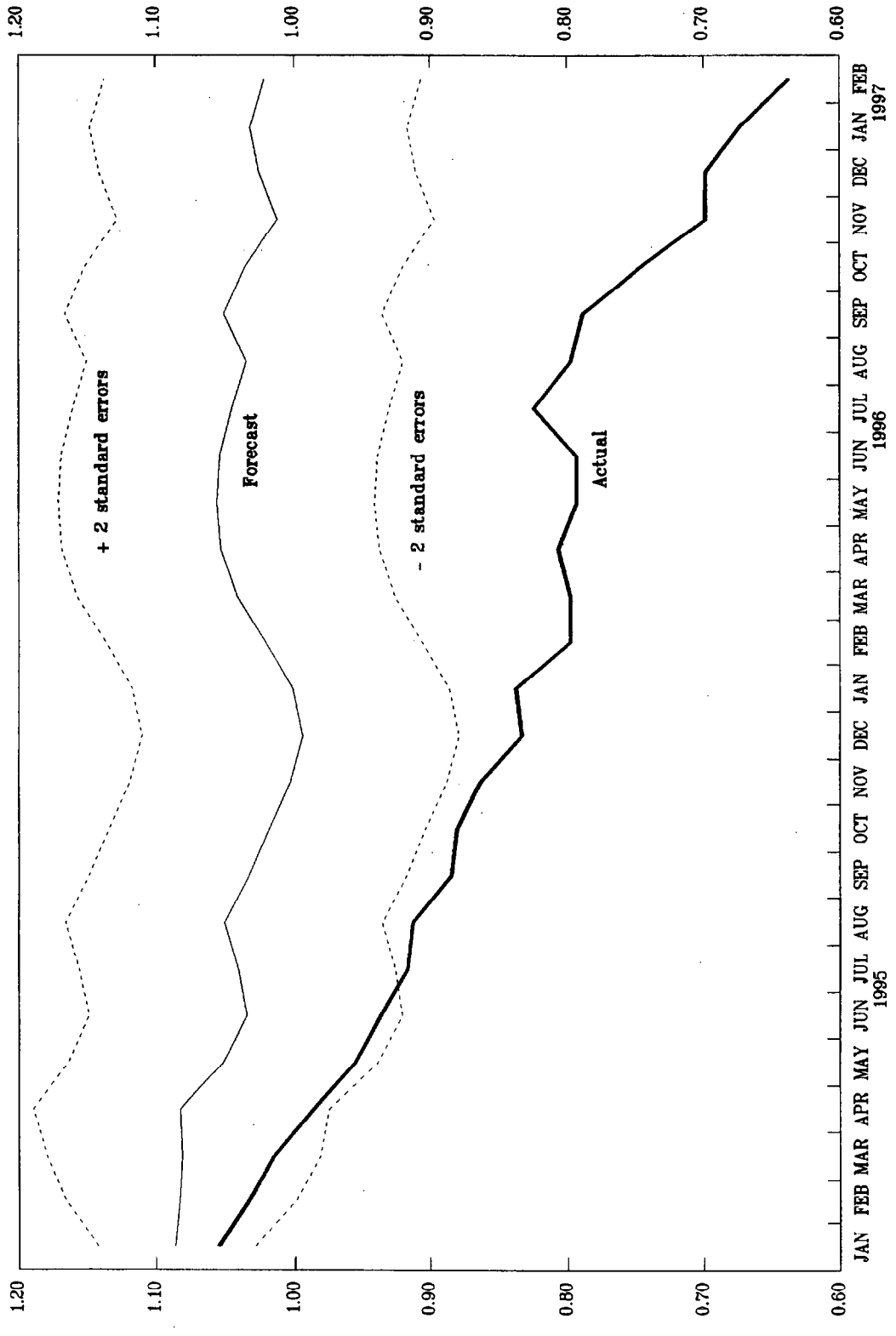


Sources: The Wall Street Journal and the Financial Times; Standard & Poor's, a division of McGraw-Hill; and Investment Company Institute.

CHART 2

UNITED STATES

LOG DIVIDEND YIELD: FORECAST AND ACTUAL (BASIC MODEL)

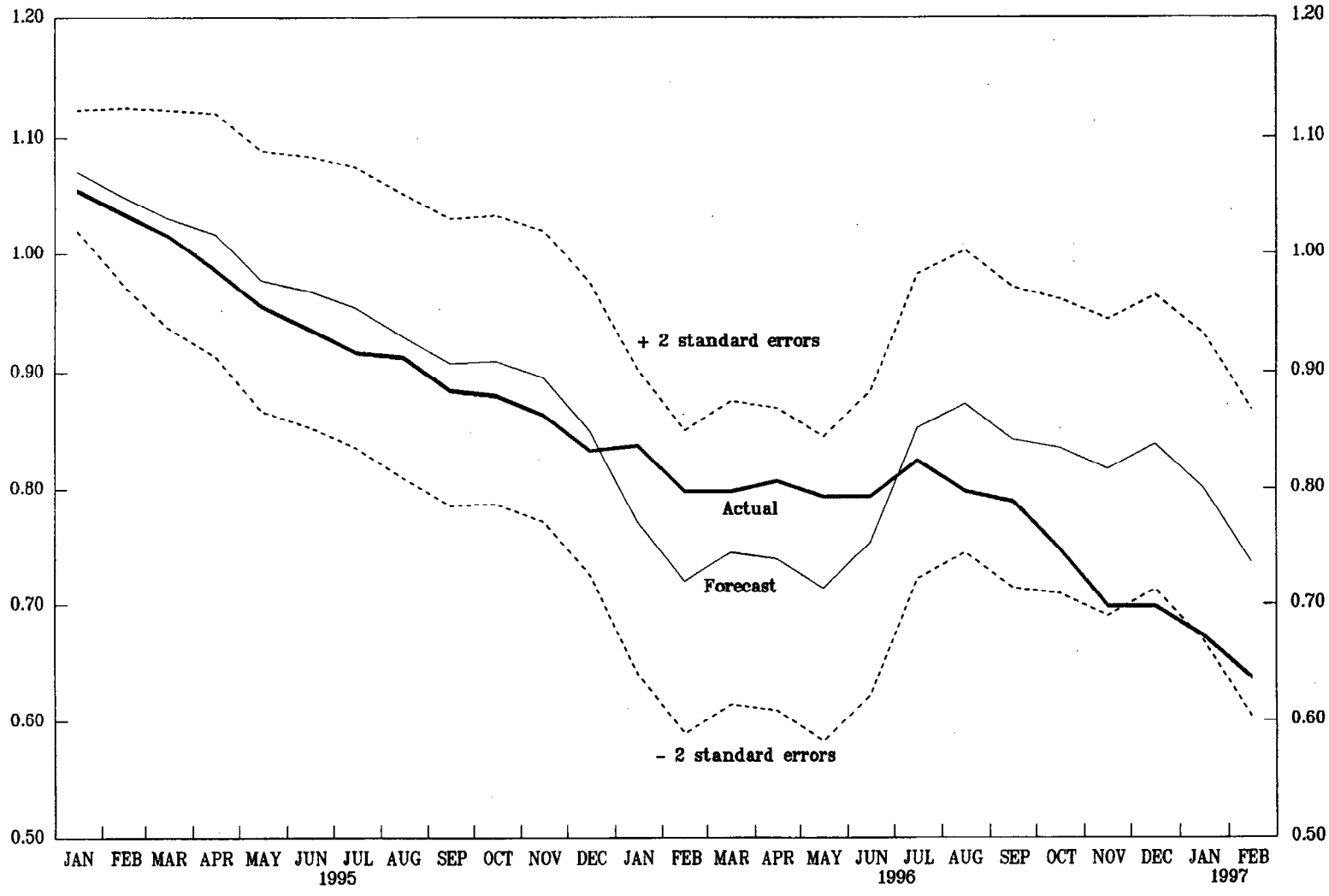


Sources: Standard & Poor's, a division of McGraw-Hill; and Fund staff estimates.

CHART 3

UNITED STATES

LOG DIVIDEND YIELD: FORECAST AND ACTUAL (AUGMENTED MODEL)



Sources: Standard & Poor's, a division of McGraw-Hill; and Fund staff estimates.

VII. The Insurance Role of Social Security[1]

1. The Old-Age and Survivors Insurance portion of the Social Security system is primarily a pay-as-you-go pension plan, in which payroll taxes of current workers are used to finance the benefits of current retirees.[2] As a result of a sharp rise in births from roughly the mid-1940s to the mid-1960s (the baby-boom generation), a long-term decline in fertility rates, and improvements in life expectancy, the number of retirees per worker (the dependency ratio) is expected to rise sharply over the next three decades (Chart 1). This aging of the population compromises the longer-term finances of the Social Security system, which has become the main vehicle for retirement savings in the United States. In 1994, Social Security was the major source of income for approximately 60 percent of the U.S. population over 65 and was responsible for keeping almost 40 percent of the elderly out of poverty. Based on the system's current terms (i.e., contribution and benefit rates), projections suggest that Social Security will not have sufficient funds to pay all promised benefits on time starting around 2030. A low level of confidence in the system, because of this long-term imbalance, was one of the key problems identified by the Social Security Administration Advisory Council (1997).

2. Past analyses of the Social Security system have examined its adverse effects on savings and the supply of labor (see for example Feldstein (1974) and (1996)) and, in turn, options to reform the system are often assessed in terms of the effect they would have on the level of output or aggregate savings. Alternatively, reform options are evaluated on the basis of the ratio of the present value of expected benefits to the present value of contributions (see Gramlich (1996)). However, these analyses generally neglect to take into consideration the value of the insurance that Social Security provides against old-age poverty.

3. This paper illustrates the old-age insurance value of a social security system and evaluates proposed reforms by comparing their insurance value. The analysis is based on a life-cycle general equilibrium model. Parameters in the model are chosen to be consistent with the observed structure of the U.S. economy and the Social Security system, together with the age distribution and life-expectancy characteristics of the U.S. population. The model assumes that the economy is populated with a large number of heterogeneous, risk-averse, rational individuals. These individuals are uncertain about how long they will actually live and how long retirement will last. They can save to provide for retirement, but it is assumed that there are no private annuity markets (in reality this market is thin) to provide some protection against the risk of life-span uncertainty. Results of the model need to be qualified because not all of the potential distortions associated with a social security system are fully incorporated,

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[1]Prepared by Victor Valdivia. A complete description of the model and the simulation results is given in Valdivia (1997).

[2]In the remainder of this paper, Social Security refers only to Old-Age and Survivors Insurance. The disability and hospital insurance parts of the Social Security system are not considered.

and including these distortions would likely lower the net welfare gains from social security implied by the model. Also, the sensitivity of the results to changes in model parameter values, functional forms, and the importance of bequests has not been fully explored.[3]

4. The model illustrates that risk pooling made possible by the introduction of a social security system can provide welfare gains despite the adverse effects it may have on aggregate savings, employment, and output. These gains reflect the insurance the system provides to the elderly against the risk that they will live *much* longer than expected and outlive their savings. At the same time, adverse selection problems can be so severe that they prevent the wide use of voluntary private retirement insurance, making it necessary for social security to be mandatory.[4] The model also suggests that, given the value of social security as old-age insurance, the age of eligibility could be raised without substantially reducing the net welfare gains from the system. On the other hand, the insurance value of the system is diminished to the extent that confidence declines in the ability of the system to meet future obligations.

A. Insurance Role of Social Security

5. Although all individuals in the model are assumed *ex-ante* to save sufficiently to provide for retirement based on their life expectancy, those who *ex-post* live much longer than expected can end up with little savings and, hence, will be able to consume only minimal amounts in the later stages of their lives. The introduction of a social security system provides insurance against this outcome and can therefore raise welfare. On the other hand, the social security system eliminates a precautionary motive for savings associated with longevity uncertainty and encourages early retirement. Therefore, after its introduction, individuals save and work less and aggregate savings, employment, and output fall. The tabulation below shows the model's steady-state estimates of the effect on aggregate economic variables of the introduction of a social security system. However, the model results illustrate that the welfare gains from the old-age insurance that social security provides can more than offset the welfare losses from lower output, employment, and savings. The model also is useful in examining the distributional and welfare effects of social security. Chart 2 shows the distribution of consumption by population group, and Chart 3 shows the distribution of the lifetime utilities of the population, with the average of this utility distribution representing the measure of economy-wide welfare used here.[5]

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[3]In this model, parents care about their offspring and bequeath wealth to them. Most other life-cycle models do not have these features.

[4]Adverse selection occurs when only those individuals who have good reason to believe that they will live for a long time buy annuities. The cost of annuities is therefore high, and many people cannot afford them; see Schulz (1995).

[5]The utility measure reflects the value of leisure. The use of average utility as an economy-wide welfare measure assigns equal weight to all individuals.

Impact of Social Security on Aggregate Variables (In percent deviation from steady-state baseline)	
Output	-6.1
Consumption	-3.3
Investment	-14.0
Capital	-14.0
Employment	-1.3
Wages	-4.8

6. When there is no social security, the long lower tails in the consumption and utility distributions reflect individuals who live for many years, have used up most of their wealth, and are able to consume very little. When social security is available, these tails disappear, since these individuals are protected from the effects of long life on consumption. The clipping of the lower tail in the utility distribution increases average utility, and therefore, welfare.

Distributional and Welfare Impact of Social Security (In percent change from steady-state baseline)	
Wealth distribution	
Mean	-14.0
Standard deviation	-12.2
Consumption distribution	
Mean	-3.3
Standard deviation	-60.0
Utility distribution	
Mean	+26.7
Standard deviation	+44.8
Value of Social Security	
As a percentage of aggregate consumption	4.5
As a percentage of GDP	3.1

The tabulation above shows how disparities in wealth and consumption are reduced by introducing a social security system. Note, however, that disparities in the utility distribution

security is reported in the final two rows of the table. According to the model, individuals would willingly give up around 3 percent of GDP in order to obtain the insurance that social security would provide.

Need for a mandatory system

7. The basic model can be modified by replacing a government-run social security system with a voluntary private retirement insurance scheme. The modified model suggests that *young individuals would prefer not to purchase retirement insurance*. There are two main reasons for this. First, because individuals discount future consumption, the young would prefer to consume more early in their lives, and they would have more disposable income to do so if they do not buy retirement insurance. Second, given uncertainty about the time of death, the young know that they may die before retirement, so they run the risk of buying insurance that they might not end up needing. Both of these effects diminish as individuals advance toward retirement age.

8. The fact that young workers opt not to purchase insurance is an example of adverse selection captured by the model. In reality, there are additional informational problems affecting the pricing and availability of private retirement insurance, because the purchasers of this insurance are likely to have more information about their expected life-spans than the insurance companies. The model suggests that even when there are no such informational asymmetries, the *adverse selection problem arising from the preference of the young not to buy retirement insurance can be so severe that it prevents a nonmandatory retirement insurance plan from working*. In these circumstances mandatory enrollment in social security would overcome the adverse selection problem.[6]

Old-age insurance instead of retirement insurance

9. The welfare gains derived from the basic model arise because of insurance against old age. However, the social security system protects all retirees, not just the very old. To illustrate the effects on the insurance role of social security of increasing the age at which benefits are received, the model is modified. Individuals are assumed to retire at age 65, but receive social security benefits only after they reach some age greater than 65. Hence, social security in effect becomes an insurance scheme that provides protection only against the "catastrophe" of living *much longer* than expected.

10. The welfare gains predicted by the model for different ages of benefit payout are reported in the tabulation below. Almost 90 percent of the welfare gains of the case when the

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[6]Social Security also has the advantage over traditional private pensions in the United States in that it is fully portable from one job to another, and protects workers who change jobs before they are vested in private pensions plans.

age of entitlement to benefits is set at 65 can be obtained with less than half the level of social security taxes, if benefits are paid only to those above age 75.

Old-Age Insurance 1/

Age at Which Benefits are Received	Contribution Rates (Percent)	Value of Social Security (Percent of Aggregate Consumption)	Value of Social Security (Percent of GDP)
65	13.25	4.5	3.1
75	6.11	3.9	2.7
80	3.38	3.3	2.2

1/ A 43 percent income replacement rate for social security benefits is assumed in all cases.

Low confidence in Social Security

11. One problem with Social Security today is the low level of confidence in the system's ability to pay promised benefits in the future. The basic model can be modified to examine how the risk that the government will default on promised benefits would affect a social security system. The model shows that the risk of default lowers the insurance value of social security. Therefore, raising the confidence in social security can raise welfare by making it a more effective insurance program. Hence, it would be possible to raise economic welfare while lowering social security benefits, provided doing so improves the financial position of the social security system and the system's ability to meet its future obligations becomes more credible (see tabulation below).

Effect of Default Risk on Welfare

Probability of Default (Percent)	Value of Social Security (Percent of Aggregate Consumption)	Value of Social Security (Percent of GDP)
0	4.5	3.1
5	4.2	2.9
10	4.0	2.7

B. Options for Reform

12. The report of the Social Security Administration Advisory Council proposed three different approaches to dealing with the long-term financial problems of the Social Security system: the maintenance benefit (MB) plan, the individual accounts (IA) plan, and the personal security account (PSA) plan.

13. The MB plan proposes to continue the current system, subject to some modifications. To meet the system's financial needs, income taxation of Social Security benefits would be increased, coverage would be extended to state and local government employees, and the payroll tax rate would be raised by 1.6 percentage points in the year 2045. The plan also recommends studying the possibility of the Social Security trust fund investing a portion of its assets in a stock index fund, to raise its return and avoid raising taxes in 2045.

14. Under the IA plan, individual accounts would be created alongside the current Social Security system. A 1.6 percentage point increase in the payroll tax rate would fund these accounts. Workers could select a number of investment options, but the accounts would be administered by the government. At retirement, the funds in the individual accounts would be converted to an annuity to supplement the Social Security benefits. Additional measures to improve the financial position of the Social Security system would include increasing income taxation of benefits, expanding coverage to state and local government employees, speeding up the already scheduled increase in the age of eligibility for full benefits[7], and reducing the growth of benefits for middle- and high-wage workers.

15. The PSA plan proposes to establish an individual account for each worker. Five percentage points of payroll taxes would be allocated to these accounts, and these funds could be invested according to the workers' choices but would be privately managed. The rest of the taxes would finance a minimum retirement benefit to all eligible retirees. In addition to this minimum benefit, a worker would receive at retirement the funds accumulated in his PSA. Under this plan, coverage of state and local government employees also would be expanded, the age of eligibility would be raised faster than currently envisaged, and there would be changes to benefits and their income taxation. The 5 percentage points of taxes diverted to the PSAs would not be available to pay for current retirees, and to pay for these liabilities, a 1.5 percentage point increase in the payroll tax rate would be required.

16. A key result from the analysis of this paper is that the pooling of risk through a pay-as-you-go social security system can deliver higher welfare. This suggests that the MB plan

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[7]The retirement age is already scheduled to rise gradually from 65 to 67 between the years 2000 and 2022.

might provide the highest welfare and the PSA plan might provide the least.[8] It also suggests that, if a defined contribution approach is used (as is the case in the IA or PSA plans), it would be preferable to convert the balance in these accounts to an annuity upon retirement. This is because those individuals who live for many more years than expected could withdraw 'too fast' from their saving accounts and could end up in poverty.

17. Another result from the model is that the welfare gains from social security largely stem from protecting the very old. Hence, raising the age at which benefits can be collected may be an effective way to restore financial balance while minimizing the welfare losses due to lower benefits. All plans involve raising this age, but perhaps a more rapid increase, as proposed under the IA and PSA plans, might be a better way to restore balance and limit the increase in payroll taxes.

[8] The insurance value of the proposed reform plans is not fully examined explicitly. For example, the insurance value of the two tiers in the PSA plan was not considered in the model.

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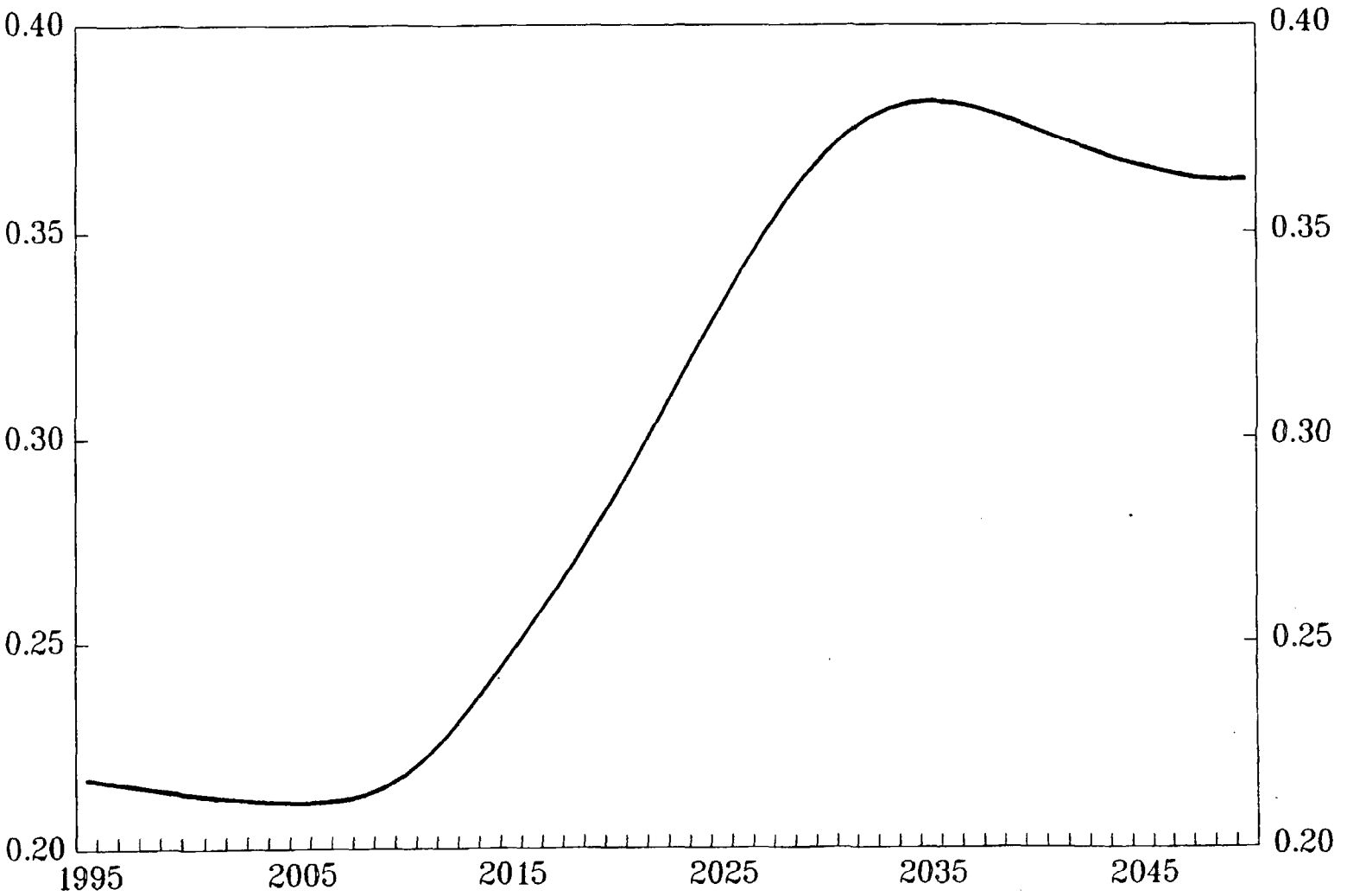
CHART 1

UNITED STATES

PROJECTED DEPENDENCY RATIO 1/

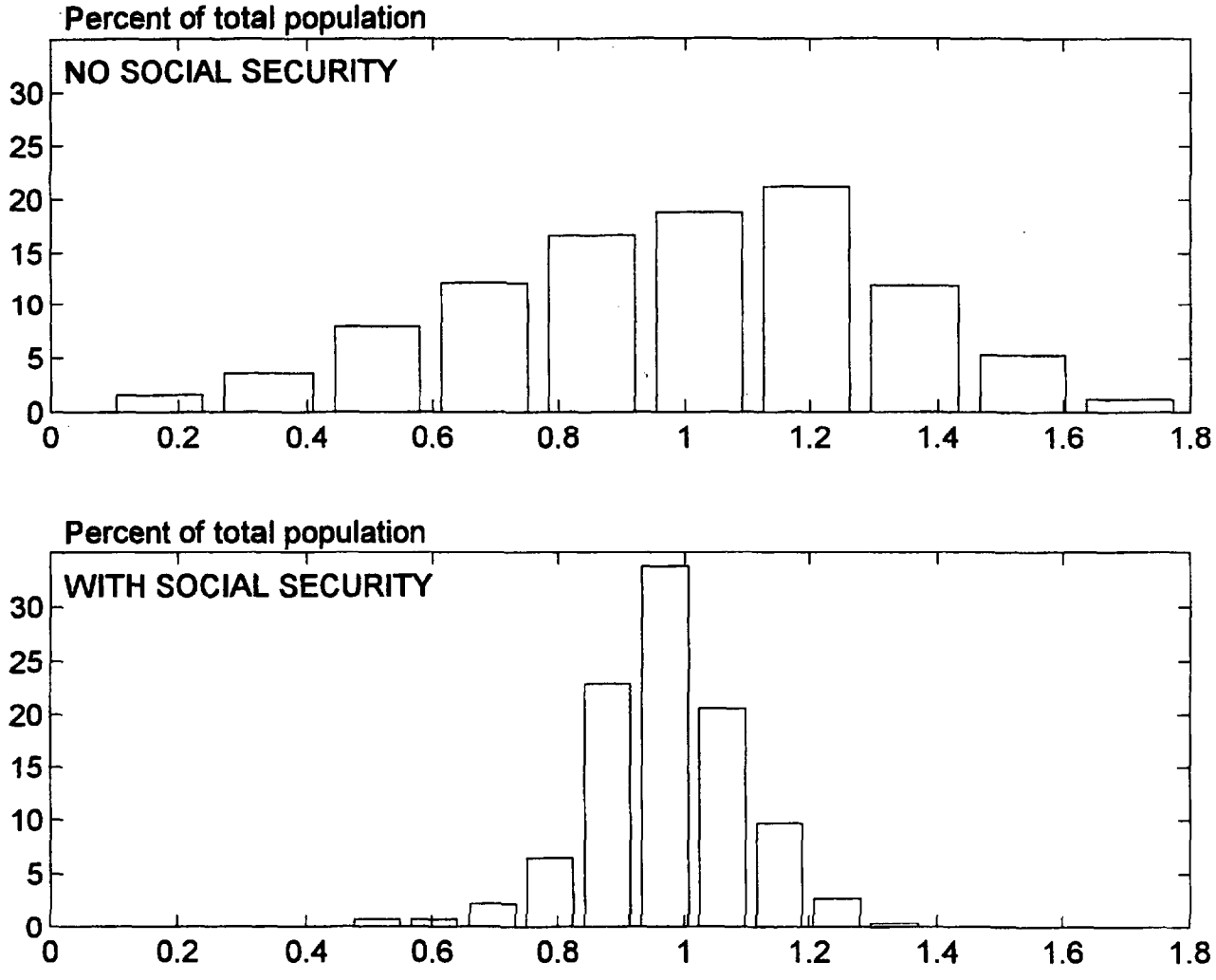


Source: Day (1996).

1/ The number of retirees per worker.

Chart 2

UNITED STATES
CONSUMPTION DISTRIBUTION 1/

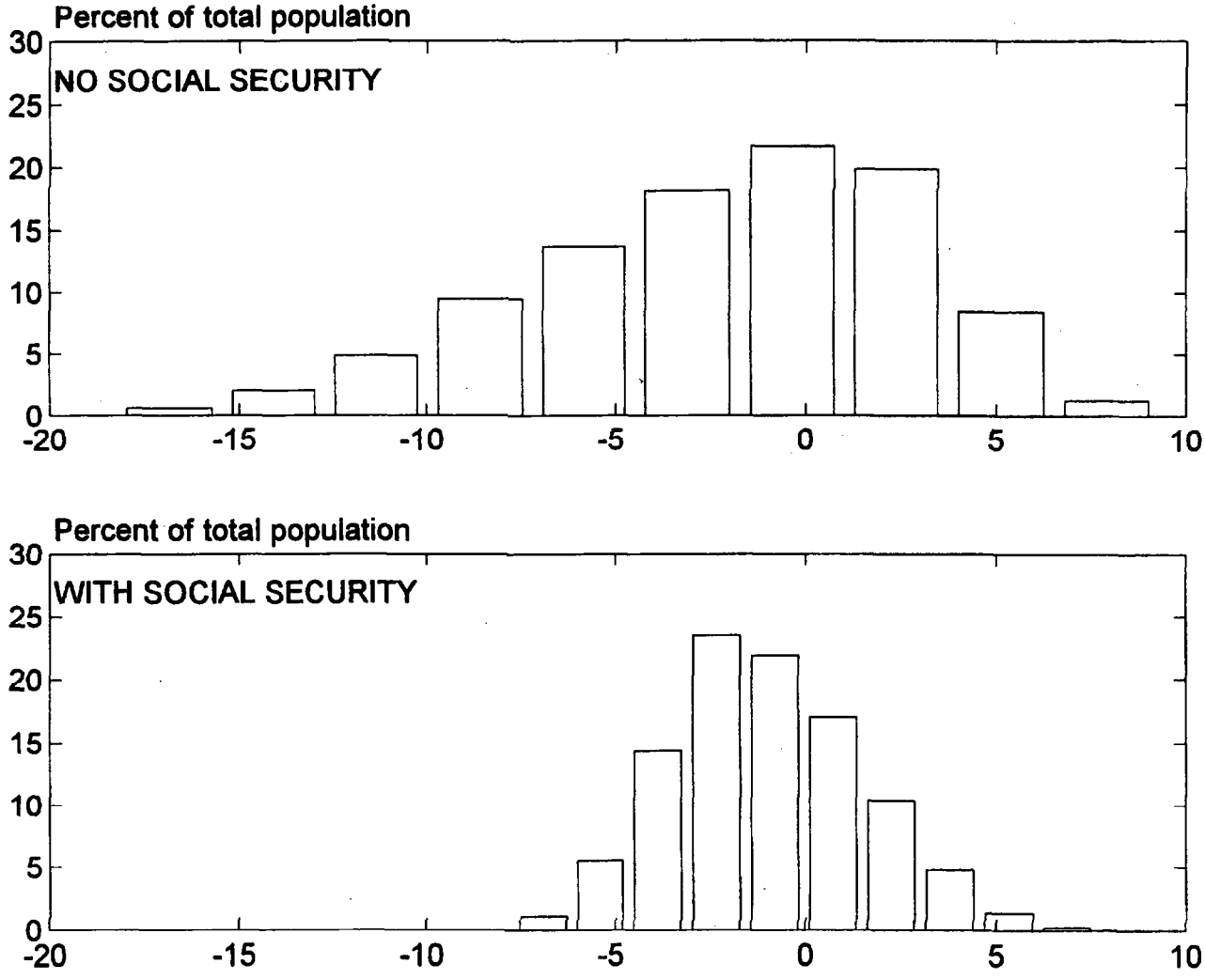


Source: Model simulations.

1/ The x-axis represents values for consumption.

Chart 3

UNITED STATES
UTILITY DISTRIBUTION 1/



Source: Model simulations.

1/ The x-axis represents values for utility.

VIII. Investing Social Security Trust Fund Assets in Private Securities [1]

1. At present, the Social Security system faces a large unfunded liability position as the value of prospective benefits over the longer-term exceeds the prospective receipts of the system from payroll taxes at currently legislated rates and from investment of Social Security trust fund assets by a substantial margin. The possibility of increasing the return on trust fund assets as one approach to addressing the financial needs of the system has received considerable attention. Under current legislation, Social Security trust fund assets are exclusively invested in special government securities.[2] As a result, the expected yield on these assets is lower than if the trust funds were allowed to hold a more diversified portfolio.

2. The recent report of the Advisory Commission on Social Security (1997) proposed a number of options for improving the long-term viability of the system. While the members of the Commission could not agree on a single approach, there was broad agreement that some redirection of assets toward equities and other private securities could be one element in a plan to improve the finances of the system.[3] It was taken as given that allowing the trust funds to hold private assets would increase expected returns and improve the longer-term financial position of the Social Security system.[4] However, there was no attempt to assess the macroeconomic and intergenerational distribution effects of such a change in the system's asset holdings. To examine these effects, a simple, theoretical closed-economy macroeconomic model, with two distinct overlapping generations (workers and retirees) was developed.

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[1] Prepared by Michael Leidy. A complete description of the model and the analysis summarized here is given in Leidy (1997).

[2] There are two Social Security trust funds: the trust fund for Old-Age and Survivors Insurance (OASI, which pays retirement and survivors benefits) and Disability Insurance (DI, which pays disability benefits).

[3] In the Advisory Council report, only the plan identified as "Maintain Benefits" calls specifically for a fraction of trust fund reserves to be invested in equities. However, the other two plans (Individual Accounts and Personal Security Accounts) include provisions to establish individual savings accounts, part of which could be invested in equities.

[4] Investing trust fund assets in private securities is not equivalent to privatizing Social Security (either fully or in part). To be effective, privatization of the system would necessitate raising national saving to fill at least part of Social Security's unfunded liability. A simple proposal to diversify trust fund assets by investing in private securities would not produce the needed increase in national saving; essentially, it would only redistribute investment income between the private and public sector and redistribute real resources between the current and future generations of workers.

3. Because Social Security is essentially a pay-as-you-go[5] system with defined benefits, the current working (or the retired) population has no direct stake in improving the financial outlook of the trust fund, unless the sustainability of the system is in doubt. Rather, it is the future worker/taxpayer whose burden in supporting the next generation of recipients would either be reduced or increased according to the performance of the trust fund's portfolio. This is because any shortfall in the system's receipts relative to its benefit payments would have to be made up through future taxation. Under a variety of assumptions, the model suggests that improving the expected return on trust fund assets, by shifting these investments from government bonds to private securities, tends to *reduce* the future claim on national output of the current working population (i.e., future retirees). As discussed below, whether aggregate saving would be affected, and thereby the level of future output, depends on whether current workers interpret this policy change as affecting their future Social Security benefits.

4. By investing in private securities, Social Security's longer-term financial position would be improved at the expense of expected returns on the private portfolios of the current working population. The model shows that shifting trust fund assets to private securities induces an accommodating adjustment in the structure of private portfolios, which become more heavily weighted toward lower-yielding government bonds. The aggregate saving function in the model treats saving as depending positively on disposable income and negatively on expected future Social Security benefits.[6] If Social Security is perceived as providing defined benefits to retirees, aggregate saving may be unaffected by a shift in the composition of trust fund assets.

5. If aggregate saving is unaffected when trust fund assets are invested in private securities, future real output would remain on the same trajectory as before the policy change, but the future real resources available to current workers would be reduced because the return on the aggregate private portfolio declines. In contrast, the resources available to future workers would increase as their burden of financing the retirement benefits of current workers (future

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[5]A "pay-as-you-go" system implies that the current benefits of retirees are financed out of current payroll tax receipts. Under such a system, benefits are defined and the financing burden facing current workers depends on the size of the guaranteed benefits to current retirees relative to any trust fund assets that may have been accumulated from past contributions.

[6]The expected yield is not included in the aggregate saving function in the model. The response of private saving to a change in the expected yield is ambiguous theoretically and empirical work on aggregate savings in the United States typically indicates that the income and substitution effects induced by a change in yield are largely offsetting.

retirees) would be diminished by the higher returns on trust fund assets invested in private securities. This raises an important issue of intergenerational equity.[7]

6. If, instead, the improvement in the financial position of the Social Security system from investing in private securities leads current workers to feel more secure about the prospect of receiving future benefits, a reduction in aggregate saving may result, since concerns regarding the possible demise of the system may have been helping to support higher levels of saving than otherwise. As a result of lower current saving, the path of future output would be lower. The combination of reduced saving and lower returns on private portfolios would again imply that the future real resources available to the current workers (future retirees) would be significantly lower. The effect on the future generation of workers is, however, less clear. While the level of future real output may be lower as a result of depressed current saving, the obligations of future workers to finance the retirement benefits of current workers (future retirees) would be diminished by the higher returns on trust fund assets invested in private securities. The model suggests that the net impact on the real resources available to future workers will depend on the extent to which the government actually reduces the future tax burden following the improvement in the Social Security system's finances and on the return to equities relative to the real marginal product of capital.

7. The model was also used to examine how the effects of a shift in Social Security trust fund assets toward private securities might differ from a current increase in the Social Security payroll tax as a means to improve the longer-term finances of the system. When future benefits are perceived to be decoupled from the value of trust fund assets, it can be shown that an increase in current taxes increases aggregate national saving and, thus, stimulates future real output. It can be shown that while future workers clearly benefit if capital is priced competitively, the impact on current workers depends on several factors. Specifically, it can be shown that, if the marginal propensity to save out of disposable income exceeds the differential rates of return between private securities and government bonds, then the future consumption of current workers (future retirees) would decline. However, if the marginal propensity to save out of disposable income is smaller than the return differential, then future consumption of current workers would increase. The reason for this is that a tax increase in the pure pay-as-you-go case induces two opposing effects. First, it induces current workers to save less, since the tax increase reduces disposable income, tending to reduce the future income stream of current workers, *ceteris paribus*. Second, because it reduces government borrowing, the tax increase also sets in motion market forces that induce current workers to hold an aggregate portfolio that is more heavily weighted in private securities. This factor, *ceteris paribus*, raises the yield on private portfolios, tending to increase the future income stream of current

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[7]It should also be pointed out that current retirees under the pay-as-you-go system may not have fully contributed to the benefits that they are receiving, depending on when the system was established and how the defined benefits may have been modified over time. In such circumstances, current workers would pay for the benefits of current retirees, as well as for a larger part of their own future benefits, if trust fund assets were invested in private securities.

workers. On balance, if the induced effect on personal saving is small (i.e., the marginal propensity to save is small) relative to the portfolio effect (reflected in the yield differential between government bonds and private securities), the current generation of workers would capture a share of the increase in future output.

8. An issue that was not formally modeled but that warrants comment involves the question of how capital will be allocated across sectors should a policy change allow Social Security assets to be invested in private securities. When capital is allocated privately, there is a tendency for it to flow toward those sectors with the highest return. Consequently, in the absence of distortions, the resulting allocation of resources tends to maximize national product. In assessing the possible macroeconomic effects of investing Social Security trust fund assets in private securities, it is critical to consider whether financial capital would continue to pursue the highest rate of return, or whether the allocation of these assets might be influenced by noneconomic considerations. If investment decisions were to become politicized, the efficient allocation of capital may be undermined and the level of national output reduced.

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IX. MEDICARE: FINANCIAL PROBLEMS AND REFORM OPTIONS[1]

1. Spending on Medicare has risen rapidly in recent years, consuming a growing share of GDP and the federal budget. Under provisions of the current system, financial pressures on Medicare will intensify in the years ahead, particularly as the baby-boom generation begins to retire. A solution to the longer-term financial requirements of the Medicare system will probably require a combination of increases in the Medicare payroll tax, further constraints on payments to health care providers, increases in the costs paid by the system's beneficiaries, and some increase in the age of eligibility. In addition, given the uncertainties about how the demand for Medicare services, and the price of medical services, will evolve over time, there may not be a "once-and-for-all" solution for Medicare's financing problems.

A. *Structure of the Medicare System and its Financial Problems*

2. The Medicare system comprises two separately financed trust funds: the ***Hospital Insurance (HI)*** trust fund, which reimburses health care providers for the costs of inpatient hospitalization, skilled nursing facilities, home health care, and hospice services; and the ***Supplementary Medical Insurance (SMI)*** trust fund, which covers services provided by physicians and hospital outpatient services (Table 1). Persons age 65 and over, and most disabled persons are eligible for HI coverage. Funding for HI benefits comes from a payroll tax, with employees and employers each currently paying 1.45 percent of earnings. SMI coverage is optional and available to all people eligible for HI benefits. SMI is financed through federal government general revenues and enrollee premiums, which currently are set at 25 percent of SMI costs through 1998 (the current monthly premium rate is $43.80 per enrollee). Medicare beneficiaries incur other health care expenses reflecting deductibles and co-payments for some services, as well as payments for medical services not covered by HI or SMI.

3. Medicare beneficiaries can choose between two kinds of coverage: *fee-for-service,* in which beneficiaries freely choose their health care providers, and *managed-care plans,* in which beneficiaries receive services from a network of providers. About 90 percent of current beneficiaries opt for the fee-for-service coverage. Fee-for-service providers are paid directly by Medicare according to an established fee schedule or reasonable costs. Managed-care plans are paid 95 percent of fee-for-service costs, with adjustments for demographic and other characteristics of the plan's beneficiaries. While managed-care plans limit the choice of providers, they tend to cover a broader range of services and entail less out-of-pocket expenses for beneficiaries.

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[1]Prepared by Brenda González-Hermosillo and Jeffrey Cole. Additional information is available on request.

4. The most immediate financial problem faced by Medicare is the growing deficit in HI. In the near term, this deficit can be met by drawing down trust fund assets. However, on the basis of current policies, the Medicare Trustees expect HI expenditures to continue to outpace revenues and to exhaust the trust fund by 2001 (Table 2).[2] SMI does not face the same immediate financing problems since it is funded in part from federal government general revenues. Nevertheless, the program's effect on the federal budget would grow significantly, since current law limits SMI premium increases after 1998 to the rate of increase in Social Security benefits. Hence, based on SMI cost projections, premium receipts would account for a declining share of SMI costs over time.

5. The basic financial problems of Medicare reflect the rapid growth in outlays per beneficiary that has occurred over the past two decades. As a percent of GDP, Medicare spending more than doubled between 1975 and 1995 (Table 3, Chart 1, and tabulation below), with the percentage of the population enrolled increasing from 10.8 percent to 13.6 percent. Outlays per enrollee rose by 650 percent over this period, in part reflecting the relatively rapid rate of increase in the cost of medical services (Table 1). However, outlays per beneficiary rose by 60 percent in real terms over the same period, largely owing to changes in program coverage and advances in medical technology which have introduced new treatments.

6. Projections in the Medicare Trustees' annual reports suggest that, while growth in outlays per beneficiary is expected to slow gradually over the period to 2070, the number of enrollees would rise rapidly to nearly 25 percent of the total population by 2070 (Table 3, Chart 1, and tabulation below). The sharp rise in the number of enrollees, particularly in the early part of the next century, reflects members of the baby-boom generation reaching 65 (Table 4). Accordingly, Medicare outlays are expected to rise from about 2.6 percent of GDP in 1996 to around 4.2 percent in 2010, and double to 8.4 percent by 2070. Medicare income is expected to rise from 2.8 percent of GDP in 1996 to 3.6 percent in 2010 and 5.6 percent in 2070, leaving a rising gap in the program's finances.[3] At the same time, to cover the growing costs in the SMI program (and assuming no changes in the current SMI premium structure), budget outlays to meet the federal government's share of SMI expenditures would rise from 0.9 percent of GDP in 1996 to 1.9 percent in 2010 and 3.8 percent in 2070 (Table 3 and Chart 2). Hence, the combined financing required to meet projected Medicare costs would rise from around 0.7 percent of GDP in 1996 to 6.6 percent in 2070.

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[2] The Medicare Trustees' projections reported in this note are based on "intermediate assumptions" which constitute the Trustees' best estimate of future program income and outlays.

[3] The estimated Medicare income includes the Trustees' projection for HI income and staff's estimates for SMI revenues which are based on the assumptions of no changes from the current SMI premium structure and a balance in the SMI trust fund that remains constant at the historical minimum level of around 20 percent of SMI costs.

7. It should be emphasized that the Medicare Trustees' projections of the program's longer-term costs are "best guesses" of medical care costs. In the past, Medicare expenditures have been substantially underestimated because of more-rapid-than expected increases in prices of medical services and demand for health care services. In part, this development has reflected advances in medical technology that have dramatically changed treatment regimes.

Medicare Enrollment, Income, and Outlays

(In percent of GDP)

	Enrollment (Percent of Population)	Income	Total Outlays	Of Which: Federal Budget Outlays for SMI	Gap
1975	10.8	1.1	1.0	0.2	0.1
1980	11.8	1.3	1.3	0.3	0.0
1985	12.2	1.8	1.7	0.4	0.1
1990	12.9	2.2	1.9	0.6	0.3
1995	13.6	2.4	2.5	0.5	-0.1
1996	13.7	2.8	2.6	0.9	0.1
2010	14.8	3.6	4.2	1.9	-0.6
2030	21.8	5.3	7.1	3.4	-1.9
2050	22.9	5.3	7.8	3.5	-2.5
2070	24.4	5.6	8.4	3.8	-2.8

Sources: Social Security and Medicare Trustees' 1997 annual reports; and Fund staff estimates.

B. Options for Reform

8. The Medicare Trustees estimate that measures enacted promptly equivalent to a 4 percentage point increase in the Medicare payroll tax would be required to fill the projected gap in the HI program through 2070. Payroll taxes, however, are already high, and it might not be desirable to address the system's needs solely through increases in these taxes. Equity considerations would also argue for spreading the burden of financing Medicare across generations. Medicare costs will have to be contained by further efforts to reduce the growth in payments to health care providers and by changing incentives in the system to promote greater efficiency and to encourage beneficiaries to choose lower-cost options. In addition, reductions in benefits also may need to be considered.

9. Measures to shore up Medicare's short-term financial position are included in the balanced budget agreement reached between the Administration and the Congress in May 1997. The balanced budget agreement stipulates that overall Medicare savings will amount to $115 billion over the next five years ($434 billion over ten years), extending the life of the HI trust fund through 2007. Details regarding the measures to be taken to meet the agreements provision remain to be finalized. Measures are expected to include reforms in payments to medical service providers, a reallocation of home health care services from coverage by HI to SMI, and maintaining SMI premiums at 25 percent of the program's costs after 1998.[4] While these proposal will contribute to lowering Medicare's costs, they would not redress the system's long-term financial problems in a substantial way.

10. Limitations on Medicare providers in the *fee-for-service* sector usually have focused on restraining costs by limiting the increase in the system's fees under the current practice of periodic "updates."[5] Controlling costs in this way runs the risk of creating incentives for providers to offer a higher volume of services in order to maintain fee income, while beneficiaries do not have substantial incentives to refuse "unnecessary" services. Hence, as past experience suggests, measures to limit the rise in the prices for medical services may not be fully effective in curbing Medicare spending. In the *managed-care* sector, Medicare's payments are a fixed amount per beneficiary, giving providers an incentive to enroll relatively healthy beneficiaries who are expected to use fewer services on average. As a result, Medicare may pay more for the typical beneficiary in a managed-care plan than it would have cost for such beneficiaries in the fee-for-service sector. One way to realize savings would be to reduce the reference rate for payments to managed-care plans to attempt to capture at least part of the impact of this "favorable selection" incentive, by having Medicare reimbursement more directly linked to costs in this sector.

11. Redressing Medicare's long-term financial viability would require overhauling the structural characteristics of the system in a way that would control costs and provide some incentive for beneficiaries to be more prudent users of Medicare services. Increases in deductibles or co-payments would provide such an incentive for beneficiaries to be more prudent users of Medicare services.

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[4] While not affecting the overall Medicare income-outlay gap, holding SMI premiums at 25 percent of SMI costs would reduce required federal government transfers to the SMI program by 0.2 percent of GDP in 2010 and by 0.6 percent of GDP by 2070.

[5] The Health Care Financing Administration periodically adjusts Medicare's fee-for-service payments to reflect inflation or cost increases.

12. Medicare costs also might be reduced by the introduction of some means testing in the program. This could be achieved by raising the premiums or the deductibles that affluent Medicare recipients pay. [6]

13. A more radical approach would be to convert Medicare into some form of a defined contribution plan under which Medicare would pay a fixed amount annually toward the health care costs of each beneficiary and costs in excess of this amount would have to be paid by the beneficiary. While a switch to a defined contribution plan would make Medicare outlays more predictable, it would shift the risk of unanticipated increases in medical service costs to beneficiaries. For lower-income beneficiaries, this risk would likely be borne by other government programs (in particular, Medicaid), but this could help target benefits more effectively. Converting Medicare into a defined-contribution plan would provide incentives for beneficiaries to be more discriminating, while at the same time fostering greater competition among the various kinds of health care providers. Both of these factors would serve to limit the growth in overall health care costs.

14. Potential savings from limiting Medicare's cost increases can be quite significant. For example, a permanent 1 percentage point reduction in the annual rate of growth in outlays per enrollee would reduce projected annual Medicare costs by $10.5 billion in 2000, $81.4 billion in 2010, and $785 billion by 2030 (Chart 3).

15. Medicare benefits also might be cut by reducing eligibility. In particular, the age of eligibility might be raised to more than 65 years old over time, reflecting increased life expectancy and paralleling possible increases in the retirement age for receiving full Social Security benefits.[7] The Congressional Budget Office developed a scenario based on an increase in the age of eligibility for Medicare from 65 to 70, phased in over the period from 2003 to 2032 (tabulation below). Medicare enrollment as a percent of the total population would be reduced by ¼ percentage point in 2010, by 4¼ percentage points in 2030, and by nearly 5½ percentage points in 2070. On this basis, Medicare outlays would be reduced by 0.1 percent of GDP in 2010, by 1 percent of GDP in 2030, and by 1¼ percent of GDP in 2070. Larger savings could be realized by either speeding up the phase-in of the increase in the age of entitlement, or by raising it to more than 70 years old.

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[6] The Senate Finance Committee had initially proposed to raise the deductibles paid by high income Medicare recipients, but it recognized that there could be significant implementation problems associated with this alternative. The Senate subsequently focussed on the proposal of mean-testing payments for premiums. In particular, the Senate proposed that increased Medicare premiums should be paid by elderly individuals with annual incomes above $55,000 and couples with combined incomes above $75,000.

[7] As part of the potential measures to address Medicare's financial problems, the Senate proposed to raise the program's eligibility age from 65 to 67.

Medicare Enrollment and Outlays Projections Assuming Age of Eligibility is Raised to 70 by 2032

	Current Law		Increase Age of Eligibility	
	Enrollment (Percent of Population)	Total Outlays (Percent of GDP)	Enrollment (Percent of Population)	Total Outlays (Percent of GDP)
1996	13.7	2.8	13.7	2.8
2010	14.8	4.2	14.6	4.1
2030	21.8	7.1	17.6	6.1
2050	22.9	7.8	17.5	6.5
2070	24.4	8.4	19.0	7.1

Sources: Medicare Trustees' 1997 annual reports, Congressional Budget Office; and Fund staff estimates.

List of References

Congressional Budget Office, 1997a, *Reducing the Deficit: Spending and Revenue Options*, A Report to the Senate and House Committees on the Budget, March.

_____, 1997b, *Long-Term Budgetary Pressures and Policy Options*, A Report to the Senate and House Committees on the Budget, March.

Social Security and Medicare Boards of Trustees, 1996, *Status of the Social Security and Medicare Programs*, Washington D.C., June.

Table 1. United States: Medicare Enrollees and Expenditures, According to Type of Service

	1970	1975	1980	1985	1990	1992	1993	1994 1/	1995 1/	1996 1/	Average Annual Growth Rate 1970s-1980s	1980s-1990s	1990-1996
						(Millions of people)							
Enrollees													
Total	20.5	25.0	28.5	31.1	34.2	35.6	36.3	36.9	37.6	38.1	3.0	1.7	1.6
Hospital Insurance (HI)	20.4	24.6	28.1	30.6	33.7	35.2	35.9	36.5	37.0	37.6	3.0	1.7	1.6
Supplementary medical insurance (SMI)	19.6	23.9	27.4	30.0	32.6	33.9	34.6	35.2	36.0	36.4	3.1	1.6	1.6
						(Millions of dollars)							
Expenditures													
Total	7,493	16,316	36,822	72,294	110,984	135,845	150,370	164,862	184,200	200,337	15.6	10.6	8.8
Total HI	5,281	11,581	25,577	48,414	66,997	85,015	94,391	104,545	117,600	129,929	15.4	9.1	9.9
Total SMI	2,212	4,735	11,245	23,880	43,987	50,830	55,979	60,317	66,600	70,408	15.9	13.2	7.0
Expenditures per enrollee													
Total	366	653	1,292	2,325	3,245	3,816	4,142	4,468	4,899	5,258	12.2	8.7	7.1
Total HI	*259*	*471*	*910*	*1,582*	*1,988*	*2,415*	*2,629*	*2,864*	*3,178*	*3,456*	*12.1*	*7.4*	*8.2*
Total SMI	113	198	410	796	1,349	1,499	1,618	1,714	1,850	1,934	12.5	11.4	5.3
						(Millions of 1983-84 medical care dollars)							
Real expenditures													
Total	22,038	34,349	49,162	63,639	68,088	71,385	74,588	78,060	83,462	87,675	7.6	3.0	3.7
Total HI	15,532	24,381	34,148	42,618	41,102	44,674	46,821	49,500	53,285	56,862	7.4	1.7	4.7
Total SMI	6,506	9,968	15,013	21,021	26,986	26,710	27,767	28,559	30,177	30,813	7.9	5.5	1.9
Real expenditures per enrollee													
Total	1,075	1,374	1,725	2,046	1,991	2,005	2,055	2,115	2,220	2,301	4.4	1.3	2.1
Total HI	761	991	1,215	1,393	1,220	1,269	1,304	1,356	1,440	1,512	4.3	0.0	3.1
Total SMI	332	417	548	701	828	788	803	811	838	847	4.7	3.8	0.3
						(Percent of total program expenditures)							
HI													
Inpatient hospital	91.4	93.9	94.3	92.8	88.7	83.7	80.7	78.0	...	...			
Skilled nursing facility	4.7	2.4	1.5	1.1	3.8	4.9	6.1	7.3	...	...			
Home health agency	1.0	1.4	2.1	4.0	5.5	8.9	10.9	12.0	...	...			
Hospice	0.0	0.0	0.0	0.1	0.5	1.0	1.1	1.4	...	...			
Administrative expenses	3.0	2.3	2.1	2.0	1.4	1.6	1.2	1.4	...	...			
SMI													
Physician	80.9	72.1	72.8	72.5	67.3	63.9	63.0	62.2	...	...			
Outpatient hospital	5.2	13.6	16.9	18.1	19.3	21.4	20.6	22.4	...	...			
Home health agency	1.5	2.0	2.1	0.2	0.2	0.2	0.2	0.2	...	...			
Group practice prepayment - HMOs	1.2	1.7	1.8	3.0	6.4	7.8	8.9	9.1	...	...			
Independent laboratory	0.5	0.8	1.0	2.3	3.4	3.7	3.7	3.3	...	...			
Administrative expenses	10.7	9.8	5.4	3.9	3.5	3.1	3.6	2.8	...	...			
						(Index 1983-84=100)							
Addendum													
CPI - All items	38.8	53.8	82.4	107.6	130.8	140.4	144.6	148.3	152.5	157.0	7.1	4.3	2.6
CPI - Medical care items	34.0	47.5	74.9	113.6	163.0	190.3	201.6	211.2	220.7	228.5	7.4	7.3	4.9

Sources: National Center for Health Statistics. Health, United States, 1995; and Medicare Trustees' annual reports.

1/ Preliminary estimates.

Table 2. United States: Income, Outlays, and Balances of the Medicare Trust Funds 1/

(In billions of dollars)

	HI				SMI			
			Trust Fund				Trust Fund	
	Income	Outlays	Net Increase	Balance	Income	Outlays	Net Increase	Balance
1970	6.0	5.3	0.7	3.2	2.2	2.2	0.0	0.2
1975	13.0	11.6	1.4	10.5	4.7	4.7	-0.1	1.4
1980	26.1	25.6	0.5	13.7	10.9	11.2	-0.4	4.5
1985	51.4	48.4	3.0	20.5	25.1	23.9	1.2	10.9
1990	80.4	67.0	13.4	98.9	45.9	44.0	1.9	15.5
1991	88.8	72.6	16.3	115.2	51.2	48.9	2.3	17.8
1992	93.8	85.0	8.8	124.0	57.2	50.8	6.4	24.2
1993	98.2	94.4	3.8	127.8	57.7	57.8	-0.1	24.1
1994	109.6	104.5	5.0	132.8	55.6	60.3	-4.7	19.4
1995	115.0	117.6	-2.6	130.3	60.3	66.6	-6.3	13.1
1996	124.6	129.9	-5.3	124.9	85.6	70.4	15.2	28.3
1997	127.4	140.2	-12.8	112.2	80.9	76.9	4.0	32.3
1998	131.4	151.5	-20.1	92.1	85.3	84.8	0.5	32.8
1999	135.4	164.1	-28.6	63.4	94.0	93.5	0.5	33.3
2000	139.7	177.7	-37.9	25.5	102.9	102.4	0.5	33.8
2001	143.8	192.8	-48.9	-23.4	112.9	112.3	0.6	34.4
2002	147.9	208.8	-60.8	-84.3	124.3	123.6	0.7	35.1
2003	151.8	225.9	-74.1	-158.3	137.0	136.2	0.8	35.9
2004	155.4	244.0	-88.6	-246.9	151.1	150.2	0.8	36.7
2005	159.2	262.9	-103.7	-350.6	168.5	165.9	2.6	39.2
2006	162.3	283.2	-120.9	-471.5	188.0	183.6	4.4	43.7

Source: Medicare Trustees' annual reports.

1/ Data for 1997 - 2006 are the Trustees' projections based on their intermediate scenario.

Table 3. United States: Medicare Outlays, Income, and Program Gap Projections 1/

(In percent of GDP, unless otherwise indicated)

		Outlays					Income				Program Gap	
								SMI				
Year	Enrollees as a Percent of Population	HI	SMI	Total	Per Enrollee ($'000)	Growth Per Enrollee (Average Annual Percent)	HI	Total	Of Which: Federal Government Transfer	Total	Total	Excluding Federal Government Transfer
1970	9.4	0.51	0.21	0.72	0.4		0.58	0.21	0.11	0.79	0.07	-0.04
1975	10.8	0.71	0.29	1.00	0.7	12.5	0.80	0.29	0.16	1.08	0.08	-0.08
1980	11.8	0.92	0.40	1.32	1.3	14.6	0.94	0.39	0.27	1.33	0.01	-0.26
1985	12.2	1.16	0.57	1.73	2.4	12.5	1.23	0.60	0.44	1.83	0.10	-0.34
1990	12.9	1.17	0.77	1.93	3.3	6.7	1.40	0.80	0.58	2.20	0.27	-0.31
1995	13.6	1.62	0.92	2.54	5.0	8.5	1.59	0.83	0.54	2.42	-0.12	-0.66
1996	13.7	1.71	0.93	2.64	5.3	7.1	1.64	1.13	0.86	2.77	0.13	-0.73
2000	14.0	1.92	1.11	3.03	7.0	7.2	1.47	1.11	0.85	2.58	-0.45	-1.30
2005	14.2	2.18	1.39	3.57	10.2	7.8	1.46	1.40	1.15	2.86	-0.71	-1.86
2010	14.8	2.43	1.80	4.23	14.5	7.3	1.47	2.16	1.90	3.63	-0.60	-2.50
2015	16.2	2.77	2.23	5.00	19.3	5.9	1.48	2.68	2.40	4.16	-0.84	-3.24
2020	18.3	3.18	2.54	5.72	24.0	4.5	1.49	3.05	2.74	4.54	-1.18	-3.92
2025	20.3	3.61	2.86	6.47	29.8	4.5	1.50	3.43	3.10	4.93	-1.54	-4.64
2030	21.8	4.01	3.13	7.14	37.8	4.9	1.51	3.76	3.41	5.27	-1.87	-5.28
2035	22.6	4.31	3.26	7.57	48.3	5.0	1.51	3.91	3.57	5.42	-2.15	-5.72
2040	22.7	4.49	3.25	7.74	61.6	5.0	1.50	3.90	3.57	5.40	-2.34	-5.91
2045	22.6	4.59	3.20	7.79	77.7	4.7	1.49	3.84	3.53	5.33	-2.46	-5.99
2050	22.9	4.63	3.17	7.80	96.0	4.3	1.49	3.80	3.50	5.29	-2.51	-6.01
2055	23.1	4.67	3.20	7.87	119.7	4.5	1.48	3.84	3.55	5.32	-2.55	-6.10
2060	23.8	4.74	3.29	8.03	148.0	4.3	1.48	3.95	3.66	5.43	-2.60	-6.26
2065	24.1	4.84	3.37	8.21	186.0	4.7	1.47	4.04	3.76	5.51	-2.70	-6.46
2070	24.4	4.96	3.42	8.38	234.6	4.8	1.46	4.10	3.83	5.56	-2.82	-6.65

Sources: Social Security and Medicare Trustees' 1997 Annual Reports; and Fund staff estimates.

1/ Data for 2000-2070 include the Trustees' projections (based on their intermediate scenario) for HI outlays, SMI outlays, and HI income. The 2000-2070 projections for SMI income are staff estimates.

Table 4. United States: Population by Age

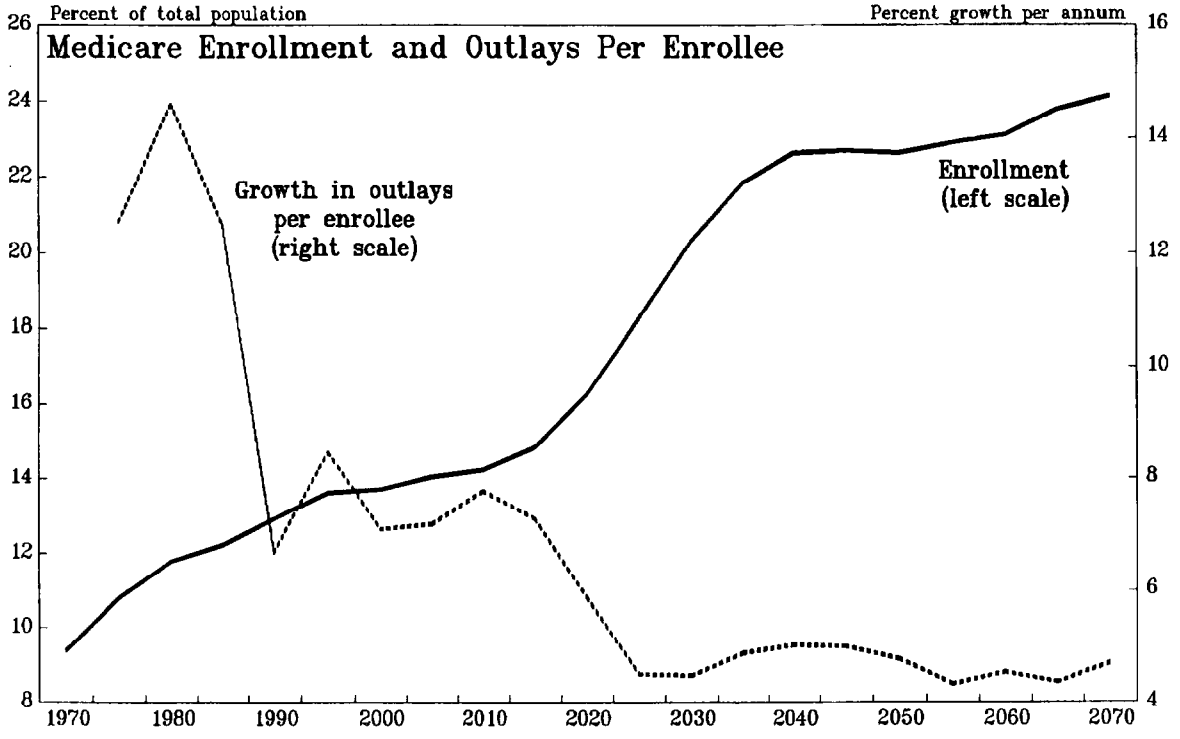
Age Group	1950	1970	1990	1995	Projected 2000	2010	2020	2030	2040	2050	2060	2070
					(Millions of people)							
Less than 20 years old	54	81	75	79	81	81	82	83	83	84	85	85
20 to 64 years old	93	113	153	160	168	186	193	192	198	203	203	206
65 and older	13	21	32	34	35	40	53	68	73	75	81	84
Total	**159**	**215**	**260**	**273**	**285**	**307**	**328**	**344**	**355**	**362**	**369**	**376**
					(Percent of total population)							
Less than 20 years old	33.8	37.6	28.9	29.0	28.6	26.5	24.9	24.2	23.5	23.2	23.0	22.8
20 to 64 years old	58.2	52.7	58.8	58.5	59.0	60.5	58.9	55.9	55.9	56.0	55.1	54.8
65 and older	8.0	9.7	12.3	12.5	12.4	13.0	16.2	19.9	20.6	20.8	21.9	22.5
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

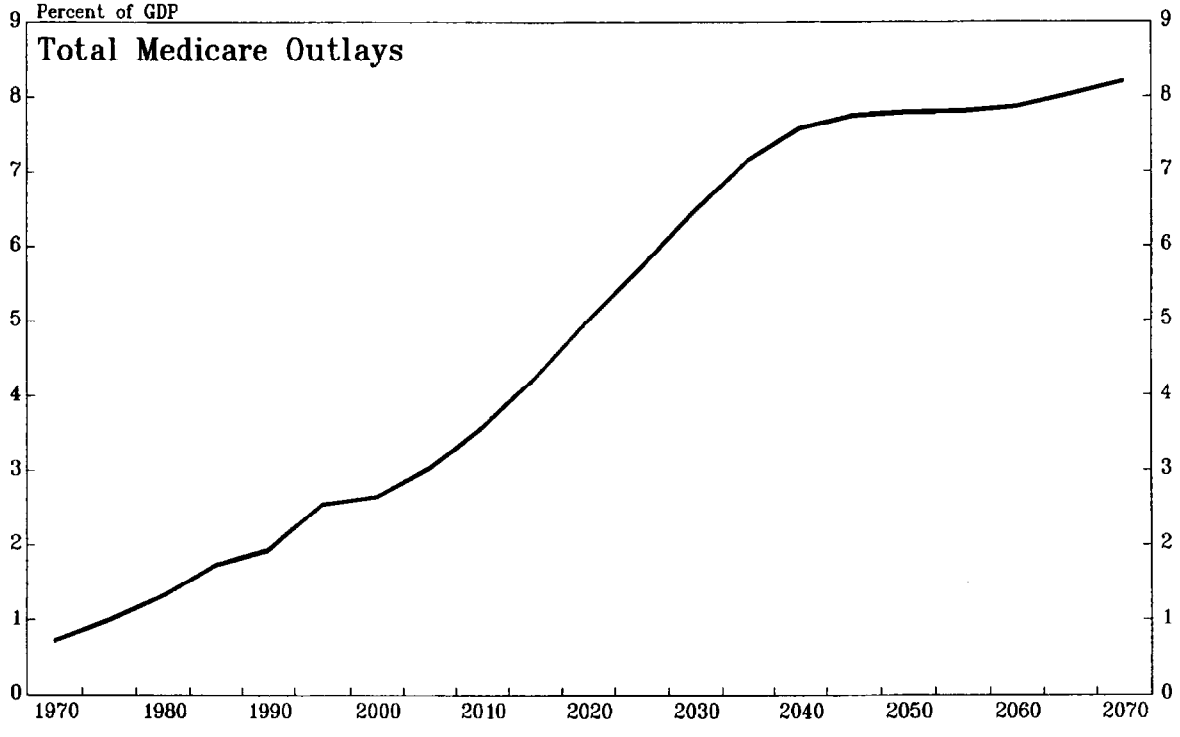
Source: Social Security Trustees' 1997 Annual Report.

CHART 1

UNITED STATES

MEDICARE ENROLLEE AND OUTLAY PROJECTIONS 1/





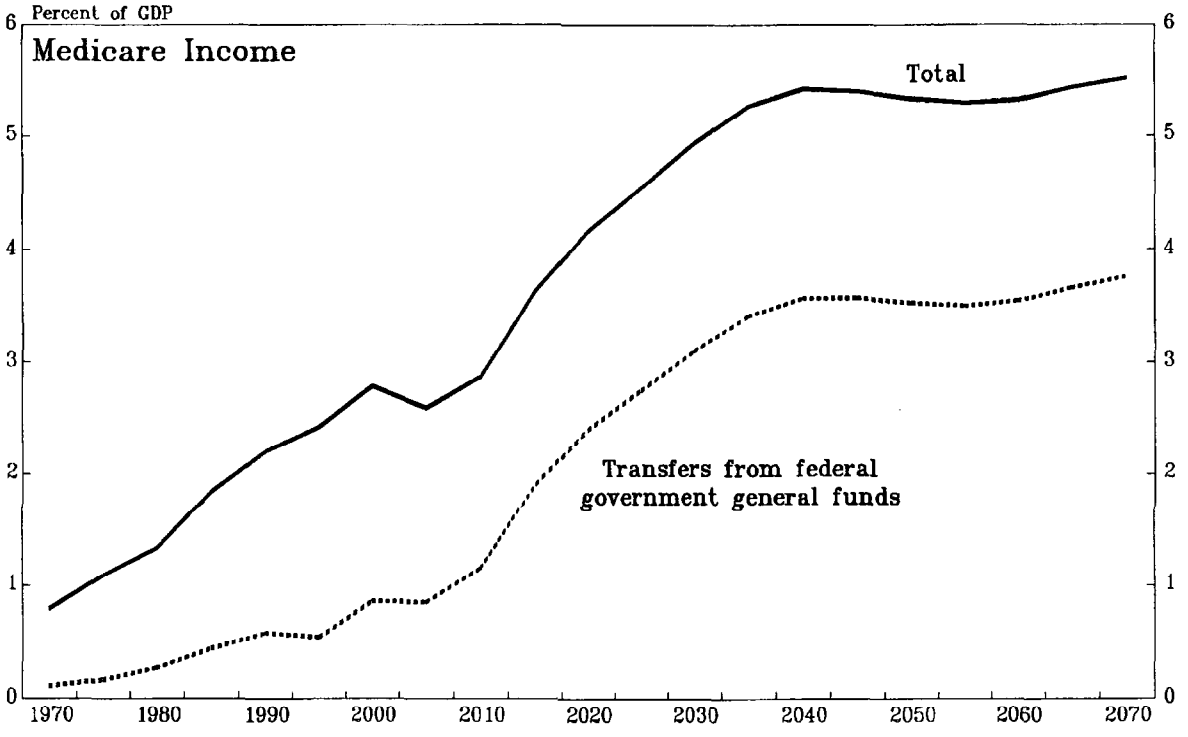
Source: Social Security and Medicare Trustees' 1997 Annual Report; and Fund staff estimates.

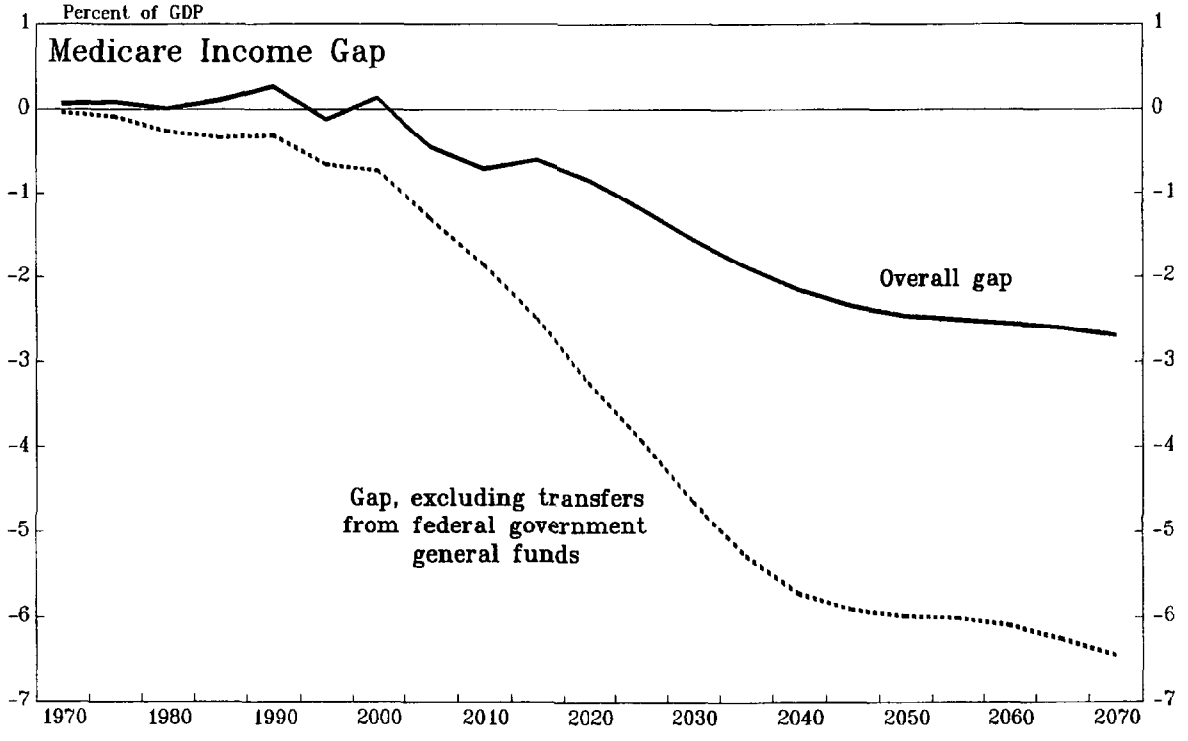
1/ Data for 2000-2070 include the Trustees' projections (based on their intermediate scenario) for HI and SMI outlays. The number of enrollees is based on the Trustees' demographic projections.

CHART 2

UNITED STATES

MEDICARE INCOME AND GAP PROJECTIONS 1/





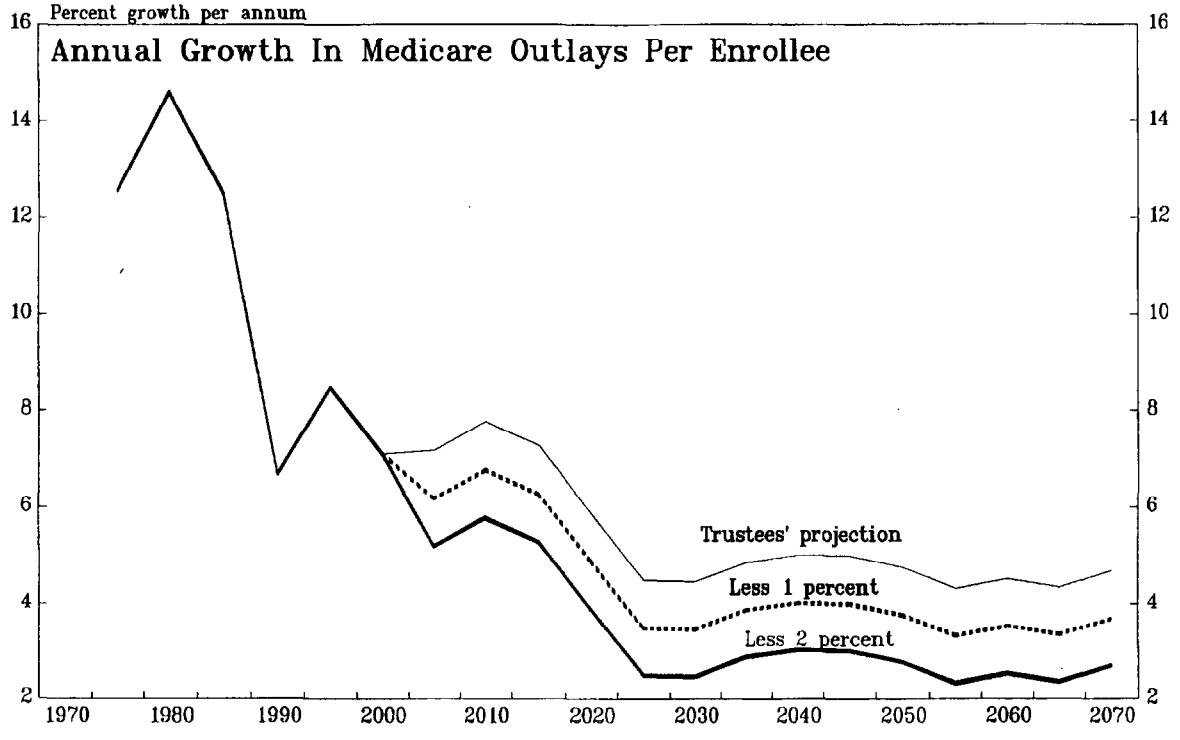
Source: Social Security and Medicare Trustees' 1997 Annual Report; and Fund staff estimates.

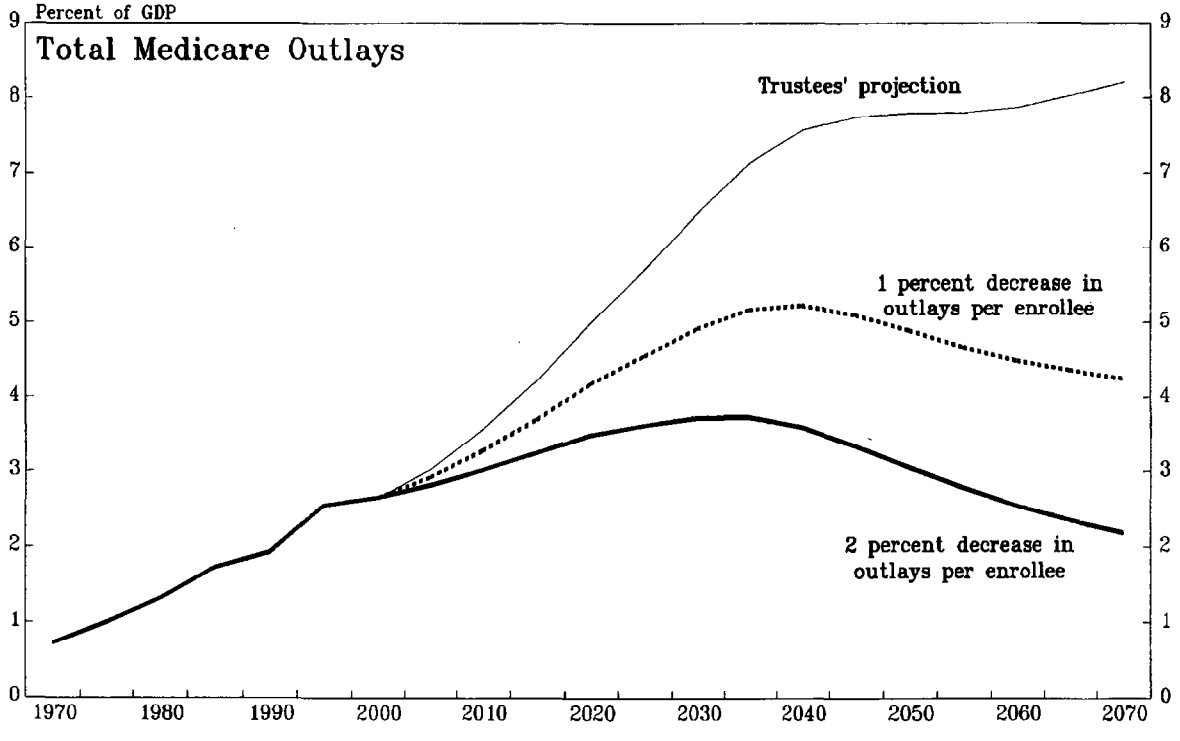
1/ Data for 2000-2070 includes the Trustees' projections (based on their intermediate scenario) for HI outlays, SMI outlays, and HI income. The 2000-2070 projections for SMI income are staff estimates.

CHART 3

UNITED STATES

GROWTH PER ENROLLEE AND OUTLAY PROJECTIONS 1/





Source: Social Security and Medicare Trustees' 1997 Annual Report; and Fund staff estimates.

1/ Data for 2000-2070 include the Trustees' projections (based on their intermediate scenario) for HI and SMI outlays. The number of enrollees is based on the Trustees' demographic projections.

X. Official Development Assistance

1. The U.S. budget for development assistance is channeled primarily through the Agency for International Development (USAID), the Economic Support Fund (ESF), the multilateral development banks (MDBs), and food aid under Public Law 480. The USAID provides financial support to developing countries, mainly in the form of grants, with a focus on promoting projects related to agricultural development, population control, primary education, health, and the environment. The ESF contributes financial assistance to countries facing security risks, with a large share of these funds being provided to Israel and Egypt. In recent years, most of the contributions to the MDBs have been directed to the World Bank's International Development Association (IDA), which provides concessional lending to the poorest nations. Title 1 of the Public Law 480 provides concessional loans for the purchase of U.S. agricultural commodities, Title 2 provides food aid to both government and private organizations, and Title 3 provides food aid conditional on policy reforms.

2. U.S. foreign assistance outlays on a budgetary basis are estimated to increase to $9.95 billion in FY 1997 from $9.47 billion in FY 1996 (0.13 percent of GDP in both years) (Table 1). Programs which received increases in funding included humanitarian and refugee relief, the ESF, and food aid. For FY 1998, the balance budget agreement provides for increases in foreign assistance roughly in line with the Administration's proposals in the budget released in February 1997, which envisaged further increases in spending on aid programs. In particular, the agreement provides for funding to pay the U.S. arrears to the United Nations and other international organizations over the next three fiscal years, contingent on demonstrable reforms in these institutions, and funding for the New Arrangements to Borrow (NAB). Funding for the latter initiative would be accommodated at the requested level by a provision that would allow for an upward adjustment to discretionary spending limits should Congress act to support the proposal.[1] Final details on the level and composition of foreign assistance spending remain to be worked out by the Administration and Congress.

3. In its 1996 report, the OECD Development Assistance Committee (DAC) noted that U.S. official development assistance (ODA) had increased by $1.7 billion in 1996 to $9.1 billion (0.12 percent of GDP). In part, the increase in U.S. ODA in 1996 reflected a make-up in disbursements that were not made in 1995 owing to delays in the enactment of the FY 1996 budget. In terms of the level of assistance provided, the United States ranked as the second largest donor among DAC participants in 1996; however, U.S. ODA as a percent of GNP continues to be the lowest among the list of DAC participants (Table 2).

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[1] A similar provision was made for the increase in the U.S. quota in the IMF in the 1990 Budget Enforcement Act.

Table 1. United States: Outlays for Foreign Assistance on a Budget Basis

(In billions of dollars)

	Fiscal Year						
	1991	1992	1993	1994	1995	1996	1997
Outlays for foreign assistance by program:							
Agency for International Development	2.61	2.94	3.27	3.04	2.49	3.90	3.71
Assistance for New Independent States of the former Soviet Union	0.0	0.0	0.05	0.28	0.83	0.77	0.70
Economic Support Fund	4.32	2.94	3.23	2.77	2.74	2.24	2.47
Multilateral Development Banks	1.26	1.45	1.16	1.36	1.40	1.75	1.67
International Organizations	0.26	0.27	0.38	0.31	0.50	0.30	0.29
PL 480 food aid	0.75	1.35	1.44	1.73	1.37	0.80	1.09
Enterprise for the Americas Initiative debt forgiveness	0.0	0.0	0.0	0.0	0.02	0.0	0.03
Refugee Assistance	0.55	0.67	0.67	0.70	0.71	0.64	0.85
Peace Corps	0.18	0.20	0.21	0.21	0.23	0.21	0.24
Credit Liquidating accounts	0.0	-0.48	-1.01	-0.46	-0.44	-0.56	-0.52
Offsetting receipts	-0.53	-0.49	-0.94	-0.56	-0.56	-0.57	-0.57
Other	0.0	0.03	0.0	0.0	0.0	0.0	0.0
Total	**9.40**	**8.88**	**8.46**	**9.38**	**9.29**	**9.47**	**9.95**
(In percent of GDP)	0.17	0.14	0.13	0.14	0.13	0.13	0.13

Source: U.S. Agency for International Development.

Table 2. United States: ODA by DAC Countries in 1996, Preliminary

	In Millions of U.S. Dollars	Rank	Percent of GNP	Rank
Australia	1,093	13	0.29	12
Austria	640	16	0.28	13
Belgium	937	15	0.35	7
Canada	1,782	9	0.31	10
Denmark	1,773	10	1.04	1
Finland	409	17	0.34	8
France	7,430	4	0.48	5
Germany	7,515	3	0.32	9
Ireland	177	19	0.30	11
Italy	2,397	7	0.20	17
Japan	9,437	1	0.20	18
Luxembourg	77	21	0.41	6
Netherlands	3,303	5	0.83	3
New Zealand	122	20	0.21	16
Norway	1,311	11	0.85	2
Portugal	221	18	0.21	16
Spain	1,258	12	0.22	15
Sweden	1,968	8	0.82	4
Switzerland	1,021	14	0.34	8
United Kingdom	3,185	6	0.27	14
United States	9,058	2	0.12	19
Total DAC	**55,114**		**0.25**	
Memorandum items				
DAC average	.....		0.40	
EU countries combined	31,290		0.37	
European Commission	4,842		....	

Source: OECD News Release, June 1997.