AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

Union Calendar No. 206

107TH CONGRESS, *1st Session* | HOUSE OF REPRESENTATIVES | REPORT 107–347

THE 2001 JOINT ECONOMIC REPORT

R E P O R T

OF THE

JOINT ECONOMIC COMMITTEE
CONGRESS OF THE UNITED STATES

ON THE

2001 ECONOMIC REPORT
OF THE PRESIDENT

TOGETHER WITH

ADDITIONAL VIEWS

U.S. GOVERNMENT PRINTING OFFICE
99–006 WASHINGTON : 2002

JOINT ECONOMIC COMMITTEE

[Created pursuant to Sec. 5(a) of Public Law 304, 79th Congress]

HOUSE OF REPRESENTATIVES

JIM SAXTON, New Jersey, *Chairman*
PAUL RYAN, Wisconsin
LAMAR SMITH, Texas
JENNIFER DUNN, Washington
PHIL ENGLISH, Pennsylvania
ADAM H. PUTNAM, Florida
FORTNEY "PETE" STARK, California
CAROLYN B. MALONEY, New York
MELVIN L. WATT, North Carolina

SENATE

JACK REED, Rhode Island, *Vice Chairman*
EDWARD M. KENNEDY, Massachusetts
PAUL S. SARBANES, Maryland
JEFF BINGAMAN, New Mexico
JON CORZINE, New Jersey
ROBERT TORRICELLI, New Jersey
ROBERT F. BENNETT, Utah
SAM BROWNBACK, Kansas
JEFF SESSIONS, Alabama
MIKE CRAPO, Idaho
LINCOLN CHAFEE, Rhode Island

CHRISTOPHER FRENZE, *Executive Director*
ROBERT KELEHER, *Chief Macroeconomist*
PATRICIA RUGGLES, *Democratic Staff Director*

LETTER OF TRANSMITTAL

CONGRESS OF THE UNITED STATES,
JOINT ECONOMIC COMMITTEE,
Washington, DC, December 19, 2001.

Hon. J. DENNIS HASTERT,
Speaker of the House, House of Representatives,
Washington, DC.

DEAR MR. SPEAKER: Pursuant to the requirements of the Employment Act of 1946, as amended, I hereby transmit the 2001 Joint Economic Report. The analyses and conclusions of this Report are to assist the several Committees of the Congress and its Members as they deal with economic issues and legislation pertaining thereto.

Sincerely,

JIM SAXTON,
Chairman.

CONTENTS

	Page
OVERVIEW OF CURRENT MACROECONOMIC CONDITIONS	1
CHAIRMAN'S VIEWS AND REPUBLICAN STAFF REPORTS	3
Overview of the Current Macroeconomy	3
The Performance of Current Monetary Policy Indicators	8
Information Technology and the New Economy	21
Economic Benefits of Personal Income Tax Rate Reductions	33
Tax Policy For Economic Growth	54
A Guide to Tax Policy Analysis: The Central Tendency of Federal Income Tax Liabilities in Distributional Analysis	72
Hidden Costs of Government Spending	102
VICE CHAIRMAN'S VIEWS AND DEMOCRATIC STAFF REPORTS	114
Vice Chairman's Statement	115
Effective Economic Stimulus	120
Economic Stimulus Principles and Options	163
A Return to Deficits	197
What Do Families Get From the Tax Cut	213
Estate Tax Myths	229
Highest Marginal Tax Rates	239
Airline Bailout	248

Union Calendar No. 206

107TH CONGRESS, *1st Session* | HOUSE OF REPRESENTATIVES | REPORT 107–347

THE 2001 JOINT ECONOMIC REPORT

DECEMBER 19, 2001.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. SAXTON, from the Joint Economic Committee, submitted the following

R E P O R T

together with

ADDITIONAL VIEWS AND STUDIES

Report of the Joint Economic Committee on the 2001 Economic Report of the President

OVERVIEW OF CURRENT MACROECONOMIC CONDITIONS

After ten years, the longest U.S. economic expansion on record ended in March of this year, according to the National Bureau of Economic Research (NBER). Most economists would identify several contributing factors to the economic slowdown in 2000, although they might disagree as to the relative importance of each:

1. Tighter monetary policy beginning in mid-1999;
2. A sharp increase in energy prices in 1999–2000; and
3. A sharp decline in equity prices.

Those contributing factors were not independent of each other.

First, the Federal Reserve intended to slow the growth of the economy. Between June 1999 and May 2000, the central bank raised interest rates six times and by a total of 175 basis points, sending the federal funds rate up to 6.5 percent, its highest level since 1991. According to the statements of the Federal Open Market Committee (FOMC), the central bank believed that even with the extraordinary productivity growth, economic demands were outpacing growth in supply—a condition that could not be sustained without some acceleration in inflation. The FOMC's intent was to head off such an inflationary surge before it arrived. The central bank's restrictive monetary policy affected financial (includ-

ing equity) markets, some (though not all) interest sensitive sectors of the economy, as well as several categories of business investment. Secondly, substantial energy price increases in 1999–2000 also had an adverse effect on the economy. Consumers, spending more on higher-priced energy products, had less to spend on discretionary items. The rise in energy prices also raised the cost of energy inputs to production, squeezing businesses' earnings and profits in the non-energy sectors.

Third, these factors worked in concert with other forces to weaken a somewhat overvalued stock market. This, in turn, reduced household wealth, thereby weakening household consumption. The higher cost of capital associated with declining equity prices may also have diminished incentives for businesses to invest. For the most part, those factors were in operation by the middle of 2000. To some extent, however, they have reversed their effects during 2001. In particular, the Federal Reserve has lowered interest rates eleven times since the beginning of the year, cutting the funds rate by a total of 475 basis points. Additionally, energy prices retreated to levels that are well below their peaks. As a consequence, by late summer, many economists were expecting a near-term economic rebound.

The Terrorist Attacks

The economic impact of the terrorist attacks of September 11, however, changed this outlook in several important ways. In the short-term, the attack increased overall uncertainty and apprehension in financial markets and affected consumption and investment as confidence waned. Moreover, the attacks had direct impacts on certain industries, most notably airlines, aerospace, travel, insurance, hotels, and related areas. Employment in air travel, travel services, lodgings and recreation has declined significantly since August. In response to the attacks, business investment and government spending to repair and replace buildings and shore-up our security, intelligence, and defenses will increase.

Current Prospects

As a consequence of the events of September 11, the prospects for the economic outlook have changed considerably. The expected economic rebound has been pushed back in time and two quarters of negative real growth appear likely. Currently, the consensus forecast is that the recovery will begin during the first half of 2002.

Macroeconomic Policy Response

The prospects for a rebound, of course, are due, in part, to recent policy actions. The Federal Reserve continued to lower interest rates following September 11 to 1.75 percent, a forty year low. The Administration and Congress have enacted a series of measures to support the economy, and some may provide additional support before the end of the year.

Uncertainties and Risks

Despite consensus forecasts of a near-term economic rebound, currently there is little hard evidence that a turnaround has begun. Furthermore, a number of significant uncertainties and risks—mostly on the downside—now litter the economic landscape, sug-

gesting a robust rebound is by no means assured. Debt burdens are sizable and will take time to work off. The international economy appears quite weak and vulnerable with no obvious source of strength. The risks of further terrorist attacks remain. All of this suggests that substantial risks exist and pose substantial challenges to economic policymakers.

The preponderance of downside risks suggests that a further stimulus package may be prudent. Such a package should address the weakness in the economy that has led to the recession and aim to offset the adverse effects described above.

REPRESENTATIVE JIM SAXTON,
Chairman.

SENATOR JACK REED,
Vice Chairman.

CHAIRMAN'S STATEMENT

OVERVIEW OF THE CURRENT MACROECONOMY

Background

According to the National Bureau of Economic Research (NBER), the recent economic expansion peaked in March 2001. This expansion was the longest on record; it followed the second-longest peacetime expansion on record, which lasted for most of the 1980s. The recession between the expansions was mild and just eight months long. Accordingly, over the last 20 years, the U.S. economy experienced exceptionally sustained economic growth.

The Mid-2000 Slowdown

While the expansion officially peaked in March 2001, the growth of the economy began to slow much earlier from the robust rates experienced in the mid and late 1990s. The slowdown became obvious in mid-2000. Real GDP growth slowed dramatically from its rates of the late 1990s. The growth of key components of GDP, especially investment, also fell sharply. Growth in fixed nonresidential business investment has fallen significantly in recent quarters. The growth of consumption has registered more modest declines. The declines were reinforced by a weakening manufacturing sector; industrial production and capacity utilization of industry fell sharply. The National Association of Purchasing Managers (NAPM) index also weakened starting in mid-2000.

The labor market was affected by the slowdown. Employment gains slowed significantly; average monthly payrolls increased much more slowly after mid-2000. Manufacturing employment fell sharply after July 2000, and the unemployment rate began to increase in the autumn.

Causal Factors

The speed of the slowdown surprised most economic forecasters, who quickly revised their projections downward. Although forecasters were surprised, they had already been worried about several factors that contributed to the slowdown: (1) tightening monetary policy, (2) a sharp increase in energy prices in 1999–2000, and (3) a concomitant sharp decline in stock prices.

(1) The Federal Reserve raised interest rates six times, by a total of 175 basis points, from June 1999 to May 2000. The Federal funds rate peaked at 6.5 percent, the highest level since 1991. For the most part, the Federal Reserve acted without convincing evidence that a resurgence of core inflation was imminent. Restrictive monetary policy affected financial markets (including the stock market), interest-sensitive sectors of the economy, and investment.

(2) Substantial energy price increases in 1999–2000 hurt the economy. Consumers spent more on energy and had less to spend on other things. Energy price increases had a negative impact on economic activity, since purchasing power was transferred to oil-producing countries from the United States and other countries that are net consumers of oil. The price increases also affected the supply side of the U.S. economy, by raising costs, reducing aggregate supply, and leading to reductions in output. Higher energy costs squeezed business earnings and profits, which affected the firms' stock prices.

(3) These factors and other forces weakened a somewhat overvalued stock market, reversing the stock market's "wealth effect" boost to consumption. The associated higher cost of capital also contributed to a slowdown in investment activity. The reverse wealth effect has become potentially more significant because of the spread of stock ownership in recent years. This is the first downturn the United States has faced in which more than half of households are invested in the stock market. Widespread stock ownership has led to a more sophisticated appreciation of the workings of financial markets on the part of the public, and to the realization that Americans' economic welfare is now closely related to the performance of stocks they own either directly or indirectly (through mutual funds, 401(k) plans, or other retirement and pension plans). Perhaps this realization explains broader popular support for economic stimulus legislation to enhance incentives for investment.

Most of the factors contributing to the slowdown were in place by mid-2000, but because of long and variable lags, their full influence was not felt for some months afterward. As the economy remained sluggish, many of the factors that had contributed to the slowdown reversed themselves in 2001. The Federal Reserve lowered interest rates; energy prices retreated and stabilized well below their earlier peaks; and the stock market stopped falling and began to stabilize. As a consequence, by late summer 2001 many economists were expecting an economic rebound to begin soon.

The Terrorist Attacks

The terrorist attacks of September 11 changed the economic outlook. In the short term, the attack increased uncertainty and apprehension in financial markets, and affected consumption and investment as confidence waned. The attack had a direct impact on the airline, aerospace, travel, insurance, and hotel industries.

There will be long-term effects of the terrorist attacks as well. The economic costs of a permanently increased terrorist threat will likely bring major changes to our way of life. Americans will bear an increased cost of security; in effect, an added "security tax." The "tax" will take the form of travel delays, additional security checks, longer cross-border transfers, higher insurance costs, additional

identification requirements, and other inconveniences. It will require spending money on new security guards and buying metal detectors, which do nothing to increase the quantity or quality of goods and services provided. The "security tax" will raise the cost of doing business, stifle gains from free exchange, add inefficiencies, and hence constitutes a negative supply shock to the economy.

The attacks will spur near-term investment and defense spending to repair or replace buildings and shore up our security, intelligence, and defenses. However, the total private capital stock will be less than it would otherwise have been. The so-called "peace dividend"—the reduction in defense spending made possible by the end of the Cold War—will be lessened. Money for a necessary security buildup will to some extent crowd out private investment. Thus, the attacks will adversely affect aggregate supply and the longer-term potential growth rate of the economy.

Current Prospects

The effects of the September 11 attacks tilted the economy into recession and changed considerably its prospects for the near future. The expected economic rebound has been pushed back, and two more quarters of negative growth (the fourth quarter of 2001 and the first quarter of 2002) appear likely. Even so, the chances for an economic rebound in 2002 look promising; current recessionary conditions appear to be short and mild. With an inventory correction near completion, energy prices lower than a year ago, a substantial easing of monetary policy in the pipeline, tax cuts in place, and a stock market that has recovered from its lows of a few months ago, projections for a rebound are plausible.

Macroeconomic Policy Response

The prospects of a rebound are due in part to recent macroeconomic policy action. The Federal Reserve has lowered short-term interest rates eleven times this year, reducing the Federal funds rate 475 basis points to a 40-year low of 1.75 percent. Several of its rate cuts came after September 11. Fiscal policy has also become less restrictive since September 11. Congress may yet take some additional fiscal action (in the form of tax cuts and spending increases) to provide economic stimulus. The combined monetary and fiscal response should help shorten the current slowdown.

Uncertainties and Risks

Despite a consensus among forecasters that an economic rebound will begin soon, currently there is little hard evidence that it has in fact begun. Furthermore, downside risks litter the economic landscape. The effects of the "security tax" will weigh on the economy for some time. Debt burdens are sizable and will take time to work off. The international economy appears quite weak. The risk of further terrorist attacks remains. Substantial risks exist, posing substantial challenges to economic policymakers.

The preponderance of downside risks suggests that a further stimulus "insurance" package may be prudent. Such a package should address the weakness in investment that has led the economic slowdown and aim to offset the adverse effects of the "security tax." Accelerating depreciation allowances, liberalizing expens-

ing provisions, and front-loading scheduled cuts in tax rates would be especially appropriate elements of such a package.

REPRESENTATIVE JIM SAXTON,
Chairman.

REPUBLICAN STAFF REPORTS

THE PERFORMANCE OF CURRENT MONETARY POLICY INDICATORS

INTRODUCTION

The Federal Reserve necessarily uses intermediate indicators in implementing a price-stabilizing monetary policy because of the well-known lags involved as well as the need for occasional pre-emptive action. With a quasi (informal) inflation targeting approach in place, the Fed's intermediate indicators must provide reliable signals of future changes in inflation. In recent years, however, mainstream economists (and their favored indicators) have done a relatively poor job of forecasting inflation. Inflation has been routinely overestimated: i.e., forecasted inflation has been higher than actual inflation. "Standard tools" or conventional indicators commonly used for forecasting inflation in many of these models involve the gap between actual unemployment and NAIRU[1] or between actual and potential GDP. In recent years, these policy guides (and models making use of such guides) have faired poorly, persistently overestimating inflation.

This paper briefly reviews the poor performance of these indicators in recent years and describes important problems of using real economic variables to forecast inflation. An alternative approach using market price indicators is briefly described, its advantages outlined, and its performance reviewed. These market price indicators consistently provided accurate signals as to future movements in core inflation and, accordingly, appear to have outperformed the conventional indicators.

The Policy Framework

A great deal of agreement has emerged in recent years as to the proper goal of monetary policy. In particular, under current exchange rate arrangements, the credible maintenance of price stability or a stable value of money has come to be viewed as the proper ultimate objective of monetary policy.[2] The obvious nature of this monetary policy goal was perhaps best summarized by Swedish economist Knut Wicksell more than a century ago:

> There is no need to waste words proving how important it is that the exchange value of money or, what is the same thing seen from the opposite angle, the general level of ...prices, remains as stable and constant as possible. Money is the standard of all values, the basis of all property transactions, and daily becomes more and more so. All commodities are exchanged for money, and moreover, we produce only in order to exchange, and to exchange for money. What then can be more important

[1] NAIRU is an acronym for non-accelerating inflation rate of unemployment. If actual unemployment falls below NAIRU, inflation is projected to increase (and vice versa).

[2] The case for and advantages of price stability have been made elsewhere and will not be repeated here. See, for example, Robert Keleher, "Establishing Federal Reserve Inflation Goals," a Joint Economic Committee study, April 1997.

than that what constitutes the standard of everything else, should itself remain a constant magnitude.[3]

In pursuit of price stability, the Federal Reserve in recent years has in effect adopted a quasi (informal) inflation targeting procedure, which has succeeded in lowering and containing inflation.[4] With price stability the central focus of monetary policy, the policy apparatus chosen should be that which best contributes to achieving this goal. Key elements of this policy apparatus are the intermediate indicators or guides used to achieve price stability. Such intermediate indictors are essential to this effort because of well-known policy lags, the frequent need for pre-emptive policy action, and other well-known problems with direct price targeting.[5] Appropriate intermediate indicators should be reliable forerunners or proxies for inflation or inflationary expectations: indicators or guides that reliably signal future changes in inflation or changes in inflationary expectations.

Currently, there is a good deal of disagreement among economists as well as Federal Reserve policymakers as to the best set of intermediate indictors to use in obtaining the Fed's goal. Conventional analysts, for example, use models that typically embody a "Phillips curve" relationship relating inflation positively to an "output gap." That is, these analysts employ the gap between actual unemployment and NAIRU or the gap between actual GDP and potential GDP as key inflation indicators or guides.[6] These are among their standard tools for forecasting inflation.[7]

Forecast Errors of Mainstream Models

In recent years, however, the inflation forecasts of mainstream economists (and their models) have been inaccurate and off the mark. Analysts generally agree that, for the most part, economists have done a poor job forecasting inflation. In particular, inflation has generally been overestimated; inflation forecasts have been persistently higher than actual inflation. An evaluation of inflation forecasts by the Congressional Budget Office (CBO), for example, indicates that the Blue Chip consensus persistently overestimated (two-year average) inflation rates from 1991-1992 to 1998-1999.[8]

---

[3] Wicksell, Knut, "The Influence of the Rate of Interest on Commodity Prices," in Knut Wicksell: Selected Papers on Economic Theory, edited by Erik Lindahl, Harvard University Press, Cambridge, Mass., 1958, p. 67 (originally published in 1898).

[4] See, for example, the testimony of Federal Reserve Chairman Alan Greenspan: *The Economic Outlook and Monetary Policy*, Hearing before the Joint Economic Committee, Congress of the United States, One Hundred Fifth Congress, First Session, October 29, 1997. See especially page 14.

[5] See, for example, Manuel Johnson and Robert Keleher, Monetary Policy: A Market Price Approach, Quorum Books, Westport, Conn., 1996, p. 23.

[6] If actual unemployment falls below NAIRU, inflation is projected to increase (and vice versa). If actual GDP growth exceeds potential GDP growth, inflation is projected to increase (and vice versa).

[7] Relationships similar or analogous to these are ingredients in approaches used by the Congressional Budget Office and by the staff at the Federal Reserve Board. See, for example, Douglas Hamilton, "Description of Economic Models," CBO Paper, November 1998, p. 7; and David Reifschneider, Robert Tetlow, and John Williams, "Aggregate Disturbances, Monetary Policy, and the Macroeconomy: The FRB/US Perspective," Federal Reserve Bulletin, January 1999, p. 7.

[8] See Matthew Solomon, "Appendix B: Evaluating CBO's Record of Economic Forecasts," The Budget and Economic Outlook: Update, CBO, July 2000, Table B-4, p. 61. Analysis of forecasts by St. Louis Federal Reserve

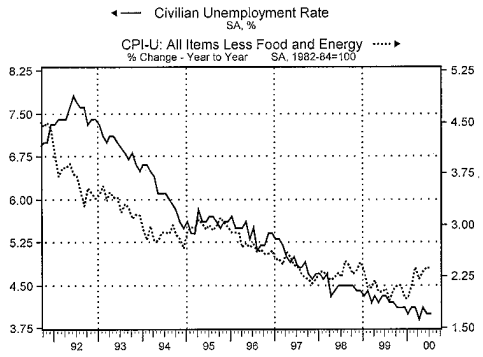
Part of the reason for these inaccurate forecasts relates to unreliable indicators used in forecast formulation. In particular, models using the actual unemployment rate relative to NAIRU (or actual GDP relative to potential GDP growth) as key ingredients in their inflation forecasts were inaccurate; these models persistently overestimated inflation. For example, CBO -- which employs such variables as important ingredients in its inflation forecasts -- assessed its recent forecasts and established that CBO has persistently overestimated inflation since the early 1990s.[9] Similarly, staff at the Federal Reserve Board (FRB) recognized inadequacies of inflation forecasts based on Phillips Curve or NAIRU concepts. A recent FRB study of such relationships, for example, found that actual inflation consistently fell short of their model's predictions of inflation over a recent five-year period.[10] This led them to remark that:

> The tendency of our baseline equations to significantly overpredict inflation since the mid-1990s... is an indication of structural change... or of misspecification.[11]

Some Simple Observations

It is not necessary, however, to engage in sophisticated forecast assessment to recognize the inadequacies of these Phillips curve-type guides as indicators of inflation. These inadequacies can readily be observed with a few simple graphs. For most of the past eight years, for example, the unemployment rate and core inflation have fallen together (see Chart 1[12]). During this lengthy period, there is little sign of an inverse relation between these two variables as is sometimes suggested by Phillips curve proponents.

Chart 1



Bank Economists draws similar conclusions. See William T. Gavin and Rachel J. Mandal, "Mixed Signals?" National Economic Trends, Federal Reserve Bank of St. Louis, July 2000.

[9] See Solomon, *op. cit.*, p. 61.

[10] Flint Brayton, John M. Roberts, and John C. Williams, "What's Happened to the Phillips Curve?" Division of Research and Statistics, Federal Reserve Board, Washington, DC, September 1999.

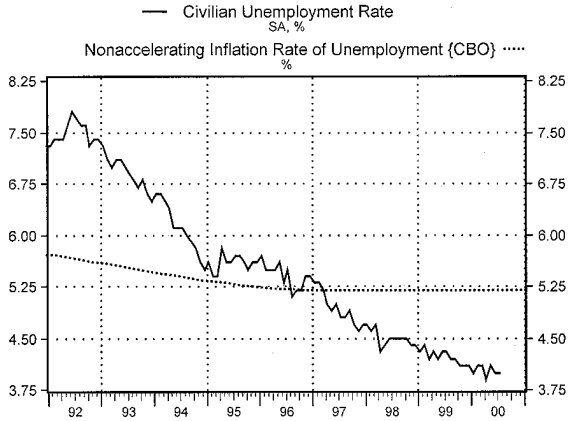
[11] *Ibid.*, p. 4.

[12] The source for all graphs is Haver Analytics.

As Chart 2 reveals, the civilian unemployment rate has fallen for eight years, has remained below 6 percent for more than six years, below 5 percent for more than three years, and has vacillated in the neighborhood of 4 percent during the past year. As late as the mid-1990s, estimates of NAIRU were typically in the neighborhood of 6 percent.[13] As Robert Gordon noted in 1998:

> In contrast to the near universal forecasts of accelerating inflation that would accompany a dip in the unemployment rate below 6 percent, inflation actually decelerated significantly between 1994 and 1998.[14]

Chart 2



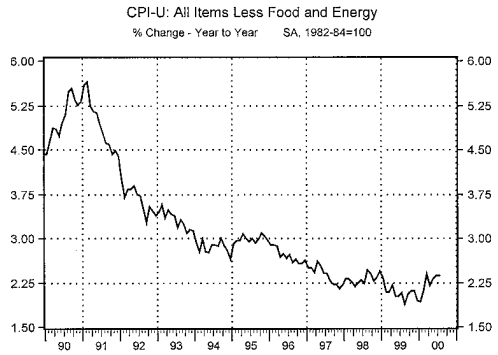
Accordingly, as unemployment continued to fall with no signs of accelerating inflation, erroneous estimates of NAIRU were downward-revised. Current (downward-revised) CBO estimates of NAIRU are also shown in Chart 2. Even with a downward-revised estimate of NAIRU, the unemployment rate has remained below NAIRU for almost 3 1/2 years. Yet the core rate of inflation, as measured, for example, by the core CPI, has remained relatively well behaved, as Chart 3 illustrates. In short, these charts suggest that in recent years the unemployment rate, either alone or relative to NAIRU, has not been a reliable guide or indicator of future inflation.

---

[13] See, for example, Arturo Estrella and Frederic S. Mishkin, "Rethinking the Role of NAIRU in Monetary Policy: Implications of Model Formulation and Uncertainty," NBER Working Paper No. 6518, April 1998, p. 1.

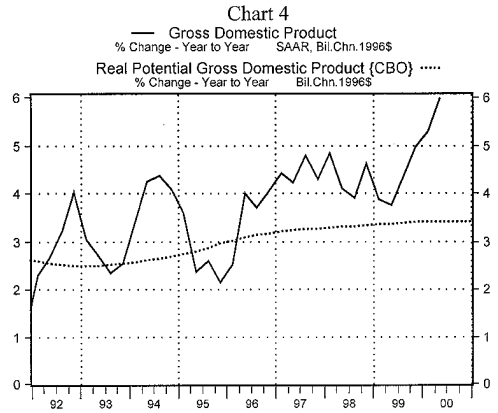
[14] Robert J. Gordon, "Foundations of the Goldilocks Economy: Supply Shocks and the Time-Varying NAIRU," February 3, 1999. Revision of paper presented at the Brookings Panel on Economic Activity, September 4, 1998, p. 1.

Chart 3



As Chart 4 indicates, similar observations about the inadequacies of inflation guides can be made with respect to the growth of actual GDP relative to estimates of potential GDP growth. Real GDP growth has consistently exceeded estimates of potential GDP growth (on a year-over-year basis) since the mid-1990s: i.e., for almost five years. Yet for the most part core inflation decelerated over this period. And analogous to NAIRU, as this gap persisted while core inflation continued to decelerate, (erroneous) estimates of potential GDP have repeatedly been revised upward, from the neighborhood of 2 1/2 percent to about 3 1/2 percent. Nonetheless, the conclusion remains inescapable: this actual GDP-potential GDP gap has been an unreliable guide to future movements of inflation.

Chart 4



The charts depicted here lead to a number of observations. In particular, in recent years:

- Low unemployment, even when it is low relative to downward revised estimates of NAIRU, has not been reliably associated with increased inflation.

- Economic growth persistently in excess of (upward-revised) estimates of potential GDP growth has not meaningfully stimulated core inflation or inflationary expectations.

- The gap between actual unemployment and NAIRU as well as the gap between actual GDP growth and potential GDP growth have been inaccurate guides to or indicators of inflation. These variables have contributed to inaccurate inflation forecasts. Indeed, for much of the late 1990s, these variables sometimes have not even predicted the correct direction of core inflation movements; core inflation has often continued to decelerate when these gaps have widened.

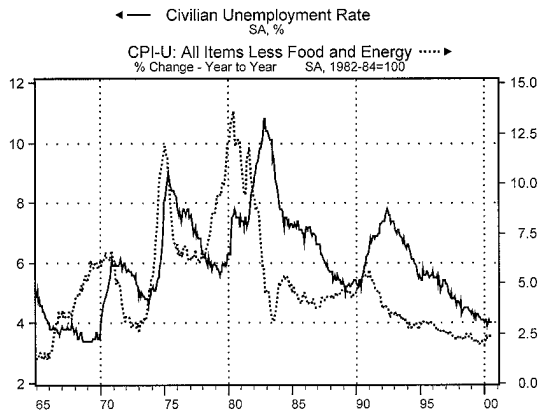
Problems with using conventional "gap" models to forecast inflation.

There are a number of theoretical and empirical problems with using real economic variables -- such as the gap between actual and " non-inflationary" unemployment or the gap between actual and potential GDP growth -- to forecast inflation. These problems, for example, include the following:

- The relationship between real economic activity and inflation is ambiguous. For decades it was generally believed that prices were pro-cyclical: i.e., that output and prices were positively correlated. Often, some form of Phillips curve relationship (associated with demand-side disturbances) was used to rationalize such correlation.[15] Recent evidence, however, indicates that properly assessed, this correlation is negative over the post-war period.[16] And from a long-term trend perspective, unemployment and inflation move together i.e., they are positively correlated as indicated in Chart 5. This suggests that robust real economic activity does not necessarily lead to higher inflation.

[15] See, for example, Wouter J. den Haan, "The Comovement Between Output and Prices," Journal of Monetary Economics, 46 (2000), p. 4.
[16] See, for example, Michael Pakko, "The Cyclical Relationship between Output and Prices: An Analysis of the Frequency Domain" Journal of Money, Credit, and Banking, Vol. 32, No. 3, August 2000, part 1, p. 382 and the evidence cited therein.

Chart 5



Part of the reason for this ambiguity is that using real economic activity to forecast inflation often does not adequately distinguish between demand-side and supply-side disturbances. These respective disturbances, however, can have very differing impacts on the output-price relationship. Demand-side stimulus, for example, can produce short-term output gains with increases in inflation. On the other hand, supply-side stimulus such as productivity advances can produce output gains with falling inflation. Furthermore, stable, decelerating inflation can serve to promote economic growth. The unreliability of this output/inflation relationship suggests that real economic variables may be misleading policy guides for the Federal Reserve in an inflation-targeting monetary policy strategy.

- Potential GDP and NAIRU are unobservable and the latter cannot be estimated with precision: Since both potential GDP and NAIRU are unobservable, there is an inherent problem of estimating or measuring these variables. The only truly foolproof way to determine or verify whether actual GDP is meaningfully above or below potential is to observe aggregate price movements. Similarly, the only foolproof way to truly verify whether actual unemployment is in the vicinity of NAIRU is to observe price or wage movements.

  Furthermore, recent research has demonstrated that NAIRU cannot be estimated with much precision; there is significant uncertainty in the empirical estimates of NAIRU. Empirical analysis by Staiger et. al., demonstrates that estimates of NAIRU are quite imprecise with large, wide confidence bands.[17] This suggests a

[17] Staiger, Douglas, James H. Stock and Mark Watson, "How Precise are Estimates of the Natural Rate of Unemployment?" in Reducing Inflation: Motivation and Strategy, edited by Christina D. Romer and David H.

lack of confidence as to the actual estimates. In assessing the Staiger et. al., analysis, for example, one commenter stated:

> ...The data are incapable of distinguishing between a wide range of estimates of the natural rate... a variety of plausible models yield widely differing estimates of the natural rate at a point in time... The standard errors of the estimated natural rates are quite large -- a typical 95% confidence interval runs from 5 to 8 percent... Even with forty-two years of monthly time-series observations, the data just do not provide precise estimates.[18]

For all practical purposes, the size of this imprecision and uncertainty precludes the use of NAIRU as a reliable guide for a price-stabilizing monetary policy.

- Potential GDP (or NAIRU) is constantly changing in unpredictable ways: In a dynamic economy, potential GDP and NAIRU are constantly changing in unpredictable ways. NAIRU, for example, was estimated to be around 5% in the 1960s, 7% in the 1970s, and 6% in the early to mid-1990s. More recently (and following NAIRU's poor inflation forecasting record) estimates of NAIRU have been revised down again. These changes in NAIRU are related to a number of factors including changing labor force demographics, government unemployment programs, or regional economic disturbances among other factors.[19] In practice, these unpredictable changes contribute to forecasting error and make NAIRU an unreliable policy guide in a price stabilizing monetary policy regime.

In short, there are a number of theoretical, empirical, and practical problems associated with the use NAIRU or potential GDP as policy guides in a price-stabilizing monetary policy strategy. These problems, together with the recent poor forecasting record of these variables, suggest that alternative policy guides should be considered.

Some Alternative Monetary Policy Indicators: Market Price Guides to Monetary Policy

An alternative set of monetary policy indicators appropriate for price stability goals has recently been proposed. A detailed description of the approach using these indicators has been given elsewhere and will only be briefly summarized here.[20] This approach uses certain market price indicators -- broad indices of commodity prices, various measures of the foreign exchange value of the dollar, and long-term bond yields -- as guides for a price-stabilizing monetary policy. All of these sensitive market prices yield early warning signals pertaining to changes in the value of, or price of money: i.e., relevant to movements in the general price level. Being

Romer, University of Chicago Press, Chicago, 1997(a); Staiger, Douglas, James H. Stock and Mark Watson, "The NAIRU, Unemployment, and Monetary Policy," Journal of Economic Perspectives 11:33-49, 1997(b).

[18] Alan B. Krueger, "Comment," in Reducing Inflation: Motivation and Strategy, edited by Christina D. Romer and David H. Romer, University of Chicago Press, Chicago, 1997, pp. 242-3.

[19] John Judd, "NAIRU: Is it Useful for Monetary Policy?" Federal Reserve Bank of San Francisco, Economic Letter No. 97-35; November 21, 1997, p. 2.

[20] For a through description of this approach see Manuel Johnson and Robert Keleher, Monetary Policy, A Market Price Approach, Quorum books, Westport, Connecticut, 1996.

prices, these indicators signal movements in demand relative to supply and accordingly potentially can be more useful than the above-described "gap" models. These market prices are intended to serve as informational indicators, not policy targets. Other things equal, each indicator can signal the relative "ease" or "tightness" of monetary policy.

These market prices have a number of distinct advantages over competing intermediate indicators of monetary policy. Such market price data, for example, are observable, easy-to-understand, timely, and readily available, literally minute-by-minute. They are accurate, less subject to sampling error, and unaffected by revision, rebenchmarks, seasonal adjustments, or shift-adjustments that sometimes plaque quantity data. Several formal studies investigating the usefulness of various forms of economic statistics conclude that market price data are superior to other forms of data.[21] Furthermore, they are forward-looking and can signal future changes in inflation and inflationary expectations. If these market price indicators are carefully assessed in conjunction with one another, they can be useful forerunners of inflation and helpful guides for a price-stabilizing monetary policy.

Recent Performance

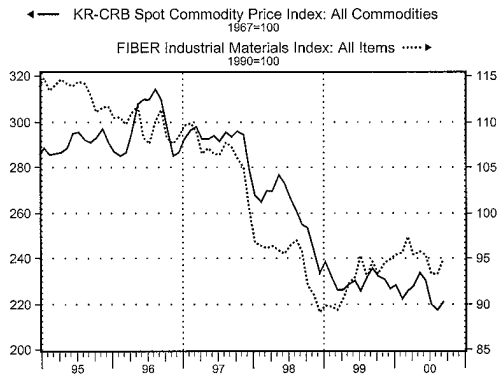
Recently, while conventional models were overestimating actual inflation, market price indicators provided relatively reliable signals as to future movements of general prices. In particular, these indicators accurately foretold the persistent disinflation of core CPI prices, for example, and have accurately suggested that no important resurgence of inflation was imminent. These guides indicated that monetary policy generally remained in an anti-inflation mode rather than "easy" as suggested by the above-cited conventional "gap" models.

Each major market price indicator contributed to this interpretation as follows:

- Commodity prices: Since the mid-1990s, broad indices of commodity prices have generally signaled that monetary policy remained in an anti-inflation mode. Broad indices of core commodity prices have generally remained stable or persistently trended down since 1995 with some commodity prices indices remaining below commodity price levels registered in the early 1980s. The KR-CRB spot index (which does not include energy prices), for example, has persistently trended down since the mid-1990s and remains at levels below those registered in the early 1980s[22] (see Chart 6). This commodity price measure, therefore, served as a reliable forerunner of persistent downward trends of core CPI inflation during the latter half of the 1990s.

[21] See, for example, Oskar Morgenstern, On the Accuracy of Economic Observations, Princeton University Press, Princeton, N.J., 1963; and Victor Zarnowitz, "On Functions, Quality, and Timeliness of Economic Information," NBER Working Paper Series, No. 608, December 1980.
[22] The source for the Commodity Research Bureau Commodity (KR-CRB) price indices is Knight-Ridder financial.

Chart 6



Various other indices of commodity prices provide some variation of this general picture but generally corroborate the central theme. The KR-CRB futures index (which includes energy prices) has trended down from 1995, but ticked up with energy prices early in 1999 before cooling in mid-2000. Similarly, as shown in Chart 6, popular indices of industrial materials prices (which also include energy prices) generally trended down after 1994 but ticked up with energy prices in 1999 and early 2000 before cooling in mid-2000[23]. Apparently, the recent energy price increase generated some heightened inflationary expectations during 1999. Abstracting from the effects of energy prices, therefore, for the most part these commodity price indices signaled that from the mid-1990s, core inflationary pressures were benign with no significant resurgence of inflation expected. These indictors, therefore, suggested that monetary policy remained in an anti-inflation mode during the second half of the 1990s. They served as accurate forerunners of the persistent lower trends in core inflation as measured, for example, by core CPI (as depicted in Chart 3).

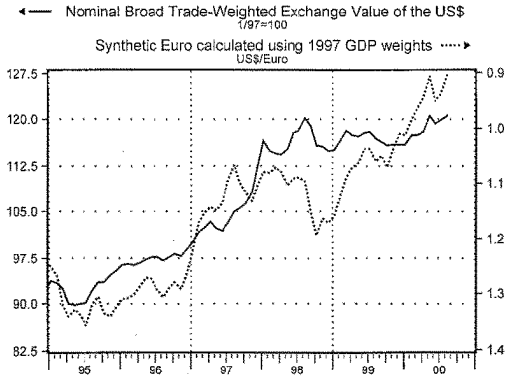
- Foreign Exchange Rates: Various measures of the foreign exchange rate of the dollar also yield potentially important information about future inflation and inflationary expectations (relative to other countries). In recent years, and especially since 1995, certain bilateral and most multilateral measures of the dollar's value have steadily appreciated, thereby persistently signaling (other things equal) that U.S. monetary policy has been firm relative to that in other countries.[24] In particular, as Chart 7 indicates, the dollar has firmed on (various measures of) a trade-weighted basis, against the yen until 1998, and especially against (synthetic measures of) the Euro. Notably, this persistent

[23] Popular indices of industrial materials prices include the FIBER (Foundation for International Business and Economic Research) industrial materials price index or the JOC-ECRI (Journal of Commerce-Economic Cycle Research Institute) industrial price index.

[24] Exchange rate movements measure changes in the value of money relative to other monies.

appreciation occurred during a period when core CPI continued to decelerate (as depicted in Chart 3 above), suggesting that (other things equal) these dollar movements accurately signaled a continuing disinflationary environment despite unemployment falling below NAIRU and robust (above potential) GDP growth. In short, during the period after the mid-1990s, this market price indicator continued to yield accurate signals as to the inflationary environment while "gap" models persistently overestimated inflation.

Chart 7

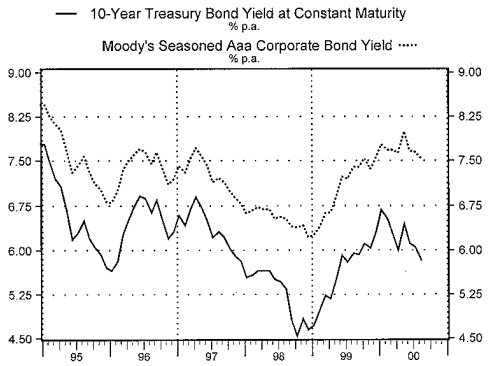


- Long-Term Interest Rates: Another market price indicator that provides useful information in assessing the prospects for inflation and expected inflation is long-term interest rates. From early 1995 to early 1999, for example, bond market yields trended down, thereby presaging a benign inflationary environment. Early in 1999, however, changes in several factors impacted the bond market. Sharp increases in energy prices influenced most general inflation indices even though core measures of inflation remained relatively well-behaved. This generated an increase in inflationary expectations as measured, for example, by some survey and market-based gauges.[25] Partly because of these altered expectations, anticipations about Federal Reserve policy began to change; the market began to expect tighter Fed policy in the future. The Fed did raise the fed funds rate six times beginning in June 1999, hiking the rate 175 basis points to 6.50 percent by May, 2000. These factors worked to increase long-term interest rates during 1999, before these rates cooled in 2000 as Chart 8 indicates. But while long-term rates advanced during this period, short-term rates increased even more, inducing the yield spread to narrow and by some measures to invert, signaling a more restrictive monetary

[25] For example, year-ahead household inflation expectations as measured by the University of Michigan's Survey of Consumers as well as market-based measures based on inflation indexed Treasury securities both indicated that inflationary expectations increased beginning in early 1999.

policy.[26] By mid-2000, therefore, long-term rates had fallen from their peak and expectations of inflation had again moderated; the inflationary environment had regained a tamer demeanor.

Chart 8



- A Joint Assessment of Market Price Indicators: The market price indicators discussed here all provide useful information as to the inflationary environment and therefore to monetary policymakers. While useful, these market price indicators are not infallible; each has drawbacks. These indicators, therefore, should be assessed jointly or in conjunction with one another in order to minimize misinterpretation. Such joint assessments provide superior information than indicators analyzed in isolation.[27]

Generally, during most of the post-1995 period, these guides consistently indicated that a resurgence of core inflation was not a serious concern. More specifically, for most of the post-1995 period, broad indices of "core" (ex-energy) commodity prices remained weak, various bilateral and multilateral measures of the foreign exchange value of the dollar remained strong, and except for the early 1999-Spring 2000 period, bond yields remained benign. For the most part, these indicators suggested that a resurgence of inflation was not likely and that significant inflationary pressures were not an important concern. The inflation message of these indicators was consistent with the actual benign core inflation that characterized the period. In this sense, these market price indicators provided more accurate inflationary signals than the above-described "gap" models that consistently predicted higher than actual inflation.

[26] Some moderation of long-term U.S. government security rates during the later portion of this period reflected diminished issuance and the debt paydown program. Nonetheless, spreads between the fed funds rate and quality corporate bond yields showed a similar pattern during this period.

[27] For a discussion of the rationale for such joint assessments, see Johnson and Keleher, *op. cit.*, especially pp. 39-40 and Chapter 11 (pp. 183-216).

SUMMARY AND CONCLUSIONS

Price stability is currently a central focus of U.S. monetary policy. Because of well-known policy lags and the need for preemptive policy action, the Federal Reserve necessarily uses intermediate indictors to help attain its inflation goals. Currently, there is a good deal of disagreement among economists as well as Federal Reserve policy makers as to the proper set of intermediate indictors to use in conducting a price stabilizing monetary policy.

Some analysts, for example, use models that typically embody a "Phillips curve" relationship relating inflation positively to an "output gap" typically using the gap between actual unemployment and NAIRU or the gap between actual GDP and potential GDP as inflation guides. In recent years, however, these models have not performed well; their inflation forecasts have persistently been higher than actual inflation. There are a number of problems associated with the use of NAIRU or potential GDP as policy guides in a price stabilizing monetary policy strategy. These problems, together with the recent poor inflation forecasting record of these variables, suggest that alternative policy guides should be considered.

Market price indicators are such an alternative useful set of guides to a price stabilizing monetary policy. These indicators -- commodity price indices, the foreign exchange value of the dollar, and long-term bond yields -- have a number of advantages as policy guides, especially when they are jointly assessed in conjunction with one another. Recently, these indicators consistently provided reliable signals as to the direction of, and to future movements in, core general prices. The inflation signals of these indicators were consistent with the actual benign core inflation that characterized the period. In this sense, these indicators provided more reliable inflationary signals than the above-described "gap" models that consistently predicted higher than actual inflation.

Assessments of this period add further empirical support to a market price approach to monetary policy and suggest that when jointly assessed in conjunction, these market price indicators are viable, useful intermediate guides to monetary policy, particularly in a (quasi) inflation targeting regime.[28]

[28] Empirical support for these market price indicators is presented in Johnson and Keleher, *op. cit.* (see chapters 8-10, 12, 13).

INFORMATION TECHNOLOGY AND THE NEW ECONOMY

The superior performance of the U.S. economy in the late 1990s has led many commentators to speculate that a "New Economy" has emerged in which heavy investment in information technology (IT) has led to an era of sustained economic growth. Although the recent economic slowdown has dampened some of the enthusiasm for the idea of a New Economy, a fundamental question remains: can the output growth experienced in the late 90's, which was significantly higher than that observed in previous decades, be traced back to IT?

This paper addresses this question by looking at the behavior of labor productivity, a key measure of economic well-being that grew at a significantly faster rate in the late '90s. The New Economy hypothesis to be examined is whether investment in IT caused the acceleration in productivity. The evidence suggests a growing consensus on two conclusions:

- Information technology is an important factor in the recent acceleration in productivity growth.
- Both the production and the use of IT contributed to the productivity revival.

Seen in this perspective, the idea of the New Economy is not as fanciful as some recent skeptics would claim.

While forecasting productivity growth is a chancy and often unsuccessful enterprise, there is some reason to believe that the acceleration in labor productivity could persist for several more years. This guarded optimism is informed by a recurrent theme in the literature that investments in IT manifest themselves in higher productivity with a lag of a few years. Thus, the enormous investments made by U.S. firms in IT in the late 90's could possibly show up in productivity numbers well into the first decade of the 21st century.

The rest of the paper is organized as follows: section I introduces some general concepts of productivity analysis, section II explains growth accounting, the standard framework for understanding productivity growth, section III applies this framework to the question of IT's impact on productivity, section IV looks at this question with methods other than growth accounting, and section V concludes.

I. PRODUCTIVITY

In its simplest form, productivity is the amount of output that can be produced with a given amount of input. Labor productivity, then, measures the amount of output produced with a given amount of labor. At the aggregate level this means GDP divided by the total number of hours worked in the economy. This definition highlights why labor productivity is considered such an important measure of the long-term performance of the

economy: growth in labor productivity increases the amount of goods and services available for consumption without a corresponding increase in the amount of time spent working. For this reason productivity growth often proxies for the change in the standard of living--the variable that, in the final analysis, most people really care about.

To measure growth in labor productivity involves calculating the ratio of the change in *real* (inflation-adjusted) GDP to the change in hours worked. While determining hours worked presents relatively few measurement problems, calculating the change in real GDP has been a research topic at the center of the New Economy debate. Nominal GDP, which is easily measured, is the product of the price index and the quantity of goods and services sold in the economy. Thus, the percent change in nominal GDP is approximately equal to the percent change in prices (inflation) plus the percent change in quantities (real GDP growth). The problem is how to attribute changes in nominal GDP between changes in prices and changes in quantities. If the type and quality of goods consumed changes very little from year-to-year, as could be expected in an industrial "Old Economy" era, then measuring changes in quantities should be trivial. If, on the other hand, the type and quality of goods available changes rapidly, as is the case with many IT-related New Economy products, then making accurate quality-adjustments to the change in quantities becomes crucial in gaining a true idea of what's going on in the economy. For example, although the price of desktop computers has not changed greatly over the past decade, the quality and power of those computers has soared. To incorporate this observation, the price per unit of computing power, rather than per computer, should have plummeted over this period. In fact, the two agencies responsible for constructing the productivity numbers, the Bureau of Labor Statistics and the Bureau of Economic Analysis, have recognized this problem and have exerted considerable effort in order to insure their numbers accurately reflect the rapid pace of change caused by technological innovation. Despite these efforts, the measurement issues surrounding the New Economy have left lingering debate.

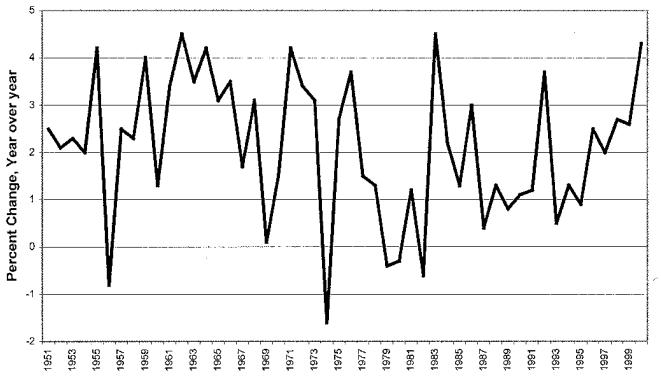
The annual labor productivity growth rates for the past 50 years are presented in Chart 1 (see below). One noteworthy aspect of this series is its procyclical variability. While the relation between the business cycle and productivity has been a topic of intense controversy in recent decades, one feature of this correlation deserves mention. In the presence of fixed costs of hiring and firing workers, economic theory suggests that labor productivity should be procyclical. This idea, known as the 'labor hoarding' theory of procyclical productivity, holds that because firms cannot costlessly adjust the amount of labor input used in response to shifts in output, we can expect aggregate hours to change less than one-for-one in response to changes in aggregate output. Sudden contractions or expansions in output (recessions or recoveries) usually generate drops or jumps in measured labor productivity because firms don't meet these contractions or expansions with immediate and proportional increases or decreases in employment[1].

The procylicality of productivity has two points of relevance for the present discussion. First, this feature of the data indicates why the contraction in labor productivity in the first quarter of 2001 should not necessarily be seen as the death knell

[1] For further discussion, see Basu and Fernald (1999).

of the productivity revival, but rather as a cyclical adjustment. Second, some had claimed that the productivity revival in the late '90s was, in large measure, a reflection of the procyclicality of the productivity series. This view, however, has been subjected to the critique that the cyclical aspect of productivity is usually felt at the beginning of a recovery whereas the productivity revival picked up steam several years into the expansion of the '90s.

Chart 1.
Aggregate Labor Productivity 1951-2000
(Nonfarm Business, BLS)



The productivity growth rates of the recent past can be divided into two sub-periods: 1973-1995, the era of the "productivity slowdown", and 1995-1999[2], the New Economy. Though measurement methodologies differ from study to study, the estimates of average annual growth in aggregate labor productivity for these periods tend to cluster around one and one-half percent for the earlier period and two and one-half percent for the latter period.

This one percentage point difference may not appear terribly important. Yet if permanent, this difference would mean living standards doubling every 28 years rather than every 46 years. Consequently, understanding the determinants of productivity growth has been a major project of contemporary economics.

Nevertheless, both the productivity slowdown and its more recent revival have been somewhat of a puzzle to economists. The deceleration in productivity growth in the 70's and 80's has attracted many candidate causes: among others, high energy prices, increased labor and environmental regulations, and monetary instability. The productivity

[2] This is not to say the New Economy ended in 1999, rather this is the last full year for which the final revision of productivity numbers is available.

revival, on the other hand, has focused attention on one possible explanation--the increased prevalence of IT in the American economy. In order to quantify the impact of IT on labor productivity, economists commonly use a decomposition known as growth accounting.

II. GROWTH ACCOUNTING

The cornerstone of growth accounting is the decomposition of labor productivity growth into a weighted sum of effective capital growth and effective labor growth plus a residual term known as total factor productivity (TFP)[3]. Or,

$$\%\Delta LP = a \cdot \%\Delta k + (1 - a) \cdot \%\Delta l + \%\Delta TFP$$

where uppercase delta refers to change and a is a parameter.[4] Effective capital growth, k, refers to the growth in the aggregate flow of capital services minus the growth in aggregate hours worked. Growth in effective capital, also know as capital deepening, has a positive effect on labor productivity because a larger amount of capital per worker should increase the output of that worker. As we will see, capital deepening can be measured for different classes of capital, in particular for deepening of IT capital. Growth in effective labor, l, captures the effect of changes in labor quality.[5]

The residual in the growth accounting equation, TFP, is commonly equated with technological change. TFP represents all the increase in output that cannot be accounted for by an increase in any other input. In this sense it is a costless expansion of the economy's set of possible production bundles. It is sometimes said that TFP is "a measure of our ignorance" in that any productivity increase we cannot attribute to a growth in an input factor we lump in with TFP.[6] This is a valid criticism and because of this we should be mindful that TFP can pick up increases in productivity due to process innovations or efficiencies generated by organizational changes. Despite its limitations, growth accounting is a useful framework and remains the starting point for the analysis of economic growth.

III. PRODUCTIVITY AND IT

Information technology can affect aggregate labor productivity through two channels: the *production* of IT and the *use* of IT. Few question that IT production has exhibited phenomenal productivity growth. This is probably best illustrated in the case of semiconductors. In the 1960's Gordon Moore, the founder of Intel, predicted that microprocessor power would double every 18 months. The prediction was accurate

[3] Also known as the Solow residual of multifactor productivity (MFP).
[4] Specifically, under standard assumptions, a is the share of output paid to capital.
[5] The more familiar decomposition of *output* growth is obtained by adding the change in aggregate hours to both sides of the labor productivity growth equation. In either case, TFP is identical.
[6] For a discussion of TFP see Hulten (2000).

enough that it became known as Moore's Law. Even accounting for R&D expenditures, the technological progress of the IT manufacturing sector has been remarkable and has contributed to the acceleration in labor productivity. In growth accounting terms, this contribution should appear as an increase in the TFP of IT-producing industries.

The second avenue through which information technology has the potential to increase labor productivity is though its use. The rhetoric of the New Economy proponents often focuses on the efficiencies that will accrue to firms engaged in activities other than the production of IT but which nevertheless successfully integrate the use of IT into their existing operations. Firms that use IT could expect productivity gains for two reasons. First, the rapid decline in the price of computing power has spurred huge investments in IT. This investment, like any other form of capital spending, should raise the productive capacity of those firms that undertake it. Second, IT has the potential to allow firms to implement efficiency-enhancing changes in the way they do business. These two effects would show up in a growth accounting equation as a capital deepening in IT-using firms and an increase in TFP of IT-using firms. Table 1 summarizes where we would expect the productivity contributions from the use and production of IT to appear in a growth accounting exercise.

Table 1.

	Use of IT	Production of IT
$\%\Delta k$ (Capital deepening)		
IT-capital	X	
All other capital		
$\%\Delta l$ (Labor quality)		
$\%\Delta TFP$ (Total factor productivity)		
IT-producers		X
All other industries	X	

The possible effect of IT use on TFP has attracted considerable attention. It is in this sense that IT could be considered a General Purpose Technology (GPT). As defined by Helpman (1998) a GPT is a "drastic innovation [that] has the potential for pervasive use in a wide range of sectors in ways that drastically change their mode of operation." Similarly, Bresnahan and Trajtenberg (1995) speak of GPT's as "'enabling technologies' opening up new opportunities rather than offering complete, final solutions." A classic example of a GPT is electricity. Around the turn of the century American industry underwent radical change due to the widespread utilization of electricity. Firms invested heavily in electric machinery as the price of electivity relative to other forms of power fell. If these firms didn't change their production process they could still expect an increase in productivity due to this capital deepening. However, as David (1990) points out, the switch from steam to electric power also allowed firms to change the floor plans of their factories in a way that increased efficiency. Thus, firms did change their

production process' and hence experienced a second productivity 'kick' from using electricity.

The distinction between production and use of IT has been critical in the debate concerning the impact of IT upon productivity. In a series of papers, Gordon (1999, 2000) has argued that IT's contribution to the acceleration in productivity experienced in the late '90s has been solely through the more efficient production of IT. The use of IT, Gordon claims, has not added to the uptick in productivity. In a certain sense, this distinction is immaterial: nobody denies that productivity did accelerate in the period under question. In another sense, Gordon's interpretation, if true, would have certain implications about the sustainability of the New Economy. The narrow concentration of productivity growth in one sector would make the economy's continued health vulnerable to disruptions in that sector. Furthermore, the efficiency gains in IT production, particularly semiconductors, will eventually run into physical constraints; Moore's Law cannot hold indefinitely. Gordon's reading of the facts, however, has been controversial and as we will see shortly, several studies have found the use of IT to have made a substantial contribution to the productivity revival.

The growth accounting equation has been applied to the two sub-periods mentioned above by a number of economists in order to clarify how and why the pickup in productivity occurred. Growth accounting exercises can produce different results for the same period because there are several choices to be made as to how to measure the aggregate flow of capital and labor services. Three of the most recognized studies include one government survey, BLS (2000) and two academic works, Jorgenson and Stiroh (1999) and Oliner and Sichel (2000). Their findings are presented in Table 2.

Table 2.

	Jorgenson & Stiroh	Oliner & Sichel	BLS
Labor Productivity 1973-1995	1.42	1.41	1.39
Labor Productivity 1995-1999	2.37	2.57	2.30
Acceleration	0.95	1.16	0.91
$\%\Delta k$ (Capital deepening)	0.29	0.33	0.10
IT-capital	0.34	0.50	0.38
All other capital	-0.05	-0.17	-0.31
$\%\Delta l$ (Labor quality)	0.01	0.04	0.06
$\%\Delta TFP$ (Total factor productivity)	0.65	0.80	0.90
IT-producers	0.24	0.31	n.a.
All other industries	0.41	0.49	n.a.

All three surveys decompose the approximately one percentage point acceleration in productivity growth into the standard categories of capital deepening, increased labor quality, and TFP. Furthermore, these studies separate capital deepening into IT-capital deepening and all other forms of capital deepening. In all three cases IT-capital is defined as computer hardware, software, and communications equipment. The two academic studies disaggregate TFP into IT-producing and non-IT-producing sectors.

The results of these studies reveals that IT-related capital deepening contributed between one-third to one-half a percentage point to the acceleration in productivity in the late nineties. This indicates that a large part of why workers became more productive after 1995 is that they had more high-technology equipment with which to perform their jobs. Growth in investment in all other forms of capital, machinery, structures, etc., slowed during the late '90s and contributed less to productivity in this period than during the "productivity slowdown". The increase in labor quality was relatively similar across both time periods and thus did not contribute much to the productivity revival. TFP, on the other hand, did accelerate appreciably in the later period, adding between two-thirds to nine-tenths of a percentage point to the relative change in the rate of productivity growth.

It appears, then, that the productivity revival is concentrated in IT-capital deepening and a pickup in TFP. Jorgenson and Stiroh and Oliner and Sichel both find that TFP acceleration in IT-producing industries added about a quarter percentage point to the productivity revival. The increase in TFP in other industries accounted for about a half of a percentage point. This acceleration in TFP in non-IT-producing industries could be due to the use of IT or it could be due to a number of other factors--the coarseness of the growth accounting framework is ill-suited to localize the causes of TFP growth. Among the contributions of IT to TFP, the evidence suggests that it is unlikely that the Internet has yet to contribute substantially to productivity growth. One possible avenue through which the Internet could make the economy more productive is through the cost efficiencies attained through business-to-business e-commerce. Nevertheless the magnitude of these transactions has not been large enough to have much impact on the aggregate numbers. It is possible that valuing the services provided by the Internet as a final, consumer good has suffered from the measurement issues discussed above, in which case the Internet has made some very modest contribution to productivity.[7]

The results of both these studies suggest that the productivity acceleration was not entirely due to higher productivity in the manufacture of semiconductors and other IT equipment. Rather, these industries probably contributed around one quarter of the one percentage point difference between productivity growth during 1973-1995 versus productivity growth during 1995-1999. By identifying IT-capital deepening, these studies also put a lower bound on the contribution from the use of IT of around one-third of a percentage point. The contribution from IT use could be even greater if some or all of the increase in TFP in non-IT-producing industries can be attributed to IT use.

[7] Oliner and Sichel review some of the literature on e-commerce.

IV. OTHER ANALYSES

Growth accounting is a blunt tool that can leave many questions answered unsatisfactorily.[8] In order to get a better idea of how investment in IT has affected productivity, many authors have conducted the analysis at the level of the firm or the industry.

Two studies which are representative of this literature are Stiroh (2001) and Brynjolfsson and Hitt (2000). Stiroh's study looks at productivity in the late 90's in 61 different industry groups sorted by level of investment in IT. In order to control for endogeneity, he measures industry IT investment undertaken before 1995.[9] His main finding is that industries that had invested heavily in IT experienced more rapid productivity growth than other industries. This result is consistent with the New Economy story that the increased use of IT is making American business more productive. After comparing industry groups, Stiroh concludes that the aggregate productivity revival is entirely due to industries that produce IT or intensively use IT; industries that do not intensively use IT contributed essentially nothing to the productivity revival. While industry productivity is compared to lagged IT investment for econometric reasons, the incidental finding of this paper is that unlike other forms of capital, outlays for IT affects productivity several years after the investment is made.

In order to estimate the effect of investment in IT on firm productivity, Brynjolfsson and Hitt track the amount of computer investment undertaken by a sample of 600 firms over an eight year period. They find that over the short-term, the marginal cost of computer investment is equal to its marginal revenue--a result that suggests that over the short-term IT investment contributes to productivity solely though the capital deepening mechanism. Interestingly, they find that over the longer-term (seven years) marginal revenue rose to between two to five dollars for every dollar invested in computers. The authors interpret this finding as suggestive evidence of the existence of productive complementarities between computer investment and organizational restructuring.

Both of the above papers uncover evidence that investment in IT affects productivity with a lag of a few years. This finding is consonant with the theory that rapid capital investment entails large "adjustment costs". According to the IT version of this story, adjustment costs are equated with the time and resources spent by employees in learning how to properly utilize the newly available IT capital as well as the time and resources spent in organizational learning as firms reconfigure their operations. Along these lines, several studies have postulated that the productivity slowdown and subsequent revival are intimately linked by adjustment costs. Greenwood and Yorukoglu

[8] Additionally, traditional growth accounting may impose an undesirable degree of structure to generate results, including a homogeneous of degree one aggregate production function and perfectly competitive markets.

[9] It is very plausible that industry productivity is contemporaneously correlated with IT investment--industries that experience faster productivity growth could be expected to then invest more heavily in IT. Ignoring this factor would produce inconsistent estimates of the impact of IT on productivity.

(1997) claim that investment in IT, which experienced rapid growth in 1970's *caused* the productivity slowdown as unmeasured adjustment costs made output growth look artificially small. The productivity revival, they claim, represents the efficiency gains from IT investment finally outpacing the associated adjustment costs. This theory would seem to provide a direct reply to the 'Solow paradox'. Writing in 1987, Robert Solow famously remarked "We see the computer age everywhere except in the productivity statistics." According to the adjustment cost view, the slow growth in productivity experienced at the time of Solow's remark reflect the large unmeasured costs of adapting to the computer age during the 1970's and 1980's--costs that were finally outweighed by the benefits by the late 1990's.[10]

The finding that IT investment affects productivity with a lag would seem to bode well for future productivity growth. Aggregate investment in IT continued at a brisk pace well into the late 1990's. If the pattern of lagged dependence of productivity on IT continues, we could expect productivity to continue its healthy growth. Caution, however, is warranted when predicting productivity numbers. As Taylor (2001) observes,

> From a macroeconomic perspective the New Economy isn't really new. After all, productivity growth rates averaged about 3.0 percent per year in the 1950' and 1960's. ...But the stagflation of the 1970's--resulting from a combination of unlucky economic events and ill-conceived public policy--arrived nonetheless.

It is sometimes said that from an economic perspective technological progress is like manna from heaven, a gift whose source is not well understood. Because of this, it is unlikely that a policymaker can affect the arrival rate of this gift in the short run. Public policy can, however, create an environment that allows society to fully capture the benefits of technological advancements. The rapid pace of change in the high tech sector requires labor and capital markets that are fluid and dynamic. Excessive regulation could harm the ability of industry to quickly and effectively respond to new opportunities opened up by technological breakthroughs. Moreover, the inherent volatility of enterprise in a sector of the economy undergoing rapid technological change demands a tax structure that creates the appropriate incentives for entrepreneurs and investors to accept this added risk. The likely existence of "spillover effects" from the development of IT implies that the benefits from entrepreneurial activity in this sector flow throughout the economy. Thus, creating incentives for IT entrepreneurial activity is akin to encouraging the private provision of a public good.

V. CONCLUSION

A consensus has emerged regarding the acceleration in productivity that occurred in the late 1990's. Two points that have found widespread agreement are:

[10] Along similar lines, in 1990 Paul David drew on the historical parallels to note that "In 1900, contemporary observers well might have remarked that the electric dynamos were to be seen 'everywhere but in the productivity statistics'!"

- Information technology contributed significantly to the productivity revival. At least half of the one-percentage point increase in labor productivity growth is attributable to IT. In all likelihood the contribution from IT is even greater than this conservative estimate.
- Both the production and use of IT has had an impact on the productivity revival.

These results imply that the New Economy thesis, when applied to the historical experience, has a sound empirical foundation.

References

Basu, Susanto and John G. Fernald. 1999. "Why Is Productivity Procyclical? Why Do We Care?" Federal Reserve Board. International Finance Discussion Paper No. 638.

Bresnahan, Timothy and Manuel Trajtenberg. 1995. "General Purpose Technologies: Engines of Growth." Journal of Econometrics, 65, pp.83-108.

Brynjolfsson, Erik and Lorin M. Hitt. 2000. "Computing Productivity: Firm-Level Eviednce" MIT. Working Paper.

Bureau of Labor Statistics. 2000. "Multifactor Productivity Trends, 1998." USDL 00-267.

David, Paul A. 1990. "The Dynamo and the Computer: An Historical Perspective on the Modern Productivity Paradox." American Economic Review, 80 pp. 355-61.

Gordon, Robert J. 1999. "Has the 'New Economy' Rendered the Productivity Slowdown Obsolete?" Northwestern University. Working Paper.

Gordon, Robert J. 2000. "Does the 'New Economy' Measure Up to the Great Inventions of the Past?" Journal of Economic Perspectives, Fall 14:4, pp 49-74.

Greenwood, Jeremy and Mehmet Yorokoglu. 1997. "1974." Carnegie-Rochester Conference Series on Public Policy. June, 46, pp. 49-95.

Helpman, Elhanan. 1998. *General Purpose Technologies and Economic Growth.* Cambridge, MA. MIT Press.

Hulten, Charles R. 2000. "Total Factor Productivity: A Short Biography." National Bureau of Economic Research. Working Paper No. 7471.

Jorgenson, Dale W. and Kevin J. Stiroh. 2000. "Raising the Speed Limit: U.S. Economic Growth in the Information Age." Brookings Papers on Economic Activity, 1, pp. 125-211.

Oliner, Stephen D. and Daniel E. Sichel. 2000. "The Resurgence of Growth in the Late 1990s: Is Information Technology the Story?" Journal of Economic Perspectives, Fall 14:4, pp. 3-22.

Stiroh, Kevin J. 2001. "Information Technology and the U.S. Productivity Revival: What Do the Industry Data Say?" Federal Reserve Bank of New York. Staff Report No.115.

Taylor, Timothy. 2001. "Thinking about a 'New Economy'." The Public Interest, Summer, 143, pp 1-7.

ECONOMIC BENEFITS OF PERSONAL INCOME TAX RATE REDUCTIONS

Table of Contents

I. Introduction 35

II. Background on Marginal Tax Rates 35

II. Economic Effects of Marginal Tax Rates 37

A. A Dollar of Taxes Costs More Than a Dollar 37
B. Six Effects of Marginal Tax Rate Changes 39
C. Tax Rates and the Tax Base 44

V. Accounting For the Dynamic Effects of Tax Changes 46

A. How Big Are Deadweight Losses? 46
B. How Big Are Dynamic Revenue Effects? 48

V. International Trends 50

I. Conclusions 52

ECONOMIC BENEFITS OF PERSONAL INCOME TAX RATE REDUCTIONS

I. Introduction

With large and growing federal budget surpluses, and with the overall federal tax burden at a peacetime high, a broad spectrum of policymakers support substantial income tax cuts in 2001. President Bush has proposed a phased-in reduction of statutory personal income tax rates from 15, 28, 31, 36, and 39.6 percent to 10, 15, 25, and 33 percent.[1] The plan would boost after-tax income for tens of millions of families, and benefit millions of small business owners who pay tax under the personal income tax system.

In addition to providing broad-based tax relief, marginal rate cuts would spur economic growth by reducing tax system distortions. A marginal tax rate is the rate paid on an incremental amount of wages, savings, or small business income. The level of marginal rates is a crucial feature of tax systems because they affect market price signals that allocate the flow of resources in the economy. As marginal tax rates rise, more decisions get based on tax rather than efficiency considerations, resulting in rising "deadweight losses" to the economy.

This paper provides background on personal tax rates, discusses the economic importance of marginal rates, and provides a brief survey of international tax rate trends.

II. Background on Marginal Tax Rates

Federal personal income tax rates were significantly lowered and the rate structure simplified during the 1980s. Before the Economic Recovery Tax Act of 1981 (ERTA), taxpayers faced a steeply progressive tax structure with 15 rates ranging from 14 to 70 percent. ERTA reduced tax rates across the board by over 20 percent with new rates ranging from 11 to 50 percent. The landmark Tax Reform Act of 1986 (TRA86) achieved a further reduction and flattening of the tax rate structure with the installation of a simple two-rate schedule of 15 and 28 percent.[2]

The enactment of ERTA and TRA86 was the result of widespread recognition that marginal tax rates should be lowered so that the production or "supply-side" of the economy could operate more efficiently. Lower rates were designed to increase after-tax returns to productive work and investment activities, and to reduce the unproductive proliferation of tax shelters, which tends to occur under high tax rates. Prior to the 1980s, major reductions in individual marginal tax rates occurred in the 1920s and 1960s.[3]

---

[1] For plan details, see Joint Committee on Taxation (2001).
[2] Some taxpayers faced a 33-percent marginal rate after TRA86 due to the effect of a phase-out of the benefit of the bottom tax rate bracket for higher-income taxpayers.
[3] For a discussion of these earlier tax rate cuts, see Joint Economic Committee (1982).

Unfortunately, the low tax rate structure achieved under TRA86 was partly undone by tax increases in 1990 and 1993, which added three new statutory tax rates of 31, 36, and 39.6 percent. Other tax changes during the 1990s pushed effective marginal rates even higher, including the phase-out of personal exemptions, the partial phase-out of itemized deductions, and the repeal of the Medicare payroll tax income ceiling.[4]

Another factor that has been steadily -- and stealthily -- increasing marginal tax rates is "real bracket creep." Since most of the tax code is indexed for inflation but not for real economic growth, increasing shares of income are moved into higher brackets each year, with some individuals pushed into a higher top rate bracket. One estimate found that about a quarter of President Bush's $1.6 trillion tax cut plan would be offset by real bracket creep during the next decade.[5] Using different assumptions, another estimate found that about 80 percent of the Bush tax cut would be offset be real bracket creep.[6]

When federal statutory income tax rates are combined with income tax phase-out provisions, payroll taxes, and state income taxes, many taxpayers face quite high marginal tax rates. The following are some of the major provisions that affect a taxpayer's overall effective marginal tax rate:

- ***Federal statutory income tax rates***. The current income tax rates of 15, 28, 31, 36, and 39.6 percent have been in place since 1993. Rates would be lowered under the Bush plan to 10, 15, 25, and 33 percent over a five-year phase-in period.

- ***State income taxes***. Personal income taxes are imposed in 43 states and the District of Columbia; the top marginal state rate averaged 6.7 percent in 2001.[7]

- ***Federal payroll taxes***. The federal payroll tax consists of the 12.4 percent Social Security tax on earned income up to $80,400 (for 2001) and the 2.9 percent Medicare payroll tax on all earned income. As a result, a moderate-income worker in the 15-percent income tax bracket faces a combined income and payroll tax marginal rate of about 28 percent (calculated as 30.3 / 1.0765 to adjust income for the hidden 7.65 percent "employer" half of the payroll tax).

- ***Federal income tax phase-outs***. At least 22 federal income tax benefits are reduced as a taxpayer's income rises. These "phase-outs" of deductions, exemptions, and credits increase marginal tax rates for taxpayers within each provision's phase-out range. Some examples, and the corresponding increase in marginal rate, include the child tax credit (5 percentage points), itemized

---

[4] An "effective" marginal tax rate is the increase in tax liability as a share of a taxpayer's incremental income taking into account all provisions of the tax code, not just the statutory rates.
[5] Martin Sullivan, "Estate Tax Reform, Not Repeal, Would Fix Bush Plan," *Tax Notes*, February 26, 2001. See also Joint Committee on Taxation (2001) for a discussion of real bracket creep.
[6] Kevin Hassett, "A Tax Phantom is Stalking You," American Enterprise Institute, October 2000.
[7] Author's calculation based on data from the Federation of Tax Administrators. This average includes only the 43 states and D.C. that impose personal income taxes.

deductions (about 1 percentage point), and personal exemptions (about 1 to 3 percentage points).[8]

- ***EITC***. The phase-out of the earned income tax credit (EITC) creates a high marginal tax rate for many moderate-income wage earners.[9] The EITC phase-out, which occurs between about $13,000 and $32,000 for workers with children, partly offsets any wage increase with a reduction in EITC benefits, thus effectively creating a higher marginal tax rate. For example, a married couple with two children earning $28,000 who receive a $1,000 raise would pay $153 of added payroll taxes, $150 of added income taxes, and have EITC benefits reduced $210 (based on a phase-out rate of 21 percent). As a result, the family faces a 48-percent marginal tax rate.[10] State income taxes may push the rate even higher.

III. Economic Effects of Marginal Tax Rates

A. A Dollar of Taxes Costs More Than a Dollar

Federal personal income tax revenues total over $1 trillion per year, an amount that cannot be easily and costlessly extracted from the economy. In fact, each tax dollar taken from an individual or business ends up costing the private economy much more than a dollar. Additional burdens stem from compliance and administration costs and deadweight losses.

Compliance and administration costs are the government, business, and individual costs of time and resources needed to make the tax system work.[11] For the government, costs are incurred for tax design and legislation, record-keeping, mailing, computer systems, assessment, audits, enforcement, and related activities of the IRS and other federal agencies. For families and businesses, it includes the time costs and out-of-pocket costs of learning tax rules, record-keeping, tax preparation, tax advice, filing, responding to audits, legal defense, and other activities.

Hundreds of thousands of skilled accountants, lawyers, and computer specialists are required in government and the private sector to keep the system running. They face a growing challenge because the federal tax code and related rules have exploded to over 46,000 pages from just 20,000 in the mid-1970s.[12] The Office of Management and Budget estimates that individuals and businesses spend over 6 billion hours (3 million

[8] Exact marginal rate effects can depend upon filing status and tax bracket. See *Phase-Outs Are Bad Tax Policy*, Institute for Research on the Economics of Taxation (IRET), January 16, 1998. See also Joint Committee on Taxation (2001).
[9] For further information, see Edwards (2000a).
[10] The effective marginal tax rate on the family is 47.7 percent because half of the payroll tax 7.65 percent is deducted before the "gross" seen by the worker ($513 / $1,076.5 = 47.7%).
[11] For a discussion of tax compliance costs and tax complexity, see Edwards (2000b).
[12] As measured by the CCH *Standard Federal Tax Reporter*. See Edwards (2000b).

person-years) record-keeping and filling out tax forms each year.[13] More than half of tax filers now pay tax preparation firms to help with the compliance burden.

Estimates of the total costs of income tax compliance and administration range from about 10 to 20 percent of income tax revenues.[14] Therefore, total annual compliance costs of the federal personal income tax system are between about $100 to $200 billion. These costs are pure losses to the nation's economy since they represent wasted resources that could be otherwise be used to produce beneficial goods and services.

A reduction in marginal tax rates would, perhaps modestly, reduce the compliance and administrative costs of the income tax system. High rates encourage taxpayers to maximize tax avoidance and evasion activities. Such activities include creating complex financial and business structures, taking compensation in more complicated tax-favored pay schemes, and lobbying policymakers to carve out special preferences in the tax code. As taxpayers try to shield their income from high rates, government must respond with more detailed tax regulations, increased information reporting requirements, and greater enforcement activities. Income tax rate cuts have the potential to reduce such unproductive activities and save time and resources of both the government and private sector.

Deadweight losses, or "excess burdens," stem from disincentive effects created by taxes that alter individual and business behavior. A simple example will illustrate this economic burden. Suppose a college student buys a car that she can just barely afford. Then suppose the government decides to levy a new excise tax on gasoline. The student decides that the higher car operation costs would bust her budget and she sells her car. As a result, the student ends up not paying any gasoline taxes, but the tax has clearly made her worse off since she has had to settle for a less efficient or less pleasant mode of transportation. The student's free market choice has been distorted thus imposing a deadweight loss on her and lowering her standard of living.[15]

Compared to this example of an excise tax on a single commodity, income taxes can have far more profound impacts because they affect important economic choices by nearly every family and small business in the country. The personal income tax is a hybrid tax on labor and capital with the result that high tax rates distort both labor costs and the cost of capital. Since labor and capital are the basic two inputs to production, cost distortions caused by income taxation can have substantial negative economic effects.

Income taxes often have high marginal rates, which increase their damage. In fact, deadweight losses increase more than proportionally to increases in tax rates.

---

[13] Office of Management and Budget, *Information Collection Budget of the U.S. Government*, FY 1999.
[14] Edwards (2000b).
[15] Also termed a reduction in her "consumer surplus," which combined with reductions in "producer surplus" equals the total deadweight loss created by a tax. Note that deadweight losses don't include tax payments themselves since these losses to taxpayers are matched by gains to the government.

Studies have found that deadweight losses increase by at least 25 cents for each additional dollar raised by higher income tax rates, as discussed in Section IV.A.

Changes in deadweight losses and economic growth are related. A tax change that reduces deadweight losses generally increases economic growth, although the magnitudes of the two effects may differ. Deadweight losses measure reductions in individuals' overall welfare or utility. Economic output, as measured by GDP, is not as broad a concept since it excludes some elements of individual utility, such as enjoyment of leisure time. But generally, tax rate cuts reduce economic distortions leading to both reduced deadweight losses and increased economic output.[16]

Cross-country statistical studies have generally found that higher taxes are associated with lower economic growth.[17] One recent study looked at the effects of marginal tax rates, in particular, and found a strong link between lower rates and faster economic growth across OECD countries.[18] Note that seemingly small changes in annual growth rates can lead to significant changes in output and income over the long-term. For example, a tax reform that increased the economic growth rate by half a percentage point would raise average incomes by over 10 percent in just 20 years.

B. Six Effects of Marginal Tax Rate Changes

This section looks more closely at how marginal income tax rates change taxpayer behavior and affect economic efficiency. In general, lower tax rates reduce deadweight losses and increase economic growth by shifting people and resources into more productive activities, and away from less productive tax-favored activities.[19] These effects are described in the following six points:

1. Labor Supply. A reduction in marginal income tax rates would increase the rewards to additional labor earnings. In response, workers may increase overtime hours or moonlighting, increase work intensity, add to their human capital to boost earnings, or be more likely to enter the labor force or delay retirement. Some groups, including married women, have been found to be quite responsive to changes in after-tax wages.

Workers respond to tax rate cuts by substituting more labor for less leisure since labor becomes relatively more attractive (the "substitution effect"). But tax cuts also create an incentive to reduce labor because a higher after-tax income increases the

---

[16] For previous Joint Economic Committee studies on these issues, see: *Tax Reduction and the Economy*, July 1999; *Some Underlying Principles of Tax Policy*, September 1998; and *Revenue Maximizing Taxation is Not Optimal*, Lawrence Lindsey for the JEC, July 1997.

[17] See OECD (1997) for a summary of the research; also, *Taxation and Economic Growth*, NBER Working Paper 5826, Eric Engen and Jonathan Skinner, November, 1996; and "The Scope of Government and the Welfare State," Randall Holcolme, Robert Lawson, and James Gwartney, *Cato Journal*, Fall 1998.

[18] Fabio Padovano and Emma Galli, "Tax Rates and Economic Growth in the OECD Countries," *Economic Inquiry*, January 2001.

[19] A lump-sum tax on each taxpayer is considered to be the least distortionary tax because it would not affect prices and therefore decision making at the margin.

demand for leisure (the "income effect").[20] Empirical research has found that labor supply substitution effects usually outweigh income effects.[21] As a result, overall labor supply can generally be expected to modestly rise in response to marginal tax rate cuts.[22]

An interesting conclusion from economic theory is that it is only the substitution effect that comes into play in determining deadweight losses, not the overall change in a taxpayer's behavior.[23] As a consequence, substantial deadweight losses may be occurring in situations where substitution effects are offset by income effects and behavior is little changed.

Higher-income taxpayers generally have the largest responses to tax changes and face the highest tax rates.[24] As a result, they experience the largest deadweight loss burdens from the income tax. Society in general also loses when higher-income taxpayers react to high tax rates because those with high incomes often have unique talents. For example, if high taxes cause highly skilled surgeons to take fewer patients, the welfare of many potential patients will suffer.

2. Saving. Personal saving provides individuals with financial security and allows the leveling out of consumption over a lifetime. The nation's savings are put to use by businesses to increase their capital stock and generate long-term economic growth. It is widely recognized that the income tax system is biased against saving and towards current consumption because the returns to saving often face high tax rates whereas current consumption does not. This basic problem with income taxes has contributed to much of the interest in fundamental tax reform in recent years. Income tax rate reductions can partly alleviate this distortionary bias in the tax code.

Lower marginal tax rates would increase the attractiveness of saving relative to current consumption (the "substitution effect"). But lower taxes may also create an incentive to save less because future saving goals could be more easily reached (the "income effect"). While empirical research on tax rates and saving has led to a wide range of results, the substitution effect probably outweighs the income effect for most taxpayers, with the result that marginal tax rate cuts will promote some additional saving.[25] And as is true for labor supply, tax cuts on savings will reduce deadweight losses even if substitution effects are offset by income effects and taxpayer behavior is little changed.

---

[20] For a graphical presentation of the income and substitution effects, see Tax Foundation (1999).
[21] For a summary of studies on responses to changes in after-tax wages, see OECD (1997), p. 59.
[22] The Congressional Budget Office (1997), p. 29 concludes that workers are "modestly responsive to revenue-neutral changes in after-tax wages. For the workforce as a whole, a 10-percent rise in after-tax wage rates could increase the labor supply between 2 percent and 4 percent." See also JCT (1997).
[23] For a discussion, see Rosen (1992) pp. 313, 314.
[24] Lowering the top rates in a progressive tax structure creates a strong labor supply response since the substitution effect may be large compared to the income effect.
[25] In a 1997 report on taxation and growth, the OECD (1997) pp. 8, 17, 52 concluded that it is "generally presumed that the substitution effects dominate [the income effects] over the longer term," so that reducing taxes on savings would have a modestly positive effect. See also JCT (1997).

Congress has recognized the disincentive effects of income taxes on personal saving and created a number of tax-favored savings vehicles, such as IRAs and 401(k) plans. While beneficial, these vehicles are not universal in coverage, have dollar cut-offs to limit their usage, and are specific to certain purposes, such as retirement saving. Also, penalties for early withdrawal limit their incentive effects. Families need to save for a whole range of purposes, many of which are not specified in tax law. Therefore, in addition to liberalizing IRAs and 401(k)s, it also makes sense to reduce taxes on returns to all types of personal savings by lowering marginal income tax rates generally.

3. Entrepreneurial Activity and Small Business Growth. The income tax system has a wide-ranging impact on how businesses are structured and operated.[26] Taxes affect such decisions as purchasing capital equipment, hiring workers, and designing compensation plans. Marginal tax rate cuts would reduce the influence of taxation on business decisions allowing firms to allocate resources with greater efficiency.

Tax rate cuts would potentially benefit the more than 20 million small businesses that are subject to tax under the personal income tax system. This includes 19.4 million non-farm sole proprietorships, 2.1 million farms, 1.9 million partnerships, and 2.6 million S corporations.[27]

Much of the benefits of reducing top marginal tax rates would go to small business owners who represent a large and growing share of tax returns in the top rate brackets. IRS data for 1998 shows that of tax filers with adjusted gross income above $200,000, 27 percent reported sole proprietor income and 49 percent reported partnership or S corporation income.[28] By comparison, 14 percent of all tax filers reported sole proprietor income and 5 percent of all filers reported partnership or S corporation income. Similarly, Federal Reserve data shows that 40 percent of the income of the wealthiest one percent of families comes from self-employment or entrepreneurship, compared to 14 percent for the general population.[29] Therefore, cutting the top income tax rates affects large amounts of small business activity, as opposed to being simply a tax cut for salaried executives or those living off of passive investment income.

Personal income tax rates have a direct effect on small business profits, hiring, investment, and growth. Recent research by Robert Carroll, Douglas Holtz-Eakin, Mark Rider, and Harvey Rosen measured the impact of marginal tax rate cuts under TRA86 on

---

[26] The capital gains tax, not discussed in this paper, is also important when considering small business tax policy, particularly with regards to fast-growth, high-tech firms. See Edwards (1999).

[27] *Statistics of Income Bulletin*, IRS, Winter 2000-2001, 1998 figures. The figure of 19.4 million proprietorships compares to 17.4 million tax returns with proprietor income since some returns have income from more than one firm. The Small Business Administration ("Small Business FAQ," December 2000) estimates that there are about 25 million small businesses in the U.S. (see also NFIB's *Small Business Policy Guide*, 2000).

[28] *Statistics of Income Bulletin*, IRS, Fall 2000. See also *Taxing Small Business and Innovation*, JEC, May 1996; and see James Alm and Sally Wallace, "Are the Rich Different?" in Slemrod (2000).

[29] Edward Wolff, "Who Are the Rich?" in Slemrod (2000). Data is for 1992. Similarly, research on U.S. millionaires has found that about 80 percent are self-made. See Edwards (2000c), p.4.

sole proprietor revenue growth.[30] They found that tax rate reductions had a "significant influence" on firm growth rates and concluded that a tax cut that raised taxpayers' after-tax share on marginal income (i.e. one minus the tax rate) by 10 percent would cause them to increase business revenues by 8.4 percent. This suggests that a decrease in the top marginal tax rate from 40 to 33 percent, as proposed by President Bush, would result in revenues for small businesses in the top tax bracket increasing by about 10 percent.

Another paper by Carroll, Holtz-Eakin, Rider, and Rosen examined changes in sole proprietor capital investment before and after TRA86.[31] Lower tax rates both increase the return to marginal capital investments and increase the cash-flow available to finance investments.[32] The authors found that "changes in marginal tax rates have a substantial impact on entrepreneurs' investment spending." For example, they found that a five-percentage point change in marginal tax rates would cause a 10-percent change in capital investment expenditures. A third paper by the same authors examined the effect of personal income tax rates on sole proprietor hiring decisions.[33] They found that a tax cut that boosts after-tax income by 10 percent would raise a small business's likelihood of hiring by 12 percent.

In summary, reductions in marginal income tax rates can be expected to have an expansionary impact on America's small business sector. This is important because small businesses fill a unique role in the economic growth process.[34] While many small businesses stay small, some will grow to become leaders in whole new industries. New firms often challenge existing firms with untried ideas and thereby generate greater competition and efficiency. Evidence suggests that small firms perform a disproportionately large share of radical innovations in the economy, such as Apple's introduction of the personal computer in the 1970s, which caught existing large computer firms by surprise.[35] Economist Joseph Schumpeter called this beneficial process "creative destruction" whereby new firms and products continually replace the old. Tax reductions that support growth in small firms can further this dynamic market growth process.

4. Production and Consumption Efficiency. The income tax code is riddled with incentives and disincentives affecting different industries, investments, and consumption goods. As a result, taxes alter the relative prices of different economic activities thus redirecting resources to less efficient uses. For example, the income tax exclusion on state and local government bond interest alters the allocation of investment funds in the economy.

High marginal income tax rates increase the value of such tax preferences, thus magnifying their economic impact. Marginal tax rate cuts would create greater neutrality between different activities and allow resources to flow towards growth-maximizing

[30] Carroll et al. (2000b).
[31] Carroll et al. (2000a).
[32] Cash-flow is important because external finance may not always be available to entrepreneurs, or may be more costly than internal funds.
[33] Carroll et al. (1999).
[34] For a discussion of the unique economic role of entrepreneurs, see Edwards (2000c).
[35] Edwards (2000c), p. 19.

areas. Simulations of major tax reforms generally show that greater tax neutrality would create a significant spur to economic growth.

As a political dynamic, high tax rates tend to generate a proliferation of special tax preferences. This occurs as policymakers and interest groups logically seek legislative fixes to the damage caused by high tax rates to their favored activities. Unfortunately, the proliferation of special provisions in the tax code causes higher compliance costs and greater inequities between taxpayers. Marginal tax rate cuts will move the tax system towards more equal treatment between different economic activities and different taxpayers.

5. Tax Avoidance. Tax avoidance refers to a wide range of activities designed to legally reduce tax liabilities. As tax rates rise, individuals and businesses restructure their operations, maximize their tax deductions, adjust employee compensation packages, modify investment portfolios, change the timing of receipts and payments, and conduct various other transactions to minimize taxes. They are aided by a large industry of expert accountants and lawyers whose job is to continually develop new techniques and products for tax planning.

Some widely noted examples of tax avoidance include: shifting portfolios from taxable securities to tax-exempt bonds, converting ordinary income to capital gains income when ordinary rates are high (e.g. converting wages to incentive stock options), substituting tax-favored fringe benefits and workplace amenities for wages, shifting business income between the corporate and personal tax bases as relative tax rates change, and converting non-mortgage interest into mortgage interest after TRA86 (which changed the interest deductibility rules).[36]

Different tax avoidance activities may affect economic efficiency to differing degrees. On the one hand, the concoction of complex financial instruments to minimize taxes may cost plenty in accountant's fees, but not alter real production very much. On the other hand, for example, the substitution of tax-favored health insurance premiums for wages has had a large impact on the structure of the U.S. health-care industry. "Tax avoidance" in this latter sense overlaps with the activities discussed in point 4, above.

As tax rates rise, taxpayers have greater incentives to invest more in tax minimization activities. Higher-income taxpayers usually have greater scope to rearrange their affairs in response to changes in tax rates.[37] As a result, a reduction in the top marginal tax rates would bring about the largest reduction in unproductive avoidance activities. One goal of tax rate reductions under TRA86 was to reduce the tax sheltering activities of high-income taxpayers. Today's fairly high tax rates again offer substantial scope to reduce these unproductive activities with rate reductions.

---

[36] Dean Maki, *Portfolio Shuffling and Tax Reform*, Federal Reserve Board, 1996, found substantial reshuffling of consumer debt into mortgage debt after TRA86, with the result that the government received only about half of the revenue from the tax change that they were expecting.

[37] For a discussion of tax avoidance techniques of the wealthy, see Douglas Shackleford, "The Tax Environment Facing the Wealthy," in Slemrod (2000).

6. Tax Evasion. Tax evasion is tax avoidance by illegal means. Like legal tax avoidance, tax evasion rises as tax rates rise, as confirmed by numerous empirical studies.[38] Like tax avoidance, tax evasion creates deadweight economic losses. These occur as resources are shifted from more productive uses to less productive uses that are easier to hide from the government.

In addition, tax evasion adds to government administration costs for audits, information gathering, and enforcement activities. The complexity of tax law combined with high tax rates have created a continuing cat-and-mouse game between taxpayers and the Treasury. A recent issue of *Forbes* described how the invention and promotion of complex tax shelters is alive and well.[39] Accountants and lawyers steadily develop new trust, partnership, insurance company, and offshore structures to allow individuals and businesses to hide income and reduce taxes. The IRS estimates that illegal offshore shelters cost $70 billion in lost annual tax revenue.[40]

But it is often not clear what is legal tax avoidance, and what is illegal tax evasion because of the inconsistencies and ambiguities in the income tax code. It sometimes takes years of reworked regulations or court fights to clarify such gray areas. High marginal tax rates exacerbate the problem by giving taxpayers the incentive to breach the legal limit. This forces the Treasury to write even more complex regulations, demand more information from taxpayers, and spend resources on enforcement.

The magnitude of tax evasion has been roughly estimated by the IRS. It found that taxes not paid on legal individual income, called the "tax gap," was about $95 billion in 1992.[41] Individual taxpayers pay only about 83 percent of what they owe, enforcement brings in another 4 percent, and the rest is uncollected. The tax gap is caused, for example, by taxpayers overstating deductions, understating income, or simply not filing returns. In summary, tax evasion is large and as a result offers substantial scope for tax rate cuts to increase reported taxable income and boost federal tax receipts.

C. Tax Rates and the Tax Base

The last section described some of the taxpayer responses to changes in marginal income tax rates. The overall effect of changes to taxpayer behavior is captured in changes to the tax base. Tax rate reductions increase reported taxable income. But by how much?

---

[38] Gale and Holtzblatt (2000), p.8 provides some cites on this literature.
[39] *Forbes*, "Are You a Chump?," March 5, 2001.
[40] *Forbes*, "Are You a Chump?," March 5, 2001.
[41] General Accounting Office, *T-GCD-97-35*, 1997. *Forbes* states that the tax gap is now about $200b. These figures do not include taxes lost to the government from illegal income sources.

A number of empirical studies have looked at the responsiveness, or elasticity, of taxable income with respect to changes in after-tax income on a marginal dollar.[42] Lawrence Lindsey, formerly at Harvard and currently Director of the National Economic Council, examined the early-1980s income tax cuts in a 1987 paper and found high taxpayer responses.[43] His elasticity estimates were greater than 1.0, indicating that a 10-percent increase in the after-tax marginal income share would result in at least a 10-percent increase in taxable income. Harvard Professor Martin Feldstein found similarly large responses to marginal tax rate reductions under TRA86,[44] as did a 1994 study by the Treasury's Gerald Auten and Robert Carroll.[45]

Recent studies have produced somewhat lower elasticity estimates. A 1999 study by Auten and Carroll found an elasticity of taxable income with respect to after-tax share of 0.57.[46] A study last year by Jonathan Gruber and Emmanuel Saez found an average elasticity of 0.4, which they think is about the mid-point of recent study results.[47] Therefore, a tax cut creating a 10-percent increase in the after-tax share on marginal income will result in a 4-percent increase in taxable income. Gruber and Saez found substantially larger elasticities at higher incomes, indicating that the largest efficiency gains come from cutting the top tax rates.[48]

The time dimension of taxpayers' elasticity or responsiveness is important. In the short-term leading up to, or after, a tax change, taxpayers can change the timing of transactions and adjust their investment portfolios. In the longer term, many other adjustments take place as individuals and businesses learn new tax rules, adjust working patterns and compensation packages, restructure finances, or start using new tax minimization strategies designed by tax professionals. As a result, larger responses to tax changes are expected in the longer term, and taxpayers may take years to fully adjust.

Another dimension of tax-induced behavior effects is the magnitude of economic impact that particular changes have. Some behavior responses, such as one-time adjustments to transaction timing, are transitory and may not have substantial economic effects. But other taxpayer responses have large and lasting impacts on economic growth. For example, tax rate changes that affect entrepreneurial investment decisions clearly have important long-term effects on the economy.

Economists have debated which particular taxpayer responses have been dominant after past marginal tax rate changes. However, Martin Feldstein has argued that it is the total change in taxable income that determines the magnitude of changes to

---

[42] For example, if the top marginal tax rate dropped from 40 to 33 percent, the after-tax share received on a marginal dollar would rise from 60 to 67 percent, a 12 percent increase.
[43] Lindsey (1987). His elasticity estimates ranged from 1.05 to 2.75, with a central estimate of 1.6 to 1.8.
[44] Feldstein (1995a) found elasticities ranging from 1.0 to about 3.0, with a central estimate of 2.1.
[45] Auten and Carroll (1994) found an elasticity of 1.33.
[46] Auten and Carroll (1999), pp. 681-93.
[47] Gruber and Saez (2000). Carroll (1998) also found an average elasticity of 0.4.
[48] In fact, "optimal tax" theory suggests that the most efficient tax system would feature declining marginal tax rates as incomes rise. See, for example, discussion in Gruber and Saez (2000).

deadweight losses, regardless of the underlying causes of the change.[49] And it is the total change in taxable income that determines the revenue feedback effects of tax changes. These two dynamic responses to tax changes are discussed in the next section.

IV. Accounting For the Dynamic Effects of Tax Changes

> *The man of system ... seems to imagine that he can arrange the different members of a great society with as much ease as the hand arranges the different pieces upon a chess-board. He does not consider that the pieces upon the chess-board have no other principle of motion besides that which the hand impresses upon them; but that, in the great chess-board of human society, every single piece has a principle of motion of its own, altogether different from that which the legislature might chuse to impress upon it.*[50]
>
> Adam Smith

Smith would certainly agree that taxpayers have a "principle of motion" of their own. Tax changes cause them to reshuffle their work, saving, investment, avoidance, and evasion activities. These adjustments create the deadweight losses generated by the tax system, and they create feedback effects on federal revenues thus making budget projections more difficult. The magnitude of these dynamic effects is discussed in the following two sections.

A. How Big Are Deadweight Losses?

The cost to the private sector of an additional dollar of tax revenue is not just a dollar. It is more because higher taxes generate larger deadweight losses, which are caused by people and resources being reallocated away from their most efficient uses.[51] As a consequence, marginal tax rate cuts generate gains for the private economy of more than the dollar value of the cuts.

Economic research indicates that deadweight losses represent at least 25 percent of each additional dollar of federal income tax revenue.[52] This means that if income tax rates were increased in an effort to raise revenue by $10 billion, taxpayers would be $12.5 billion worse off because an additional $2.5 billion of economic distortions would

[49] In particular, Feldstein (1995b) thinks that it is the overall change in compensated taxable income that determines the magnitude of deadweight losses.
[50] Adam Smith, *The Theory of Moral Sentiments*, Section VI.II.42, 1759.
[51] For a further discussion of the theory behind deadweight losses, see Rosen (1992) or Hines (1998).
[52] See Browning (1987), Ballard et al. (1985), Stuart (1984), and Vedder and Gallaway (1999). In its February 2001 *Budget Options* report, the Congressional Budget Office notes that "typical estimates of the economic cost of a dollar of tax revenue range from 20 cents to 60 cents over and above the revenue raised."

be created. Conversely, tax rate reductions will benefit taxpayers by about 25 percent more than their actual tax bill is reduced.

The Office of Management and Budget (OMB) incorporates a 25 percent deadweight loss measure into federal cost-benefit analyses.[53] OMB rules require that each additional dollar of tax revenue count as a cost of $1.25 because taxes "create an excess burden which is a net loss to society." Therefore, for new government spending projects to make economic sense, they must generate benefits at least 25 percent greater than their explicit financing costs.

Two main factors affect the magnitude of deadweight losses created by taxes. First, the larger the behavior changes caused by taxes, the larger the deadweight losses. Or more specifically, the larger the behavioral substitution effects, the larger the deadweight losses.[54] As a result, taxes may cause substantial deadweight losses even where little behavior change is observed if substantial substitution effects are being offset by income effects.

The second factor affecting the size of deadweight losses is the marginal tax rate. Deadweight losses rise more than proportionally to increases in tax rates. For income taxes, deadweight losses rise approximately by the square of the increased tax wedge between pre- and post-tax income.[55] For example, a doubling of the tax wedge causes deadweight losses to quadruple. (For excise taxes, deadweight losses rise approximately with the square of the marginal rate). As a consequence, a flatter tax rate structure is substantially more efficient than a progressive tax structure that has rising marginal rates.

Since deadweight losses rise more than proportionally to tax rate increases, modest rate reductions can increase the efficiency of the tax system significantly. For example, the Bush plan's cut in the top income tax rate from 39.6 percent to 33 percent would reduce deadweight losses for taxpayers in this rate bracket by about 35 percent.[56] Cutting the 28 percent rate to 25 percent would reduce deadweight losses by about 22 percent for taxpayers in this bracket.

Deadweight losses are usually considered with regard to changes in tax rates, but estimates have also been made of the total deadweight losses created by taxes. Marginal changes in deadweight losses are larger, measured as a percentage of marginal revenue, than total deadweight losses measured as a percentage of total tax revenue. This is because losses rise more than proportionally to tax rates. As an example, Dale Jorgenson and Kun-Young Yun of Harvard University calculated both the marginal and total deadweight losses of U.S. taxation in a 1991 study.[57] They concluded that deadweight

[53] Office of Management and Budget, *Circular No. A-94*, October 29, 1992. pp. 6, 11.
[54] Put another way, the larger are "compensated" elasticities, the larger are deadweight losses.
[55] See Rosen (1992), p. 316. See also *The Economics Effects of Taxing Capital Income*, Jane Gravelle, 1994, p. 30.
[56] Based on the formula: deadweight loss = $(.5)*(t^2)*(1/(1-t))*(E)*$(taxable income) where t is the marginal tax rate, and E (set at 0.4) is the elasticity of taxable income with respect to the after-tax share.
[57] Jorgenson and Yun (1991).

losses represented about 18 percent of total U.S. tax revenue, but were 39 percent of marginal tax revenue.[58]

Marginal tax rate reductions under President Bush's plan would reduce the deadweight losses created by the income tax. The magnitude of savings was recently estimated by Harvard professors Martin Feldstein and Daniel Feenberg.[59] They found that the plan would reduce deadweight losses of the income tax by about 38 percent of the value of the $1.6 trillion tax reduction, or about $600 billion over ten years. This means that taxpayers would save $1.38 for each dollar of officially-scored tax cuts.

B. How Big are Dynamic Revenue Effects?

In the months and years following tax changes, taxpayers respond in numerous ways to alter their reported taxable income. These changes tend to offset some of the otherwise expected changes in government revenue. The size of such dynamic revenue effects has been the subject of continued debate. As with deadweight losses, the magnitude of revenue feedbacks are larger the larger are taxpayer behavioral responses.

Table 1 provides two simple examples of the effect of taxpayer behavior on federal revenues following a marginal tax rate change. Both examples use the mid-range elasticity estimate of Gruber and Saez of 0.4 (see Section III.C). The examples show that relatively small changes in taxable income can create substantial revenue effects, particularly at higher income levels. Note that the figures relate only to changes in revenue within the marginal rate bracket.

The family in the left-hand column sees their share of marginal income rise 4.2 percent as their tax rate drops from 28 to 25 percent. A static revenue estimate would show the federal budget losing $894. However, the family responds by increasing their taxable income by 1.7 percent, which is enough to reduce the government's revenue loss to $582, indicating a 35-percent dynamic revenue offset.

The family in the right-hand column sees their share of marginal income rise 4.7 percent as their tax rate drops from 36 to 33 percent. A static revenue estimate would show the federal budget losing $1,005. However, the family increases their taxable income by 1.9 percent, which is enough to more than offset the static loss, and the federal budget gains $232 from this family in their marginal tax bracket.

---

[58] Feldstein (1995b) figured that the overall deadweight loss of the personal income tax was about 32 percent of revenues in 1994, but that deadweight losses at the margin were about 78 percent of static changes in revenues. Edgar Browning (1987) calculated the marginal and total deadweight losses of U.S. labor taxes in the 1980s and found that total deadweight losses were about 16 percent of revenue, but deadweight losses at the margin were about 32 to 47 percent of revenue.

[59] Martin Feldstein, "The 28% Solution," *Wall Street Journal*, February 16, 2001. See also Feldstein's February 13, 2001 testimony in front of the House Ways and Means Committee.

While these figures are only illustrative, full simulations of past and proposed tax rate reductions do show substantial revenue feedbacks. In their analysis of the Bush tax plan, Feldstein and Feenberg predict that it would produce a dynamic feedback effect of at least 25 percent ($400 billion) of the official revenue change of $1.6 trillion.[60] Other estimates also suggest that revenue feedbacks from marginal rate cuts are substantial.[61]

Table 1: Revenue Change Under a Marginal Tax Rate Cut
Sample Joint Filers

Assumptions	28% to 25%	36% to 33%
Taxable income	$75,000	$200,000
Income in marginal rate bracket	$29,800	$33,500
Old after-tax marginal income share	72.0%	64.0%
New after-tax marginal income share	75.0%	67.0%
Change	4.2%	4.7%
Assumed elasticity	0.40	0.40
Results	**28% to 25%**	**36% to 33%**
Static revenue change	**-$894**	**-$1,005**
Dynamic revenue change:		
New taxable income	$76,250	$203,750
Change	1.7%	1.9%
Tax increase due to larger taxable income	$313	$1,237
Net dynamic tax revenue change	**-$582**	**$232**

Source: JEC. Figures show revenue change only within the marginal bracket.

Given the potential for substantial dynamic feedbacks from tax changes, there has been an ongoing debate regarding official revenue estimates made by the Congressional Joint Committee on Taxation and the Treasury's Office of Tax Analysis. These official scorekeepers currently only include some limited microeconomic responses in revenue estimates, such as some taxpayer avoidance behavior, but do not include any responses that would alter macroeconomic variables such as GDP.[62]

There is a concern that by excluding full feedback effects in official revenue estimates, federal policy gets biased towards tax rate increases and against tax rate cuts.[63] However, some hurdles stand in the way of routine dynamic revenue analyses. In particular, there is no consensus regarding the best economic model or taxpayer elasticity values to be incorporated in estimates. In addition, complex dynamic analyses may not

[60] Martin Feldstein, "The 28% Solution," *Wall Street Journal*, February 16, 2001. See also Feldstein's February 13, 2001 House Ways and Means Committee testimony.
[61] For example, a study by the Heritage Foundation (2001) estimates that the Bush tax plan would produce revenue feedbacks totaling 47 percent of the 10-year static revenue loss. In a study of the 1981 tax cut, Lindsey (1987) estimated that revenue feedbacks offset up to 25 percent of static losses. A study by Carroll (1998) on the effect of the 1993 marginal tax rate increase found that dynamic feedbacks effects reduced the static revenue gain by between 13 and 39 percent.
[62] For a discussion, see Gravelle (1994) and Joint Committee on Taxation (1997).
[63] Also, note that since much of the revenue feedback effect comes from high-income taxpayers, marginal tax rate cuts have a more progressive distributional impact than indicated by static revenue scoring.

be available for the quick turnaround times needed by policymakers in the midst of tax debates. Nonetheless, current standing rules of the House of Representatives allow the chairman of Committee on Ways and Means to request dynamic analyses of major tax bills.[64] This option has been infrequently used so there is not yet a track record of dynamic scoring to assess.

Once a track record of dynamic tax analyses is compiled, the process could be fine-tuned, and dynamic analyses could be routinely reported as addenda for major tax bills, as a complement to the traditional estimates. This would allow policymakers to consider both the official "static" figures, as well as allow them to consider the broader economic impact of tax changes as reflected in the dynamic estimates.

V. International Trends

Recognition of the harmful effects of high marginal tax rates has led dozens of countries to reduce personal and corporate rates in recent decades. Table 2 shows changes in the top personal income tax rate for the G-7 industrial economies and for 30 other important economies.[65] The average top tax rate for the G-7 countries fell 18 percentage points since 1980. The average top tax rate for the 30 other economies shown fell 22 percentage points during the same period. Similarly, OECD figures show that the average top personal income tax rate for OECD member countries fell 17 percentage points between 1975 and 1995.[66]

Marginal tax rate cuts are sound domestic policy, but increasing global economic integration is making moderate tax rate levels a competitive necessity. Low taxes help home-country firms compete against foreign-based firms, and they aid countries in attracting foreign investment. Attraction of foreign investment is a top goal for most countries today, even though many used to erect barriers to keep it out.

While corporate taxes play a key role in international tax competitiveness, personal income taxes have risen in importance as international labor mobility has increased. Leading-edge industries locate where they have access to highly-skilled people. Countries with high personal income tax rates encourage a "brain drain" of their most talented workers in high-tech, finance, health care, and other industries. In recent years, high-tax Canada and France have seen steady brain drains to the United States and Britain, respectively, as their best young engineers and scientists have sought greater opportunity and higher after-tax wages.[67] *Business Week* profiled one French company's trouble with high personal tax rates:

---

[64] *Rules of the House of Representatives*, 107th Congress, Rule XIII (3)(h)(2).

[65] Sourced from *Economic Freedom of the World* by James Gwartney and Robert Lawson. Figures include both the national government's top rate and the lowest state or provincial top rate. The table excludes the smallest countries in Gwartney and Lawson, and countries for which full data was not available.

[66] OECD figures for central government tax rates only. OECD (1997).

[67] In the past, Britain experienced a serious outward brain drain, but now with relatively low tax rates it has attracted workers from high-tax Continental European countries. Jack Anderson in *Forbes* ("A Misery Index," February 21, 2000) notes that half a million French citizens now live in England.

Table 2: Change in Top Statutory Personal Tax Rates, 1980-1999

(Includes national and state/provincial income taxes)

	1980	1985	1990	1995	1999	1980-1999
Major Countries (G-7):						
United States	70	50	28	40	40	-30
Japan	75	70	65	65	65	-10
Germany	56	56	56	57	56	0
France	60	65	53	51	54	-6
Italy	72	81	66	67	50	-22
United Kingdom	83	60	40	40	40	-43
Canada	60	50	44	44	44	-16
Average G-7	**68**	**62**	**50**	**52**	**50**	**-18**
30 Other Countries:						
Argentina	45	62	35	30	35	-10
Australia	62	60	49	47	47	-15
Austria	62	62	50	50	50	-12
Belgium	76	76	55	58	58	-18
Brazil	55	60	25	35	28	-28
Chile	58	56	50	45	45	-13
Colombia	56	49	30	30	35	-21
Denmark	66	73	68	64	59	-7
Egypt	80	65	65	50	42	-38
Greece	60	63	50	45	45	-15
Hong Kong	15	25	25	20	17	2
India	60	62	53	40	30	-30
Indonesia	50	35	35	30	30	-20
Ireland	60	65	58	48	46	-14
Israel	66	60	51	50	50	-16
Malaysia	60	45	45	32	30	-30
Mexico	55	55	40	35	40	-15
Netherlands	72	72	72	60	60	-12
New Zealand	62	66	33	33	33	-29
Nigeria	70	55	55	35	25	-45
Peru	65	65	45	30	30	-35
Philippines	70	60	35	35	33	-37
South Africa	60	50	45	43	45	-15
South Korea	89	65	60	48	44	-45
Spain	66	66	56	56	48	-18
Sweden	87	80	72	58	56	-31
Taiwan	60	60	50	40	40	-20
Thailand	60	65	55	37	37	-23
Turkey	75	63	50	55	40	-35
Venezuela	45	45	45	34	34	-11
Average - 30 other countries	**62**	**60**	**49**	**42**	**40**	**-22**

Note: figures include the lowest subnational tax rate for those countries such as United States and Canada that have a range of state/provincial rates.

Source: Adapted from James Gwartney and Robert Lawson, *Economic Freedom of the World, 2001*

> When Strasbourg-based Transgene needed to create a subsidiary to test a new kind of gene therapy, it shunned the vine-trellised region of Alsace-Lorraine as a site for the new business ... Transgene instead set up in Massachusetts. One reason: punishing French taxes, which can gobble up more than 60 percent of the gross earnings of highly-paid workers. 'We are facing more and more difficulties attracting people to France,' says Bernard Gilly, Transgene's CEO. [68]

The United States has been successful at attracting capital and skilled labor from abroad, but it can't rest on its laurels. It needs to continuously improve its tax system because other countries are becoming more competitive all the time.[69] For example, while young Irish people for generations came here seeking opportunity, the Ireland of today has a very competitive tax system, a booming technology sector, and is keeping its best young minds at home.

Many of our largest trading partners have been recently cutting marginal tax rates. Germany is cutting its top personal rate from 56 percent to 44 percent by 2005. France is planning to reduce its top personal tax rate of 54 percent. Canada has just reduced each rate in its federal income tax structure by 1 to 4 percentage points. The Netherlands recently enacted personal tax cuts to lower its tax structure from rates of 37-60 percent to rates of 33-52 percent.[70] And Mexico's President Fox has just unveiled a plan to reduce that country's top personal income tax rate from 40 to 32 percent.[71]

Corporate tax rates are falling as well. A new survey finds that the average top corporate income tax rate in OECD countries fell from 37.5 percent in 1996 to 33 percent today.[72] This is on top of the 10 percentage point decline in the average corporate income tax rate in OECD countries between the mid-1980s and mid-1990s.[73]

VI. Conclusions

President Bush has proposed that income tax rates be reduced so that taxpayers retain a share of future budget surpluses. With federal tax revenues as a percentage of GDP at a peacetime high, it does appear that additional resources would be more productively used in the private sector than in an expanded public sector.

This paper has described how reductions in marginal tax rates would enhance economic efficiency by reducing "government waste." Government waste usually refers to unneeded spending projects. But tax-induced deadweight losses and compliance costs

---

[68] *Business Week*, "The Only Question is How Much to Slash," March 6, 2000.
[69] A recent Arthur Anderson (Europe) study rated the United Kingdom the best place for business and more "entrepreneur friendly" than second-place United States, including its corporate tax policies. "Britain's Best for Business," *Sun*, Jan. 24, 2001, based on *Not Just Peanuts*, Arthur Andersen and GrowthPlus, 2000
[70] Arthur Andersen and GrowthPlus, *Not Just Peanuts*, 2000.
[71] *Washington Post*, "Mexico's Fox Seeks Tax System Overhaul," April 3, 2001.
[72] *The Economist*, "Company Taxes," February 24, 2001.
[73] OECD (1997).

are also "waste" since they simply represent the costs of extracting cash from taxpayers, and not the creation of any new economic value.

Former Supreme Court Chief Justice Marshall famously noted, "the power to tax involves the power to destroy."[74] This is true of high marginal rates, which prevent otherwise beneficial market transactions from taking place by distorting prices. Lowering marginal tax rates will allow markets to allocate resources more efficiently and generate a higher standard of living for all Americans.

The United States was a world leader in tax reform in the 1980s. A reduction in marginal tax rates would move us back towards the simple two-rate tax structure enacted in 1986. Today, other industrial countries are moving ahead with the adoption of more competitive tax rates. The U.S. could again lead by enacting lower marginal rates as the first step towards creating a more efficient tax system for the 21st century.

[74] Quoted in National Commission on Economic Growth and Tax Reform, *Unleashing America's Potential*, January 1996. p. 8.

REFERENCES

Auten, Gerald and Carroll, Robert. 1994. "Taxpayer Behavior and the 1986 Tax Reform Act," Office of Tax Analysis, U.S. Treasury, July.

Auten, Gerald and Carroll, Robert. 1999. "The Effect of Income Taxes on Household Income," *Review of Economics and Statistics* 81(4).

Ballard, Charles, et al. 1985. "General Equilibrium Computations of the Marginal Welfare Costs of Taxes in the United States," *American Economic Review*. March.

Browning, Edgar. 1987. "On the Marginal Welfare Cost of Taxation," *American Economic Review*. March.

Carroll, Robert. 1998. *Do Taxpayers Really Respond to Changes in Tax Rates? Evidence from the 1993 Tax Act*. OTA Working Paper 79, U.S. Treasury Department. November.

Carroll, Robert, et al. 1999. "Income Taxes and Entrepreneurs' Use of Labor," *Journal of Labor Economics*, April. (and *NBER Working Paper W6578*, May 2000).

Carroll, Robert, et al. 2000a. "Entrepreneurs, Income Taxes, and Investment," in *Does Atlas Shrug*, Joel Slemrod, editor (2000).

Carroll, Robert, et al. 2000b. *Personal Income Taxes and the Growth of Small Firms*. National Bureau of Economic Research Working Paper (NBER) 7980. October.

Congressional Budget Office. 1997. *The Economic Effects of Comprehensive Tax Reform*, July.

Edwards, Chris. 1999. *Entrepreneurial Dynamism and the Success of U.S. High-Tech*. Joint Economic Committee, U.S. Senate. October.

Edwards, Chris. 2000a. *The EITC and the Taxation of Lower-Income Working Families*, Joint Economic Committee, U.S. Senate. March.

Edwards, Chris. 2000b. *Tax Complexity Factbook*, Joint Economic Committee, U.S. Senate, April.

Edwards, Chris. 2000c. *Entrepreneurs Creating the New Economy*. Joint Economic Committee, U.S. Senate. November.

Feldstein, Martin. 1995a. "The Effect of Marginal Tax Rates on Taxable Income: A Panel Study of the 1986 Tax Act," *Journal of Political Economy*. June.

Feldstein, Martin. 1995b. *Tax Avoidance and the Deadweight Loss of the Income Tax*, NBER Working Paper 5055, March.

Feldstein, Martin and Feenberg, Daniel. 1995. *The Effect of Increased Tax Rates on Taxable Income and Economic Efficiency: A Preliminary Analysis of the 1993 Tax Rate Increases*, NBER Working Paper 5370. November.

Gale, William and Holtzblatt, Janet. 2000. *The Role of Administrative Issues in Tax Reform: Simplicity, Compliance, and Administration, Draft*. December.

Gravelle, Jane. 1994. *Dynamic Revenue Estimating*. Congressional Research Service. December 14.

Gruber, Jonathan and Saez, Emmanuel. 2000. *The Elasticity of Taxable Income: Evidence and Implications*, NBER Working Paper 7512, January.

Heritage Foundation. 2001. *The Economic and Budgetary Effects of President Bush's Tax Relief Plan*, Prepared by Mark Wilson and William Beach. February 22.

Hines, James. 1998. *Three Sides of Harberger Triangles*, NBER Working Paper 6852, December.

Joint Committee on Taxation. 1997. *JCS-21-97*. U.S. Congress. November.

Joint Committee on Taxation. 2001. *JCX-6-01*. U.S. Congress. March.

Joint Economic Committee. 1982. *The Mellon and Kennedy Tax Cuts: A Review and Analysis*, U.S. Congress, June 18.

Jorgenson, Dale and Yun, Kun-Young. 1991. "The Excess Burden of Taxation in the United States," *Journal of Accounting, Auditing, and Finance*, Fall.

Lindsey, Lawrence. 1987. "Individual Taxpayer Response to Tax Cuts, 1982-1984, With Implications for the Revenue Maximizing Tax Rate," *Journal of Political Economy* (33).

Organization for Economic Cooperation and Development (OECD). 1997. *Taxation and Economic Performance*.

Rosen, Harvey. *Public Finance*, 3rd Edition. 1992.

Slemrod, Joel (editor). 2000. *Does Atlas Shrug: The Economic Consequences of Taxing the Rich*. New York: Russell Sage Foundation.

Slemrod, Joel. 1995. "Income Creation or Income Shifting? Behavioral Responses to the Tax Reform Act of 1986," *AEA Papers and Proceedings*. May.

Stuart, Charles. 1984. "Welfare Costs per Dollar of Additional Tax Revenue in the United States," *American Economic Review*. June.

Tax Foundation. 1999. *A Primer on the Economic Implications of Marginal Tax Rates*. Patrick Fleenor and Scott Moody. November.

Vedder, Richard and Gallaway, Lowell. 1999. *Tax Reduction and Economic Welfare*. Joint Economic Committee. April.

TAX POLICY FOR ECONOMIC GROWTH

I. EXECUTIVE SUMMARY

The ongoing economic slowdown, exacerbated by the terrorist attacks of September 11, makes changes in economic policy necessary. While there is bipartisan agreement on the desirability of tax relief, the composition and scale of tax legislation are both matters of contention. This paper examines current economic conditions, the primary features of several options for tax relief under consideration in Congress, and their potential effects on the economy.

Current and ongoing Joint Economic Committee (JEC) research on major tax issues[1] indicates that measures to reduce income tax rates and reduce the cost of capital would have positive short- and long-term effects on the economy. Among the findings are the following:

- The economy has been in an economic slowdown since the middle of 2000, led by a sharp decline in investment growth. The rebound previously projected by many macroeconomic forecasters for the last half of 2001 will probably be delayed or undermined by the terrorist attacks of September 11, 2001. Tax incentives for capital formation are especially appropriate given the important leading role of weakening investment in the economic slump.
- After the attacks, the extra security costs in the short run as well as in the long run will have effects similar to imposing a "security tax" on an already vulnerable economy. This security tax should be offset by tax policy, such as the relief provided under several core components of the *Economic Security and Recovery Act of 2001* (H.R. 3090).
- The current tax code penalizes work, saving, investment, and entrepreneurship. Tax changes that reduce these penalties will improve long-term economic growth.
- According to an important and growing body of economic research, the current level of taxation imposes a large excess burden at the margin; 40 cents in lost economic welfare per dollar of tax would be a reasonable estimate. There is no reason for policymakers to accept such counterproductive results.
- If the tax bill increases the GDP growth rate by only one-tenth of one percentage point annually, it would produce enough additional revenue over 10 years to offset a significant portion of the estimated static revenue losses.
- The dynamic economic impact of properly designed tax legislation, and the high degree of income mobility in the United States, lead to broadly shared economic benefits that are often ignored in conventional revenue and distributional analysis.

[1] For more information, please visit our webpage at http://www.house.gov/jec.

II. WHY CERTAIN TAX CHANGES CAN AFFECT THE ECONOMY

In a market economy, resources are allocated by the forces of supply and demand. Producers of goods and services expand production to the point where the cost of producing the last unit is covered by the price that can be obtained in the market.

The quantity of inputs to the production process – labor services and capital – is also influenced by changes in market prices. All other things equal, a rise in wage rates, for example, tends to attract new potential workers and expand the labor force. An increase in the rate of return on saving and investment tends to elicit more saving and investment. Thus, changes in prices can affect the quantity of inputs used in production.

Current and especially future prices and costs must be discovered through the market process. Market participants have differing views of future market conditions and their current implications, and these views are tested by the market process over time. Entrepreneurs whose expectations are especially prescient and accurate are rewarded, while those who are not lose their command of productive resources. The entrepreneurial function is the nerve center of the market economy because foresight and the ability to use knowledge productively underlie all the valid assumptions made about costs and prices.

Our economy is not a pure free market economy as in an abstract model. The U.S. economy is a market-based system in which market forces allocate resources, but government is also present. Market costs and relative prices are influenced by government taxation and regulation. The general effect of taxes and regulations is to increase production costs. This effect may or may not be offset by other gains, but an increase in cost or a reduction in the return to a factor of production tends to reduce the supply available. This imposes costs on the economy, withdraws resources from production, and lowers economic growth. The result is economic losses (known as excess burdens) for consumers and producers.

An ideal tax is one that interferes as little as possible with the market allocation of resources. The current tax system is not consistent with this criterion because it is biased against saving and investment, which are taxed more heavily than consumption. In addition, current tax policy also has the effect of discouraging work effort.

Furthermore, given the current level of taxation, the costs imposed are excessive in relation to the revenue raised. The excess burden of taxation is estimated at about 40% of revenues raised at the margin.

Tax legislation that removes some of the bias against work, saving, and investment, would tend to lower barriers to resources flowing into production. Tax legislation that blunts tax provisions that undermine entrepreneurship and innovation would also tend to facilitate the dynamism and flexibility conducive to economic growth. These positive economic effects can be seen during periods when broad-based tax incentives are in place.

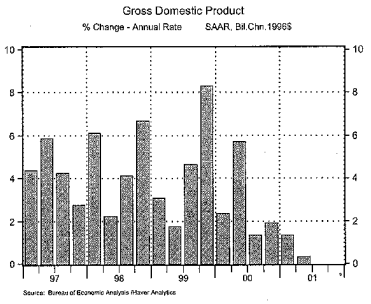
Such measures would work to increase incentives and lower production costs, also improving the cash flow of firms. Improved investment would also increase labor productivity and output, and could bolster demand for labor services that are complementary to capital. Since firms are employers, the reduction in costs and enhancement of labor productivity would work to help firms maintain employment levels and avert pressure to reduce variable costs by discharging as many workers in an economic slowdown. Economic losses incurred by employers and exacerbated by high security, tax and other costs are not in the interest of employers or employees. In sum, a balance in economic policy is needed whereby monetary policy increases aggregate spending, and changes in tax policy are geared to enhancing investment, efficiency, and expansion of output.

III. ECONOMIC STIMULUS THROUGH TAX RELIEF

Prior to the terrorist attack on September 11, most economic indicators suggested the U.S. economy was experiencing a significant economic slowdown, which began in mid-year 2000. Despite this widespread slowdown, the consensus view among economists at the time was that a near-term economic rebound was at hand for a number of important reasons. The terrorist attack of September 11, however, dramatically changed this by altering consumer and business behavior in both the short and long run; the attack embodies important short- and long-run effects. As a consequence of these effects, prospects for the economic outlook have changed dramatically. The expected near-term economic rebound is now in doubt and the likelihood is that added security expenditures and a "security tax" will adversely effect productivity growth in a longer-term horizon. The economic outlook, however, will importantly depend on the macroeconomic policy response of both monetary and fiscal policy. This analysis explains why an appropriate fiscal response should emphasize tax relief rather than additional government spending and develops a number of alternative tax options.

Some Background

Prior to the terrorist attack on September 11, the economy was experiencing a significant slowdown, which began in mid-year 2000. In fact, the macroeconomy was quite weak. Real GDP growth in the second quarter of 2001 was revised down to a low but positive rate. Investment growth had fallen. Manufacturing activity was especially weak with little sign of an imminent rebound. While consumption growth had slowed, it (along with housing strength) was



sufficient to keep the economy out of outright recession. The labor market had softened as employment growth deteriorated and the unemployment rate increased. Broad measures of inflation as well as forward-looking inflation indicators suggested no resurgence of inflation was imminent.

Despite this somber pre-attack picture, at the time it was reasonable to expect that a near-term economic rebound was in the works. With an inventory correction near completion, a retreat of energy prices, a substantial Federal Reserve easing of monetary policy in the pipeline, a tax-cut program in place, and a perception that the stock market had stabilized, consensus projections of an imminent rebound in economic activity appeared quite plausible. These arguments were buttressed by data emerging in the period immediately preceding September 11. Consumer spending, for example, moved higher in August and was maintained in early September. Auto sales were running close to August levels. Purchasing managers reported an improved orders picture in August, and the profit decline was slowing. All of this suggested that a near-term economic turnaround as embodied in consensus forecasts was at hand.

The Effects of the September 11 Terrorist Attack

The terrorist attack of September 11 changed the economic outlook in several important ways. In the short-term, the attack increased uncertainty and apprehension in financial markets. Such increased uncertainty usually increases market volatility, thereby boosting risk premiums. It normally induces investors to move out of riskier assets (such as stocks) and into safer, more liquid, and shorter-term assets (such as short-term U.S. Treasury securities, gold, and cash). This tends to adversely impact the stock market as well as commitments for long-term investments and purchases and to boost demand for short-term liquidity, which works to lower aggregate demand (spending).

This increased uncertainty has negative impacts on consumption and investment as consumer and business confidence deteriorate. Discretionary consumer purchases (such as consumer durables, i.e. cars, major appliances, etc.) and long-term business commitments are often postponed or canceled as purchasers retrench and aggregate demand contracts. Additionally, related stock market declines reduce consumption (via negative wealth effects) and investment (via higher cost of capital).

The terrorist attacks had immediate impacts on certain industries, most notably airlines, aerospace, travel, insurance, hotels, and related areas. The negative impact on these industries, however, likely will spread to other sectors as the negative effects on consumption and investment manifest themselves.

There will be long-term effects of the terrorist attacks as well. The economic costs of a permanently increased terrorist threat will likely bring major changes to our way of life. This will, for example, entail an increased cost of security; in effect, an added "security tax."[2] Such a "tax" will take the form of travel delays, additional security

[2] See Robert Keleher, "Current Economic Conditions and Outlook," Joint Economic Committee, September 28, 2001. p 2.

checks, longer cross-border transfers, higher insurance costs, additional identification requirements, higher shipping costs, more regulation, immigration restrictions, and other added inconveniences. It will involve spending money on new security guards and buying metal detectors, which do nothing to increase the quantity or quality of goods or services provided. This "tax" will raise the cost of doing business, stifle gains from free exchange, add inefficiencies, and hence constitute a negative supply-side shock or added tax on the economy. Consequently, it will adversely impact both productivity growth and the economy's long-term potential growth rate.

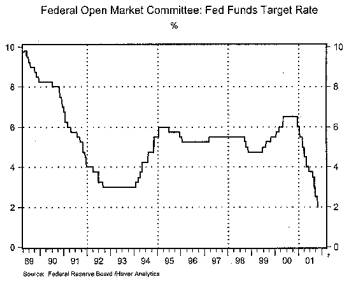
Similarly, while the attacks will spawn near-term investment and defense spending to repair and replace buildings and shore-up our security, intelligence, and defenses, the total private capital stock will be less than it would otherwise have been. The so-called "peace dividend" – a dividend that freed up resources for growth – is lessened. Monies for a necessary military/security buildup to some extent crowd out private investment. Thus, the attacks will adversely affect aggregate supply and the longer-term potential growth rate of the economy.

The Consequences of the Attack

As a consequence of these effects of September 11, the prospects for the economic outlook have changed substantially. These changes relate to the adverse effects to both aggregate demand and aggregate supply. The expected near-term economic rebound, for example, is now in doubt. Real GDP growth is expected to contract in the near-term as a consequence of the events surrounding September 11. According to this scenario, as confidence wanes, unemployment increases, and a weak stock market adversely impacts wealth positions, consumption growth may slow as consumers postpone discretionary purchases, repair their weakened balance sheets, and increase their saving. With such uncertain prospects and the added "security tax" adversely affecting profits, investment growth could remain weak. This is occurring at the same time as a global slowdown and hence weak export growth. The depth and duration of the retrenchment will depend in part on the extent of the damage to business, consumer, and investor confidence. But the near-term may be associated with recessionary conditions and a now weaker recovery may be pushed back into 2002.

The Macroeconomic Policy Response

The full economic impact of recent events, however, will depend in part on the economic policy response. This response includes monetary policy, which should focus on aggregate demand, and fiscal policy, which should be oriented to aggregate supply:



Monetary policy: The Federal Reserve lowered short-term

interest rates by 50 basis points on September 17, another 50 basis points on October 2, and an additional 50 basis points on November 6. These were the Fed's eighth, ninth and tenth interest rate reductions this year, lowering the fed funds rate by 450 basis points to 2.0 percent (from 6.5 percent in early January). In addition, the Fed has provided a substantial amount of liquidity to the markets to satisfy increased liquidity demands.

Despite these moves, however, there is little economic evidence suggesting that monetary policy is "easy." Jointly assessed forward-looking market price indicators suggest inflation remains dormant and is not a significant problem. Commodity prices remain weak, the foreign exchange rate value of the dollar remains firm, and long-term interest rates recently have fallen. Evidence from key transmission paths or channels of monetary policy also indicates that the stance of policy is not easy. Bank lending has been weak, and stock market values are off considerably. All of this suggests that current monetary policy may not be as "easy" as the recent lowered fed funds rate has led some to believe. Despite Fed efforts to stimulate the economy, more needs to be done to stimulate aggregate demand. An easier Federal Reserve policy stance may be in order.

Fiscal policy: The Congress has already approved a $55 billion emergency spending package to aid in cleaning up, rebuilding, fighting terrorism, increasing security, and aiding the airline industry. Some additional government spending for these purposes may occur. However, the effectiveness of these measures in stimulating the economy is doubtful. Further measures to bolster the economy will be needed. It is essential that such measures address the weakness in investment that has led the economic slowdown. Such proposals also should include tax relief to bolster the economy by affecting aggregate supply in order to offset the adverse effects of the "security tax" described above. These may include, for example, accelerated depreciation allowances, liberalized expensing provisions, and front-loading scheduled tax rate cuts, among other proposals. Consideration of tax relief for mutual fund shareholders, such as provided in H.R. 168, would be appropriate in this environment. Several of these alternative fiscal proposals will be examined in detail below, and some have already been passed by the U.S. House of Representatives as components of H.R. 3090.

Aggressive monetary and fiscal policy responses will cushion but not fully offset the anticipated adverse consequences of September 11. Such action would foster a shallower and shorter downturn as well as a stronger recovery than otherwise would be the case.

IV. REDUCING THE TAX BURDEN

As noted in the previous discussion, the additional security costs associated with the terrorist attacks will impose extra costs on the economy analogous to a security tax. Unfortunately, this tax burden is being imposed at a time of considerable domestic and international economic weakness. While the attacks' impact on demand should be

addressed through monetary policy, their impact on supply should be addressed through tax policy, not additional federal spending. Tax relief can reduce some of the extra associated security costs, while increased federal spending will tend to drive them higher. In addition, it is also essential to address the security tax in ways that also lessen the structural bias against saving and investment in the income tax over the long run.

The additional security costs imposed on producers will increase the cost of production, constraining output and future economic growth. Tax policies that would offset some of this extra security tax burden on producers would reduce this negative impact and help increase production, employment, and economic growth in the short run, and even more noticeably in the long run.

Increases in federal spending designed to stimulate the economy, on the other hand, would be ineffective. Federal resources cannot be raised without cost. The resources for additional federal spending must first be drawn from the private sector, so what is given from one hand has been taken from the other. New federal spending generally will not provide a *net* stimulus to the economy.

Moreover, additional federal spending would ultimately be reflected in higher taxes than would otherwise be necessary. The total cost of these taxes must be considered in evaluating the costs and benefits of higher expenditures. The current level of federal taxes imposes high additional costs, including the excess burden economists refer to as "deadweight losses." Consequently, each additional dollar of federal spending must provide far more than a dollar of benefit to provide net benefits. Economic research suggests that justification of additional federal expenditure requires surmounting a very high hurdle of associated costs.

Each tax dollar taken from individuals or businesses costs the U.S. economy far more than one dollar. Additional burdens stem from administrative costs, compliance costs, and deadweight losses. In fiscal year 2001, the Internal Revenue Service spent $8.6 billion to administer the U.S. tax code.[3] That amounts to 0.7 percent of federal income tax collections. Closely related to administrative costs, individuals and businesses spent an additional $100 billion or about 10 percent of federal income tax collections to comply with the U.S. tax code in 1999.[4]

However, the deadweight losses from the U.S. tax code dwarf its administrative and compliance costs. Taxes create disincentives that discourage individuals and firms from undertaking economically productive activities such as work, saving, or investment. Taxes alter the economic behavior of individuals and firms in ways that reduce economic welfare. Deadweight losses represent this loss of economic welfare due to taxes.

---

[3] Executive Office of the President, Office of Management and Budget, *Budget of the United States, Fiscal Year 2002, Appendix*, vol. 2. (Washington, D.C.: Government Printing Office, 2001): 2-861.
[4] Joel Slemrod and Jon Bakija, *Taxing Ourselves: A Citizen's Guide to the Great Debate over Tax Reform* (Cambridge, Massachusetts: The MIT Press, 2000): 137.

Deadweight losses are quite substantial. In 1999, a Joint Economic Committee study reviewed the empirical literature and found that the average among all deadweight loss estimates in these studies was 40 cents for every dollar collected in federal taxes.[5] High marginal federal income tax rates are particularly damaging. Deadweight losses increase more than proportionately to any increase in marginal income tax rates.

Reducing deadweight losses is closely related to increasing economic growth. Both the Organization for Economic Cooperation and Development (OECD) and the World Bank have published cross-country studies linking lower tax rates to higher rates of economic growth.[6]

The challenge before policymakers is to craft tax policy in such a way as to offset the security "tax," while addressing the structural bias against work, saving and investment in the tax code over the long run. The alternative approach, which would attempt to manage demand through spending increases, would not only be ineffective but also wasteful and costly as well. Monetary policy is a much more effective tool to bolster demand in a weak or deflationary economic environment.

In sum, the choice confronting policymakers is between increasing the costs of production, or reducing them in order to stimulate economic growth. Tax reduction coupled with fiscal restraint would work to lower production costs, while federal spending increases generally would increase costs and the burden of taxation on the economy. The following sections examine a number of viable tax policy options currently available to policymakers. These include: accelerating individual income tax rate cuts; reducing long-term capital gains tax rates accelerated depreciation; eliminating the corporate AMT; and changing the tax treatment of mutual fund investors.

Accelerating EGTRA Individual Income Tax Rate Cuts

On June 7, 2001, the *Economic Growth and Tax Relief Act* (EGTRA) became law. Among its major provisions, EGTRA reduced marginal federal individual income tax rates in four stages from 2001, 2002-2003, 2004-2005, and 2006 and beyond. Accelerating the effective dates of the legally mandated federal individual income tax rate reductions would be an effective way to stimulate an economic recovery.

Lower marginal federal individual income tax rates would accelerate economic growth in five ways:

- **Labor supply.** Empirical studies show cutting individual income tax will cause a modest rise in overall labor supply. Higher-income taxpayers, who

[5] Richard K. Vedder and Lowell E. Gallaway, *Tax Reduction and Economic Welfare*, Prepared for the Joint Economic Committee, 106th Congress, 1st Session, April 1999: 6.
[6] Willi Leibfritrz, John Thornton, and Alexandra Bibbee, *Taxation and Economic Performance* (Paris: Organization for Economic Cooperation and Development, 1997); and Keith Marsden, *Links between Taxes and Economic Growth: Some Empirical Evidence*, World Bank Staff Working Paper 605 (Washington, D.C.: World Bank, 1983).

experience the largest deadweight losses, are likely to show the largest labor supply response to a reduction in marginal federal individual income tax rates.[7]

- **Saving supply.** It is widely recognized that the current U.S. tax code is biased against saving. Lower marginal federal individual income tax rates will partially alleviate this bias.[8]
- **Entrepreneurial activity.** More than 20 million small businesses and farms are subject to the federal individual income tax. Of the individual tax filers with an adjusted gross income above $200,000 in 1998, IRS data shows that 27 percent reported sole proprietor income and 49 percent reported partnership or "S" corporation income.[9] Cutting marginal federal individual income tax rates affects large numbers of small business people, not just high-salaried executives or those living off investment income. Empirical studies demonstrate that lower federal marginal individual income tax rates help to stimulate small business revenue growth, investment, and employment. One study found a 5-percentage point reduction in marginal federal individual income tax rates would cause a 10 percent increase in small business investment.[10] Another study found that a tax cut that boosts after-tax income by 10 percent would increase a small business's likelihood of hiring by 12 percent.[11]
- **Production and consumption efficiency**. Higher marginal federal individual income tax rates cause individuals and businesses to make production and consumption decisions on the basis of the tax code. That causes widespread production and consumption inefficiencies and slows economic growth. Cutting marginal federal individual income tax rates reduces the value of tax deductions and exemptions and encourages individuals and businesses to make economically sound decisions about consumption and production rather than to game the tax system. The resulting efficiency gains will accelerate economic growth.[12]
- **Tax avoidance**. Higher-income taxpayers usually have more ability to minimize their tax burdens than other taxpayers. Lowering marginal federal individual income tax rates will encourage higher-income taxpayers to move their funds from unproductive tax shelters to more productive, but taxable investments.[13]

---

[7] Chris Edwards, *Economic Benefits of Personal Income Tax Rate Reductions*, Joint Economic Committee, 107th Congress, 1st Session, April 2001: 5-6.
[8] Edwards (2001): 6-7.
[9] Internal Revenue Service, *Statistics of Income Bulletin* (Washington, D.C.: Government Printing Office, Fall 2000).
[10] Robert Carroll et al., "Entrepreneurs, Income Taxes, and Investment," in *Does Atlas Shrug?*, Joel Slemrod, ed. (April 2000).
[11] Robert Carroll et al., "Income Taxes and Entrepreneurs' Use of Labor," *Journal of Labor Economics* (April 2000).
[12] Edwards (2001): 8-9.
[13] Edwards (2001): 9.

Accelerating already enacted marginal federal individual income tax rate cuts has another advantage – its long-term effects on the federal budget are minimized. Its budgetary effects would be limited to fiscal year 2002 through 2006 with most of its budgetary effects concentrated in fiscal years 2002 through 2004, when fiscal stimulus is needed the most. Unlike other proposals (such as cutting federal corporate income tax rates or reducing federal capital gains taxes), accelerating marginal federal individual income tax rate reductions already enacted in EGTRA would not represent a new and permanent change to the U.S. tax code. The *Economic Security and Recovery Act* would effect an important acceleration of tax relief by reducing the 27 percent tax rate to 25 percent in 2002. Separately, the bill also expands benefits for some tax filers.

Reducing Capital Gains Tax Rates

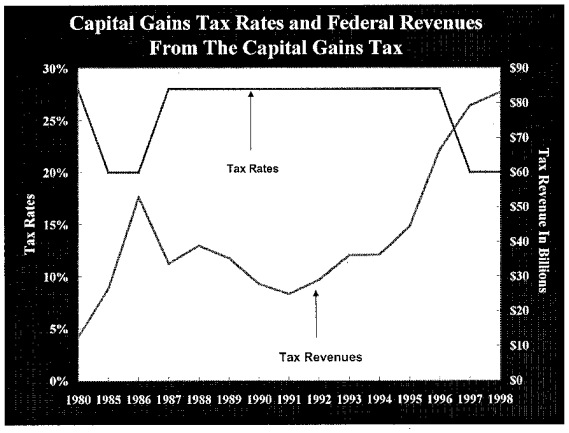
The U.S. tax code regards assets held longer than 12 months as long-term assets and assets held less than 12 months as short-term assets. Capital gains on short-term assets are taxed at regular income tax rates. Following the enactment of the *Taxpayer Relief Act of 1997*, capital gains on long-term assets held for one to five years are taxed at a maximum tax rate of 20 percent (10 percent for taxpayers in the 15 percent marginal tax rate bracket). Capital gains from the sale of assets held for more than five years are taxed at a maximum tax rate of 18 percent (8 percent for taxpayers in the 15 percent tax rate bracket). One way to stimulate the economy would be to reduce the tax rates on all capital gains. Another approach would be to standardize capital gains tax rates so that the tax rates on capital gains on assets held one to five years would be the same as those held more than five years. In other words, the maximum tax rate on all long-term capital gains would become 18 percent (8 percent for taxpayers in the 15 percent tax rate bracket). This approach has been included in the *Economic Security and Recovery Act*. Deeper reductions in the capital gains tax rate would also be desirable.

Macroeconomic benefits. Capital investment accelerates economic growth by simultaneously increasing the quantity of capital available and the productivity of labor. Reducing the capital gains tax rate stimulates capital investment. Thus, lowering the capital gains tax rate is likely to boost economic growth. Various empirical studies confirm an inverse relationship between the capital gains tax rate and the real GDP growth rate.[14]

The benefits of reducing capital gains tax rates are concentrated among small businesses. Private individuals provide the venture capital that is the major source for investment in most small businesses. Capital gains taxes directly affect the after-tax return that such venture capitalists expect to earn on their equity investments in small businesses. Reducing the capital gains tax rate stimulates entrepreneurial risk-taking by increasing the supply of venture capital available to small businesses.

[14] DRI/McGraw Hill, "The Capital Gains Tax: Its Investment, Stimulus, and Revenue Feedbacks," (April 1997), and Shahira Knight, "The Economic Effects of Capital Gains Taxation," Joint Economic Committee, June 1997.

Tax revenue. Historically, capital gains tax revenues have increased when capital gains tax rates are lowered; *e.g.*, 1978, 1981, and 1997. Capital gains tax revenues have decreased when capital gains tax rates have been raised, as in the 1986 tax bill. This may seem counterintuitive because a static analysis implies that capital gains tax revenues should fall when the same level of capital gains realizations are taxed at a lower rate. However, one must remember that capital gains realizations are largely discretionary: many taxpayers can control when assets are sold. If capital gains tax rates are high, then taxpayers will defer selling assets. This is known as the "lock-in effect." Lowering capital gains tax rates diminishes the lock-in effect and increases capital gains realizations.



In addition to unlocking effects, capital gains tax rate reductions stimulates a rise in asset prices in two ways. First, modern finance demonstrates that the price of an asset is its net present value; *i.e.*, the sum of its discounted future cash flow. Consequently, there is a tax capitalization effect; *i.e.*, a capital gains tax rate increase (decrease) causes asset prices to fall (rise) generally. Second, reducing capital gains tax rates tend to stimulate economic growth. Higher economic growth implies larger cash flows from business and consequently higher asset prices. This is the macroeconomic effect.

Together, the lock-in effect, the tax capitalization effect, and the macroeconomic effect contribute to higher capital gains tax revenue when capital gains tax rates are lowered.

Simplification. The difference in the capital gains tax rates on assets held between one and five years and assets held five years or longer is a needless complexity in the U.S. tax code that lacks any economic justification. By standardizing capital gains tax rates at 18 percent and 8 percent, Congress could take an important step toward federal tax simplification.

Accelerated Depreciation and Expensing

Business income taxes are levied on the difference between the revenues that firms earn and the costs they incur for inputs. Firms earn revenue by selling goods and services to consumers. When producing goods and services firms incur costs. Some of these costs, such as wages and salaries of workers or the cost of raw materials, are generally incurred during the same year in which the income they helped to produce is generated. Other costs, such as investments in plant and equipment, help to produce income over multiple years.

When calculating taxable income, the first type of cost is simply subtracted from the revenue generated that year. Inclusion of the second type of cost, however, is a bit more complicated. Under current law, firms generally apportion the cost of capital assets over a number of years. Such attribution varies by asset type and is governed by a set of depreciation tables produced by the Treasury Department. Under certain circumstances, smaller firms are permitted immediate deductions for investment known as expensing.

Depreciation rates help to determine the cost of capital investment.[15] As a result, they play a crucial role in determining how much investment will take place in a society. If firms are allowed to deduct their expenditures on capital assets quickly, the relative cost of such investment will be low. This will cause the level of capital investment to be relatively high. If, on the other hand, firms are required to deduct their capital expenditures over a longer horizon, the relative cost of such investment will be high. This, in turn, will cause the level of capital investment to be relatively low.

The inverse relationship between depreciation rates and capital investment suggests that accelerating depreciation schedules will increase investment. Empirical studies of investment decisions tend to support this notion and generally show a strong relationship between depreciation rates and investment.[16] By allowing 30 percent expensing for newly purchased equipment with tax lives of 20 years or less and software during the next three years, the *Economic Security and Recovery Act* effectively accelerates depreciation schedules. This would lower the cost of capital and stimulate investment. The *Act* also expands expensing for small businesses, which would have similar economic effects.

Eliminating the Corporate AMT

The corporate Alternative Minimum Tax (AMT) was passed as part of the *Tax Reform Act of 1986*. Its passage was driven by the perception that complex tax planning allowed some large corporations to pay little or no corporate income taxes. In order to prevent this, Congress created what is essentially a parallel tax system. Under current

[15] See Dale W. Jorgenson, "Capital Theory and Investment Behavior," *American Economic Review* 53, no. 2 (May 1963), pp. 247 -59.

[16] See, for example, Robert S. Chirinko, Steven M. Fazzari, and Andrew P. Meyer, "How Responsive is Business Capital Formation to IT User Cost? An Exploration With Micro Data," *Journal of Public Economics* 31 (December 1993), pp. 1875-911.

law, corporations are required to calculate their tax liabilities under both the regular and alternative minimum tax systems. They are then required to pay the greater of the two liabilities.

The corporate AMT has been criticized on many grounds. Many observers have argued that the complexity generated by the need to calculate a company's tax burden under two tax systems is reason enough to eliminate it. Public finance economists, however, have tended to focus on the role that the corporate AMT plays in determining the cost of capital investment. By its nature, the corporate AMT increases the effective tax rates of those firms subject to it.

Evidence suggests that the corporate AMT increases the cost of capital for firms that invest in equipment and intangible assets such as research and development.[17] Studies also suggest that the elimination of the corporate AMT could increase investment by as much as 7.9 percent over 10 years.[18] Such a rise in investment, coupled with the resulting increase in labor productivity, could be expected to boost the gross domestic product by as much as 1.6 percent over 10 years.[19] The *Economic Security and Recovery Act* contains a corporate AMT repeal provision that would provide needed relief and increase tax incentives for economic growth.

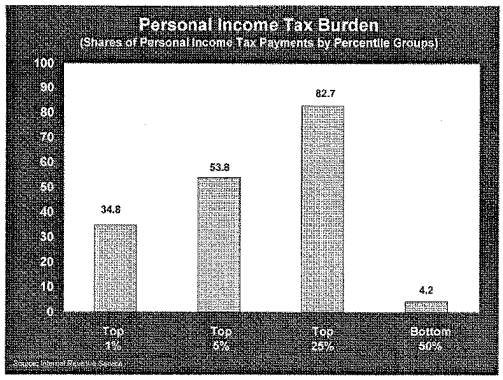
V. TAXES AND TAXPAYERS

In the debate of tax relief proposals, sometimes it is contended that tax reduction unduly favors the affluent. This point of view is often based on statistical sketches of tax changes in which the benefits appear skewed toward higher-income taxpayers, but in reality only reflect the current pattern of tax payments taken out of context. Very often this kind of information allocating the benefits of tax changes is circulated without any mention of the share of tax payments of each income group before and after the effects of the tax cut legislation are taken into effect.

According to a different set of data prepared by the Internal Revenue Service (IRS), the top one percent of filers pays 34.8 percent of the personal income taxes. The IRS data show that the income tax share of the top 5 percent is 53.8 percent, and that of the top 25 percent is 82.7 percent. Filers in the bottom 50 percent paid 4.2 percent of personal income taxes. Incidentally, the taxpayers in the top quarter of taxpayers qualified by earning more than only $50,607 in 1998. The shares of personal income tax payments are displayed in the graph below.

---

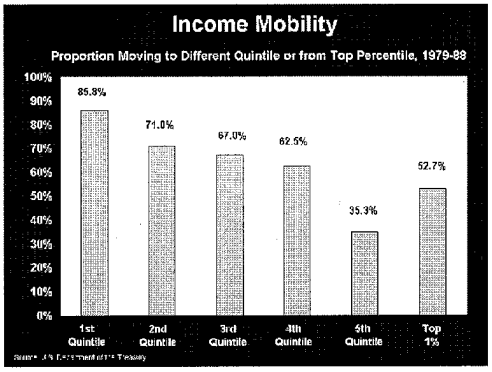
[17] See Andrew B. Lyon, *Cracking the Code: Making Sense of the Corporate Alternative Minimum Tax* (Washington, D.C.: 1997), pp. 77-97.
[18] See DRI, McGraw-Hill," Report on the Macroeconomic Impact of the House and Senate Proposals Regarding the Corporate Alternative Minimum Tax," August 1995.
[19] Ibid.



Another serious problem regarding the analysis of the tax changes on taxpayers at various income levels is that those households are not necessarily cemented into specific income classes for extended periods of time. The United States has a dynamic economy in which there are remarkable degrees of income mobility. Over extended periods, many if not most of those in a particular income strata move up or down. Thus, statements based on the assumption that taxpayers are confined to a particular income class over time are inaccurate.

For example, according to tax return data, 85.8 percent of filers in the bottom 5th in 1979 had exited this quintile by 1988. The corresponding mobility rates were 71.0 percent for the second lowest quintile, 67.0 percent for the middle quintile, 62.5 percent for the fourth quintile, and 35.3 percent for the top quintile.[20] The long-run impact of tax policy on most taxpayers depends on their tax situations and incomes in the future, not the present. The graph below displays the high degree of income mobility in the U.S. over one ten-year period.

[20] See Christopher Frenze, *Income Mobility and Economic Opportunity*, Joint Economic Committee, June 1992.



As can be seen, America is a fluid and dynamic society, not a caste system. The portrayal of the American economy as a rigid class system is contradicted by the statistical evidence. Therefore, tax reduction has broader-based benefits than some critics seem to realize.

VI. CONCLUSION

The economic slowdown that began in the middle of 2000 continues to reflect economic weakness. The prospect of a near-term economic rebound previously forecast by many economists has been jeopardized by the events of September 11, 2001. As a result of the terrorist attacks, significant and pervasive additional security costs will burden the economy in a manner similar to the imposition of a "security tax." Tax policy should attempt to offset these additional costs to facilitate economic growth over the short as well as long term.

There are other long-term structural problems with the U.S. income tax system. The current tax system is counterproductive and biased against saving and investment. Economic stimulus legislation can effectively address the weakness in investment, which has contributed to the economic slowdown. The tax system imposes large losses on the economy that reduce the economic welfare of households and businesses.

In considering alternative fiscal policies, it must be recalled that the current level of taxation imposes additional costs of about 40 cents at the margin for each dollar collected in revenue. A reduction in this burden imposed by the tax system would make a significant improvement in the economic well-being of American households.

The challenge to policy is to address the "security tax" issue in a manner that also addresses the long-term structural problems with the income tax. The additional economic costs imposed by the terrorist attacks should be alleviated by tax policy, and at the same time some of the structural biases against work, saving and investment in the

current income tax system should be corrected. Tax policy should increase economic incentives, reduce deadweight losses, provide broad-based relief to households subjected to excessive income taxation, and improve the prospects for economic growth.

A GUIDE TO TAX POLICY ANALYSIS: THE CENTRAL TENDENCY OF FEDERAL INCOME TAX LIABILITIES IN DISTRIBUTIONAL ANALYSIS

EXECUTIVE SUMMARY

This study examines the misuse of averages as a sole measure of central tendency in presenting results of analyses based on income and tax data in distributional analysis. It finds that the use of averages in tax distribution tables is misleading to the public and the press and that the median is a more appropriate and representative measure to describe income and tax amounts for the taxpaying population.

Specifically, this report finds:

- Income and tax information based on tax returns filed with the IRS do not follow the pattern of a normal distribution. Hence, the use of averages is an inappropriate measure of central tendency.
- Over 22 percent of all 1995 tax returns claimed zero tax liability.
- The Joint Committee on Taxation estimates that for calendar year 2000, 48.7 million taxpayers out of 140.2 million taxpayers overall, or 34.7 percent, will have zero or negative federal income tax liability.
- For all taxpayers, the use of the average as the measure of central tendency overstates the tax liability for the "representative" taxpayer by almost 3 times the median value.
- The dispersion of taxpayers within any income group is impossible to determine from the information presented in tax distribution tables, but is shown to vary considerably.
- The grouping of taxpayers into income categories provide a false sense of precision and misleadingly suggest that taxpayers within the same groups necessarily have similar federal income tax liability.
- In four out of the five income groups examined, a majority of taxpayers had tax liabilities that were either 25 percent greater than the average or 25 percent less than the average tax liability for each income group.

- In comparing federal income tax liabilities, distribution tables often misclassify millions of taxpayers into quintiles in which they have little tax liability in common.
    - Approximately 2.2 million taxpayers in the third quintile pay more in federal income taxes than 5.4 million taxpayers classified in the fourth quintile.
    - Over 3 million taxpayers in the fourth quintile pay more in federal income taxes than 4.1 million taxpayers classified in the fifth quintile.
- The use of averages in tax distribution tables obscures the simplest facts about proposed tax policy initiatives to the public.

ESSENTIAL QUESTIONS TO ASSIST IN EVALUATING TAX DISTRIBUTION TABLES

The issues raised in this paper and the following eleven questions will assist taxpayers in reviewing tax distribution tables:

1. Is the median presented as the correct measure of central tendency (or at least provided in addition to the average)?
2. What measure of income is being used (If adjusted gross income (AGI) is not presented, or some other measure that taxpayers understand, ask that it be provided)?
3. What taxes are being included in the analysis in both the before and after columns, and are they identical (i.e., comparing apples to apples)?
4. How many taxpayers reside within the displayed income categories?
5. What is the range of income and tax liability associated with each category?
6. What is the current and proposed (after full enactment of the proposed tax legislation) level of taxation (percent of total taxes paid to the government) paid by each income category?
7. What is the current and proposed (after full enactment of the proposed tax legislation) effective tax rate for each income category?
8. What are the ranges of tax cuts each income group is estimated to receive after full enactment of the tax legislation (ranges and medians should be provided instead of the often-presented average tax cut)?
9. Are the estimates presented free of imputations? If not, what imputations have been made to arrive at the estimates presented in the distributional tax tables?
10. What are the accuracy and reliability of the estimates presented in the distributional tax tables, and are data limitations disclosed or are they hidden?
11. What are some additional or hidden burdens that are not captured in the distributional tax tables (the hidden economic gains or losses resulting from a tax change, e.g., the economic increase in the stock of capital that would result from a repeal of the estate tax or the hidden burden of hiring lawyers and accountants to avoid the estate tax)?

A GUIDE TO TAX POLICY ANALYSIS: THE CENTRAL TENDENCY OF FEDERAL INCOME TAX LIABILITIES IN DISTRIBUTIONAL ANALYSIS

He uses statistics as a drunken man uses lamp posts – for support rather than illumination.

Andrew Lang[1]

[B]efore representing the central tendency by any single number, evaluators need to look at the distribution and decide whether the indicator would be misleading.

United States General Accounting Office[2]

I. INTRODUCTION

The analysis of tax data is a time intensive and complicated process. Much time and effort are spent collecting income and tax data, compiling data sets and running statistical analyses. However, it appears that relatively little time and effort are spent actually *understanding* the data and how best to present results to the public of analyses of tax data. This is evident in the overuse of averages and the simplistic classification of taxpayers into income ranges and quintiles by highly publicized tax distribution tables. This study shows that the link between income and tax liability is much more tenuous that that often presumed, and that a variety of other factors can greatly affect tax liability.

The taxation of individual income is a major focus of tax policy. Legislators evaluating the fundamental components of tax legislation face decisions that often affect after-tax income and wealth of taxpayers and can affect the performance of the greater economy. The presentation of tax data is necessary for the effective understanding and evaluation of tax policy by both legislators and the public. The incorrect use of descriptive statistics can have profound effects on the way tax policies are evaluated.

The official sources of tax distribution data are the Office of Tax Analysis (OTA) of the Department of Treasury, the Congressional Joint Committee on Taxation (JCT)

---

[1] Furman University Mathematical Quotation Server. Available online at: http://math.furman.edu/~mwoodard/mqs/mquot.shtml

[2] United States General Accounting Office. *Quantitative Data Analysis: An Introduction.* (GAO/PEMD-10.1.11), June 1992.

and, to a lesser extent, the Congressional Budget Office (CBO).[3] All of these organizations apply different assumptions and methodologies to the analysis of tax legislation. In addition, there are unofficial distribution tables that are publicly released by assorted advocacy groups to influence the policy process and the debate on particular aspects of tax legislation.

Many tax distribution tables released into the public domain, such as those of the Treasury Department and assorted advocacy groups, misrepresent the average as the correct measure of central tendency. Examples of these tables are provided in Appendix I. Not surprisingly, those distribution tables released to advance one point of view are the analyses most likely to misuse averages and to mislead the public. Additionally, all of the disseminators of tax distribution tables use rigid income categories to classify taxpayers that *appear* to be alike. As is commonly said, the devil is in the details.

The rest of this paper is organized as follows. Section II will briefly outline what exactly is a distribution table. Section III will then discuss the appropriate measures used to describe the central tendency of income and tax data. Sections IV and V will describe in detail why the use of averages is an inappropriate measure of central tendency for describing income and tax data, and further describe how the use of averages provides an incomplete picture in tax distribution tables. Federal income tax data from the Internal Revenue Service graphically demonstrate how the use of averages provides an illusion of precision that is false and misleading. Furthermore, these sections will explain why in order to remain impartial, distributional tax tables should *never* display averages as the sole measure of central tendency. Section VI concludes this paper. Appendix I provides examples of tax distribution tables released by the OTA and Citizens For Tax Justice and Appendix II provides a description of the data used in this paper and the limitations associated with the data.

Readers that are not familiar with distributional tax analysis, the presentation and use of distribution tables, the measures of income and methodologies used in distributional analysis are encourage to reference "**A Guide to Tax Policy Analysis: Problems with Distributional Tax Tables,**" a previous Joint Economic Committee Study. This study also details how taxpayers can effectively evaluate the merits of different presentations used in distributional analysis and is available online at: http://www.house.gov/jec

[3] For a more detailed discussion of their respective rolls, see: Michael J. Graetz. "Distributional Tables, Tax Legislation, and the Illusion of Precision," in David F. Bradford, ed. *Distributional Analysis of Tax Policy*. AEI Press. Washington, DC. 1995, page 20.

II. The Distribution Table

A distribution table can be deceptively simple. Generally, in the left-hand column are income categories classified by either dollar cut-offs, such as, $0 - $10,000, $10,000 - $20,000, $20,000 - $30,000, etc., or divided into percentile groupings such as, lowest quintile, second quintile, third quintile, fourth quintile, and highest quintile. Additional columns provide information about the number of observations, income levels, taxes paid, etc., for each income category. Usually, the table provides information pertaining to the changes in taxes that are to be paid after the proposed tax legislation is enacted. The primary focus of tax analysis is the increases and decreases in taxes paid under current law in comparison to after the proposed tax legislation becomes fully effective. Table 1 provides an illustration of a simple burden table relating to a hypothetical proposal to reduce individual taxes:

Table 1.

Income Category	Change in Federal Taxes		Effective Tax Rate		Average Tax Change
			Present Law	Proposed Law	
	$ (millions)	Percent	Percent	Percent	$
Less than $10,000	-20	-0.2	7.1	7.0	-300
10,000 to 20,000	-365	-1.0	8.1	8.0	-400
20,000 to 30,000	-1,300	-1.5	15.2	15.0	-500
30,000 to 40,000	-2,150	-1.9	17.6	17.3	-750
40,000 to 50,000	-2,750	-2.1	19.3	18.9	-1,100
50,000 to 75,000	-7,200	-2.3	21.2	20.7	-1,500
75,000 to 100,000	-6,600	-2.4	23.9	23.2	-2,000
100,000 to 200,000	-8,100	-2.2	26.2	25.5	-3,500
200,000 and over	-13,500	-3.1	29.2	27.6	-5,000
Total, all taxpayers	**-$41,985**	**-2.4%**	**22.2%**	**21.5%**	**-$650**

Source: Hypothetical Data. JEC Calculations

In viewing the results displayed in the second column, it is quite clear in this example that all taxpayer groups would receive a nominal reduction in tax. The lowest group receives a total reduction in their tax of $20 million and the highest group receives a total reduction of $13.5 billion. The third column shows the reduction in terms of percentages. The lowest group receives a 0.2 percentage reduction in tax, while the highest group receives a 3.1 percentage reduction. The fourth and fifth columns display each group's effective tax rate under present law and after the legislation becomes effective, respectively. All income groups benefit from a lower effective tax rate under the proposed legislation. The last column displays the dollar amount of the average tax cut that each member in an income category might expect to receive.

Since every income group benefits, a cursory review of the above table might lead readers to conclude that the tax proposal is beneficial for all. However, some might come to completely different conclusions. These readers may conclude that the tax legislation is not fair to the lowest income group, since the highest income group receives 32 percent of the total benefit ($13.5 billion / $42.0 billion) while the lowest income group receives less than ½ percent of the total benefit ($20 million / $42.0 billion). However, the problem with this perspective is that these numbers reflect more about the impact of the

current tax system than the tax change under consideration. In other words, in most cases such statistics primarily reflect the distribution of tax payments under the tax code before the tax change takes place. The more progressive the current tax code is, the more regressive any subsequent tax change can be made to appear. What is presented as a measure of the tax change is in reality a statistical mirage that mainly reflects the progressivity of the current tax system.

Table 1 actually provides insufficient information from which to draw an informed conclusion as to the merits of the proposed tax legislation. For example, this table does not show the current amount of taxes that each income group pays. For purposes of illustration, assume that the lowest income group currently pays no tax at all, while the highest income group pays 50% of the total tax collected. Then, based on a different measure of fairness, it could be argued that the highest income group should receive a commensurate amount of the benefits of the total tax reduction and, therefore, the proposed 32% ($13.5 billion / $42.0 billion) is *unfair* to the upper income group.

Additionally, Table 1 does not indicate how many taxpayers make up each income group, although this can be mathematically derived. Additional information is also necessary to effectively evaluate the proposed tax legislation, such as what items are included in income, what types of taxes are being included/excluded, and over what time horizon the effects are being measured.

III. MEASURES OF CENTRAL TENDENCY

As Yale University law professor and former Treasury Deputy Assistant Secretary for tax policy Michael J. Graetz writes, "[t]he current practice of fashioning tax legislation to achieve a particular result in a distribution table creates the illusion of precision when such precision is impossible."[4] It is statistically possible, based on averages, that some taxpayers would receive no tax cut or even face a tax increase. Furthermore, not only is precision impossible but the use of averages misrepresents the central tendency of the data.

The central tendency of the distribution of data is a point estimate or single number that corresponds to a typical, representative or middle score for a given set of data. Examples of such measures are the average, the median and the mode.

The average, or mean, is the most easily recognized and understood measure of central tendency. To calculate the average, each observation in the data is added together and then the sum is divided by the total number of observations. Some common uses of averages to describe central tendency are batting averages in baseball and student grade

[4] Michael J. Graetz. "Distributional Tables, Tax Legislation, and the Illusion of Precision." In David F. Bradford (Editor). *Distributional Analysis of Tax Policy.* AEI Press. Washington, DC. 1995.

point averages. The use of averages is simple and easy for people to understand. However, the use of averages may not be appropriate if there are many outliers in the data or the data do not fit the pattern of a normal distribution. This is because the average as a measure of central tendency can be highly influenced by the presence of extreme values.

The median is the middle score in a set of ranked data. It represents the point in the distribution where 50 percent of the observations lie above the value and 50 percent lie below it. The median makes no assumptions about the shape of the distribution of data. Furthermore, the median is a considered to be a statistically resistant measure of central tendency because the value associated with a median it is not highly affected by outliers that can affect the value associated with an average.

The mode is determined by finding the value that most frequently corresponds to the data set. Simply stated, the mode is the most frequently occurring attribute or observation in a data set and is most commonly used with nominal variables.

When describing the central tendency of data, the measure that should be used is the one the best describes the data. For most income and tax data this the median value, not the average. To see why this is the case, consider the following example displaying the seven salaries of a company in Table 2.

Table 2. - Annual Income

CEO	$1,000,000
Attorney	$70,000
Systems Administrator	$60,000
Economist	$50,000
Office Administrator	$40,000
Secretary	$40,000
Paid Intern	$10,500
Total	$1,270,500
Average	$181,500
Median	$50,000
Mode	$40,000

The average of these seven salaries is $181,500. The median value is $50,000 and the mode is $40,000. In this instance, and in any situation where extreme outliers can skew the average, the median is a better indicator of the central tendency because the CEO's salary is an extreme outlier causing the average to lie far from the other six salaries. The median is the best single number that represents the central tendency of this data.

To further illustrate, Bill Gates, who has an estimated net worth in the billions of dollars and an unusually high income, resides in the upper most income category of any distributional tax analysis. His income alone would be enough to skew any average

income measure in the upper percentiles. Due to the nature of income data, most official income data released by government and other statistical agencies provide the median as a measure of central tendency or at the very least provide the median along with the average.

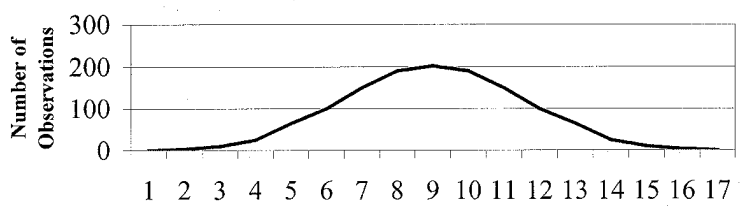
The misuse of averages in distribution tables can hide information relating to the dispersion and the true central tendency of the data from the public, further clouding the ability to make sound decisions about tax policy. The severity of the misuse of the average as a measure of central tendency depends on how far the distribution of the data varies from a normal distribution.

IV. THE CENTRAL TENDENCY OF TAX DATA

The Internal Revenue Service (IRS) Public Use Tax File, prepared by the Statistics of Income Division (SOI), contains a stratified random sample of tax returns and is used to tabulate and present statistical information representative of the entire population of individual income tax returns filed with the IRS.[5] Using this data and a statistical software package, graphical representations of the distribution of taxpayers' tax liability by income categories becomes possible.

A common graphical way to present the distribution of data is by means of a simple line chart. In this fashion, a normal distribution would take on a shape similar to the following in Chart 1 below.

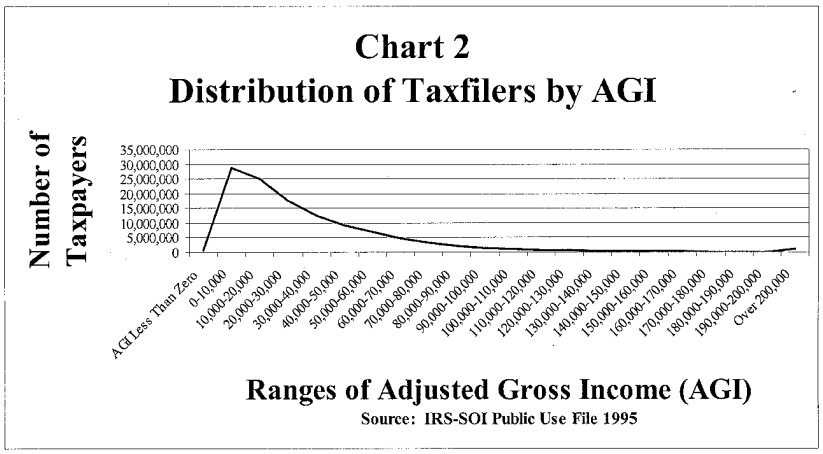
Chart 1
Example of a Normal Distribution



[5] For a full description of the IRS Public Use File, including sampling error and disclosure avoidance procedures, please see the Appendix II.

With normally distributed data the shape is symmetrical. Furthermore, the three measures of central tendency (average, median and mode) tend to be identical or very close to being identical. In the above example, the average, median and mode are all nine. However, data provided by the IRS show that income and tax data do not follow the pattern of a normal distribution.

For tax year 1995, the most recent public use file available, the distribution of tax returns by adjusted gross income (AGI) looks as follows in Chart 2.[6]

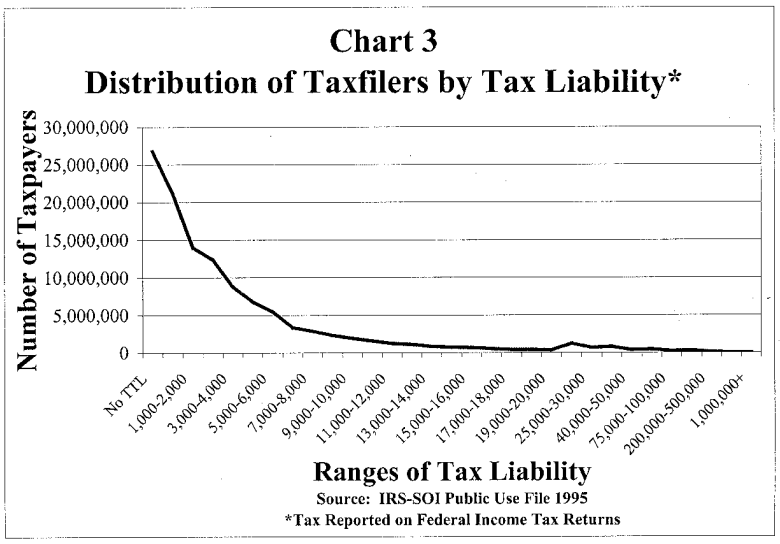


As can be seen, the distribution of tax returns based on AGI is highly asymmetrical. Furthermore, the distribution is highly skewed to the left. Due to the extreme asymmetry of the data, it would be inappropriate to use the average as an appropriate measure of central tendency when describing taxpayers based on AGI.

Chart 3 below displays how the distribution appears if the variable of analysis is federal income tax liability, or the total dollar amount that is paid to the IRS and reported straight off of a federal tax return.[7]

[6] The IRS releases aggregate statistics to the public and publishes these statistics in its "Statistics of Income Bulletin" on a lagged basis. In past years, the public use file has been published yearly on a one-year lag after the end of the filing period. The current increase in the lag has been caused by SOI's efforts to reexamine the disclosure issues involved with the microdata. The public use files for tax years 1996 – 1998 will hopefully be released starting late this summer or early fall. Furthermore, SOI hopes to have the reexamination of its disclosure policies completed shortly so that the Tax Year 2000 Public Use File will be available in December 2002.

[7] Does not include payroll or excise taxes or any taxes not reported on a federal tax return.



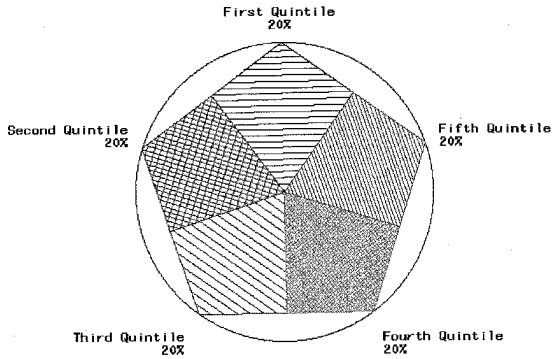
In this case, the distribution is also asymmetrical with the data highly skewed to the left. From the chart, it is observed that over 25 million tax returns have zero tax liability. Hence, any use of an average to describe taxpayers based on tax liability does not accurately represent the central tendency of the population. Furthermore, due to the skewed nature of the data, even the use of the median may not provide an accurate representation of the data.

The use of line charts is a simple way to graphically represent the distribution of data and can be created in spreadsheet software packages. A more complex chart can be used to shed light on the nuances that are often hidden in more simplistic tables. Star charts provide an interesting and novel approach to looking at the distribution of data.

Star charts are graphs created with complex statistical software packages that show statistics based on values of a variable. The center of a star chart represents the value zero. The circle enclosing the star chart represents the maximum statistic value for any one of the predefined groups. Each group value is represented by a slice. The slice with the greatest value extends out to the edge of the circle. The remaining slices are represented as proportions of the slice with the greatest value. The groups can be midpoints, quartiles, quintiles, or any programmed group that an analyst chooses to study.

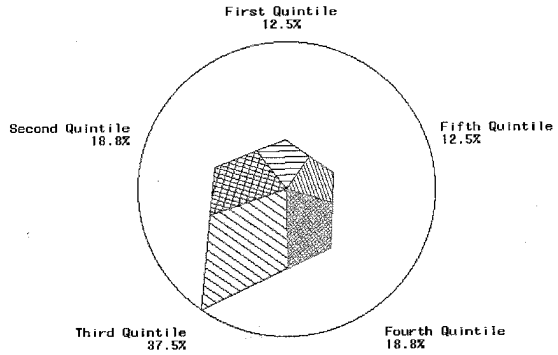
Chart 4 below provides an example of a star chart with an equal distribution. The variable of study has been grouped into quintiles. By definition, a quintile contains one-fifth of the total number of observations in a data set. If the variable under study was federal tax liability and the distribution of federal tax liability was equal for each quintile, this would imply that each quintile has the same number of total dollars as each of the other quintiles. Since each quintile group contains the same amount of total federal tax liability, each slice extends equally out to the edge of the circle.

Chart 4 — Example of An Equal Distribution



However, federal income tax liability doesn't follow an equal distribution. Chart 2 above shows that income is asymmetric and highly skewed to the right. If tax liability were normally distributed and were to follow a pattern such as that displayed in Chart 1, a star chart displaying the distribution of a variable that follows the shape of a normal distribution grouped into quintiles would look like the following example in Chart 5.

Chart 5 — Example of A Normal Distribution



This is how a variable that follows the pattern of a normal distribution displays as a star chart. The third quintile is equivalent to the middle observations that would lie underneath the height of the curve of a normal distribution displayed as a line chart, as in Chart 1 above. Since the third quintile represents the greatest value (37.5%), its slice is the longest and extends to the edge of the circle. Since both the second and fourth quintiles contain half the value as the third quintile (18.75% rounded to 18.8%), their respective slices extend halfway to the edge of the circle. Similarly, the first and fifth quintiles, or the tails of a normal distribution as displayed in Chart 1, contain only one-third the value as the third quintile (12.5%). Hence the slices representing the first and fifth quintiles extend one-third of the way to the edge of the circle. Only if a variable follows the pattern of a normal distribution similar to the pattern displayed above in Chart 5 is it appropriate to use the average as the measure of central tendency.

Tax distribution tables ultimately focus on how much more or less in taxes income groups will pay under a change in tax law. Furthermore, the majority of distribution tables that are released use the average as a measure of central tendency and group taxpayers into quintiles. Therefore, the rest of this paper will focus on federal AGI and tax liability grouped by quintiles. Using the SOI Public Use File, it is possible to calculate the average and median AGI and federal tax liability amounts for each quintile. Table 3 below displays this information for tax year 1995.

Table 3. Estimated Average and Median Amounts
Federal AGI and Tax Liability
(Rounded to Nearest $100)

	Average	Median
All Tax Returns		
AGI	$35,300	$22,100
Tax Liability	$5,200	$1,800
First Quintile		
AGI	$1,600	$3,700
Tax Liability	$100	$0
Second Quintile		
AGI	$12,200	$12,100
Tax Liability	$500	$400
Third Quintile		
AGI	$22,400	$22,100
Tax Liability	$1,800	$1,800
Fourth Quintile		
AGI	$38,700	$38,000
Tax Liability	$4,200	$3,900
Fifth Quintile		
AGI	$101,300	$71,600
Tax Liability	$19,100	$10,100

Detail May Not Add Due To Rounding.

The average and median values show some interesting contrasts in Table 3. For all tax returns, the average AGI amount is almost 60 percent more than the median. The contrast is even greater focusing on tax liability, the average of which is 189 percent greater than the median! Since the average and median are so far apart, it is obvious that the distribution of AGI and tax liability among all tax returns does not follow the pattern of a normal distribution. Hence, the average should not be used as the sole measure of central tendency.

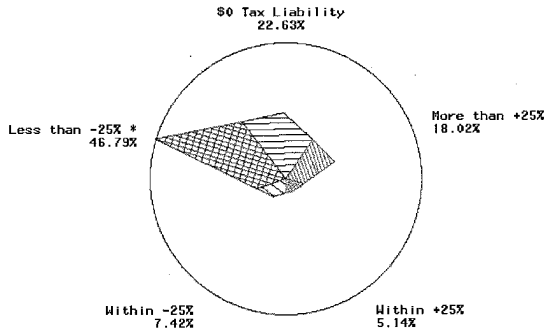
Contradictory observations are further made focusing on the quintile levels. Focusing on tax liability, the averages and medians for the second and third quintiles are relatively close. However, the opposite is the case for the first and fifth quintiles. In the first quintile, the average tax liability is $100 (rounded up) and the median is $0 (this value wasn't rounded). This means that at least 50 percent of the tax returns in the bottom quintile have zero or negative tax liability. In this instance, the median is the best representative measure of central tendency.

In fact, as will be demonstrated later in the paper, there are tax returns in each quintile that have zero tax liability. A study by the Congressional Joint Committee on Taxation (JCT) calculates that roughly 48.7 million taxpayers (including those taxpayers that don't file a federal income tax return) have zero or negative tax liability in calendar year 2000.[8] This is equivalent to 34.7 percent of the JCT's estimated number of tax units, including filing and non-filing units and *excluding* individuals who are dependents of other taxpayers and taxpayers with negative income. If these taxpayers were included in the JCT analysis, the number and percentage of taxpayers who have zero or negative tax liability would be substantially higher. This further supports using the median as the most representative measure of central tendency when describing income and tax liability amounts.

But how do the distributions of tax returns by quintile compare to that of a normal distribution? Again, Chart 5 above presented a star chart for a normally distributed variable. In order to use star charts to show the distribution of tax returns by quintile, it is necessary to define some groupings. For purposes of this analysis each quintile has been grouped further into five categories: (1) tax returns having zero tax liability; (2) returns having tax liabilities greater than zero and that are between the average amount for that quintile and the amount which is less than 25% greater than the average; (3) returns having tax liabilities that are between the average amount for that quintile and the amount which is less than 25% less than the average; (4) returns having tax liabilities greater than that amount which is 25% more than the average; and (5) returns having tax liabilities less than the amount which is 25% less than the average.

[8] United States Congress. Joint Committee on Taxation. "Distribution of Certain Federal Tax Liabilities by Income Class for Calendar Year 2000." JCX-45-00. April 11, 2000.

Chart 6 – Federal Income Tax Liability **



* For Federal Income Tax Liability Greater Than Zero
** Compared To Average Income Tax Liability

Before turning to an analysis of quintiles, the national distribution of tax returns based on tax liability for all tax returns using the groupings defined above is displayed in Chart 6.

For tax year 1995, over 22 percent of all tax returns have no tax liability. This amounts to 26.8 million tax returns. This figure is less than the 48.7 million taxpayers identified in calendar year 2000 by the JCT.[9] This discrepancy is in part based on the different years under analysis and that the unit of analysis in the 1995 data is tax returns while the JCT's unit of analysis is taxpayers.

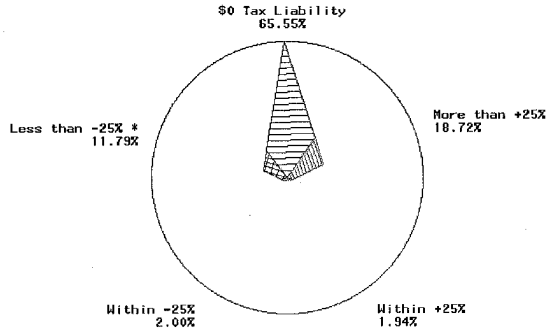
Furthermore, almost 47 percent of all returns have tax liability amounts falling between zero and 25 percent less than the average of $5,200. If these tax returns are combined with those with zero tax liability, then over 69 percent (22.63% + 46.79%) of all returns pay less than the average tax liability. Lastly, about 12 percent of all returns have tax liabilities that are within +/- 25 percent of the average tax liability amount. In other words, and perhaps most notably, almost 88 percent of all returns have tax liabilities that are either 25 percent greater than the average or 25 percent less than the average.

Based on this information, the use of the average as the sole measure of central tendency to describe the tax liability for the entire country would be misleading. The use of the average suggests that the "representative" taxpayer has a tax liability of $5,200, almost three times greater than the median amount.

[9] *Ibid.*

Chart 7 below represents the distribution of tax returns based on tax liability for the first quintile using the groupings defined above.

Chart 7 — Federal Income Tax Liability for First Quintile **



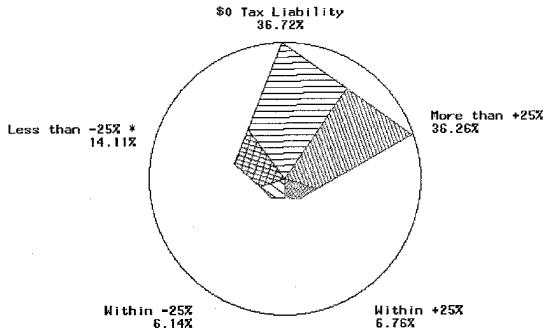
* For Federal Income Tax Liability Greater Than Zero
** Compared To Average Income Tax Liability

Notice that over 65 percent of the returns in the first quintile have no income tax liability. This means that over 65 percent of the returns in this quintile have more in common with the median ($0) than with the average ($100). Furthermore, only about 4 percent of the returns in the first quintile have tax liabilities that are within +/- 25 percent of the average tax liability amount for the first quintile of $100. This means that over 96 percent of all returns in the first quintile have tax liabilities that are either 25 percent greater than the average or 25 percent less than the average.

It would appear that the median is definitely a more representative measure of central tendency in the first quintile than the average. The use of the average in this case misleads the reader into believing that more people in this quintile have positive tax liability than those that have zero tax liability.

A similar picture emerges for the second quintile, as Chart 8 shows. Just over 36 percent of tax returns in this quintile have zero tax liability. Also, under 13 percent of the tax returns have tax liability within +/- 25 percent of the average ($500). In other words, over 87 percent of all returns in the second quintile have tax liabilities that are either 25 percent greater than the average or 25 percent less than the average.

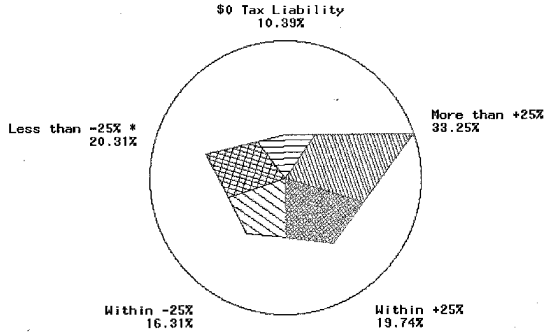
Chart 8 — Federal Income Tax Liability for Second Quintile **



* For Federal Income Tax Liability Greater Than Zero
** Compared To Average Income Tax Liability

The third quintile, in which the average and median are similar, displays a more normal pattern as Chart 9 displays.

Chart 9 — Federal Income Tax Liability for Third Quintile **

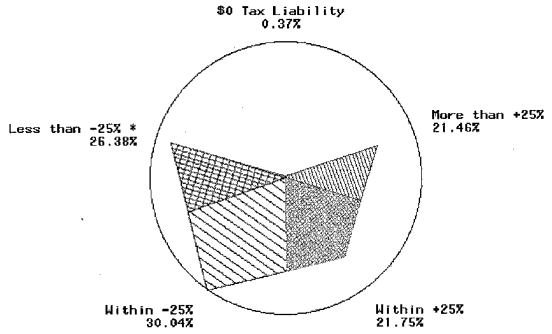


* For Federal Income Tax Liability Greater Than Zero
** Compared To Average Income Tax Liability

Ten percent of returns in this quintile have zero tax liability (10% of returns with AGI between $16,700 and $29,000). Thirty-six percent of tax returns have tax liability amounts between +/- 25 percent of the average ($1,800). However, the overwhelming majority of tax filers in the third quintile (almost 64%) have tax liabilities that are either 25 percent greater than the average or 25 percent less than the average.

The fourth quintile is similar in distribution to the third, with less than 1 percent of returns showing zero tax liability and just over 50 percent of returns having tax liability amounts within +/- 25 percent of the average ($4,200). The fourth quintile is the most "normal" of the quintiles, as can be seen from Chart 10 below. However, nearly half of the tax filers in the fourth quintile have tax liabilities that are either 25 percent greater than the average or 25 percent less than the average.[10]

Chart 10 — Federal Income Tax Liability for Fourth Quintile **

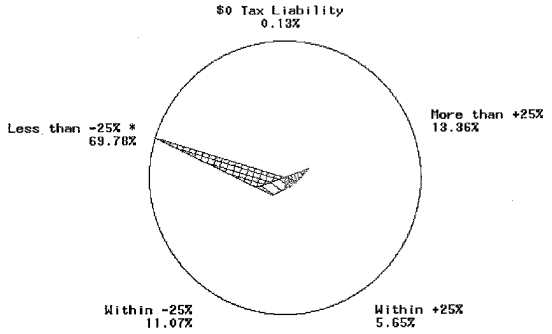


* For Federal Income Tax Liability Greater Than Zero
** Compared To Average Income Tax Liability

[10] However, almost 60 percent (57.37%) of the tax filers in the fourth quintile have tax liabilities that are either 20 percent greater than the average or 20 percent less than the average.

The fifth quintile is as non-normal as the first quintile, as Chart 11 demonstrates below. A most interesting statistic is that almost 70 percent of the returns in the fifth quintile report a tax liability amount that is *less* than 25 percent of the average. As discussed earlier, this demonstrates how a few high-income earners can have a tremendous effect on the average. Because of this, again the median is the more appropriate measure of central tendency. To report only the average would mislead the reader into believing that one-fifth of all tax returns have tax liabilities that are similar to the average amount for the fifth quintile of $19,100 instead of the median value of $10,100. The average tax liability amount for the fifth quintile is almost double the median value!

Chart 11 — Federal Income Tax Liability for Fifth Quintile **



* For Federal Income Tax Liability Greater Than Zero
** Compared To Average Income Tax Liability

Therefore, using the average as the measure of central tendency when analyzing or discussing tax policy initiatives is quite misleading. The over-reliance on averages has the effect of making it appear that tax plans that aim to reduce income tax burdens overstate the benefits to the taxpayers in the upper income categories, whereas what is primarily reflected is their higher tax burden before the tax change takes effect. Additionally, even the use of the median can be misleading due to the significant dispersion of tax liability among taxpayers. However, the use of the median is less misleading than the use of the average.

The use of averages when displaying distribution data for income and tax liability misleads the public. This clouds the transparency necessary for the public to effectively evaluate the merits of any proposed tax plan. But this is only part of the story. Not only is the use of averages as a measure of central tendency misleading, but so is the use of quintiles or income categories based on AGI or any other measure of income. These

arbitrary categories imply that the taxpayers grouped into these categories are necessarily similar in economic status and pay similar taxes. This is far from the case.

V. Misclassification of Taxpayers

It is well known to most taxpayers that tax liabilities often differ among families with the same income. This can be because of family size, filing status, whether a family itemizes their deductions or elects to take the standard deduction, whether a family pays a mortgage on their home and deducts the interest expense or rents, the nature of a family's income and many other factors. Additionally, some families are more aggressive at reducing their tax liabilities than others. For example, this can be done legally by contributing to a 401(k) plan, an individual retirement account or a medical savings account, and in many other ways as well.

The dispersion of taxpayers within any income group is impossible to determine from the information typically presented in tax distribution tables. Do most of the taxpayers within the $20,000 to $30,000 income range lie closer to $20,000 or to $30,000? All other things being equal, and from the information presented in most distribution tables, it would be expected that a taxpayer with income closer to $30,000 would necessarily have a higher tax liability, and consequently pay a greater amount in taxes than a taxpayer with income closer to $20,000. But this is not necessarily the case as Table 4 below begins to illuminate.

Table 4. Estimated Descriptive Statistics for Tax Year 1995 Tax Returns
(Rounded to Nearest $100)

All Tax Returns	Average	Median	Minimum Amount	Maximum Amount
AGI	$35,300	$22,100	($241,700,000)	$209,400,000
Tax Liability	$5,200	$1,800	$0	$62,560,000
First Quintile				
AGI	$1,600	$3,700	($241,700,000)	$7,900
Tax Liability	$100	$0	$0	$3,764,000
Second Quintile				
AGI	$12,200	$12,100	$7,900	$16,700
Tax Liability	$500	$400	$0	$58,700
Third Quintile				
AGI	$22,400	$22,100	$16,700	$29,000
Tax Liability	$1,800	$1,800	$0	$168,300
Fourth Quintile				
AGI	$38,700	$38,000	$29,000	$50,700
Tax Liability	$4,200	$3,900	$0	$529,900
Fifth Quintile				
AGI	$101,300	$71,600	$50,700	$209,400,000
Tax Liability	$19,100	$10,100	$0	$62,560,000

Detail May Not Add Due To Rounding.

Although over 65 percent of returns in the first quintile and over 36 percent of returns in the second quintile reported zero tax liability (as shown in Charts 7 and 8 above), Table 4 shows that there are actually taxpayers in each quintile that reported zero tax liability on their federal tax returns in 1995. However, the grouping of taxpayers by income measures into quintiles suggests that there are close similarities among these taxpayers with respect to the amount of federal tax liability. The suggested correlation that higher income taxpayers always have higher tax liabilities is not necessarily the case. As Table 4 also illuminates, the maximum tax liability reported on a return classified in the second quintile was $58,700. However, the maximum tax liability reported on a return classified in the first quintile was over 3 million dollars, $3,764,000. It seems counterintuitive that a taxpayer ranked and classified in a lower income category can pay more in taxes than a taxpayer ranked and classified in a higher category. This is possible because millions of taxpayers have more in common with each other based on tax liability than based on income. This important fact is ignored in typical tax distribution tables.

It could be suggested that the case highlighted above is only that of an outlier and should be discarded from the sample. Not only would discarding this observation fail to highlight extreme cases in our tax system, but it would also fail to enlighten the public that taxpayer misclassification is actually a problem involving millions of taxpayers, not just a few extreme cases. Chart 12 below begins to illuminate the problem and false sense of precision of classifying taxpayers by income categories.

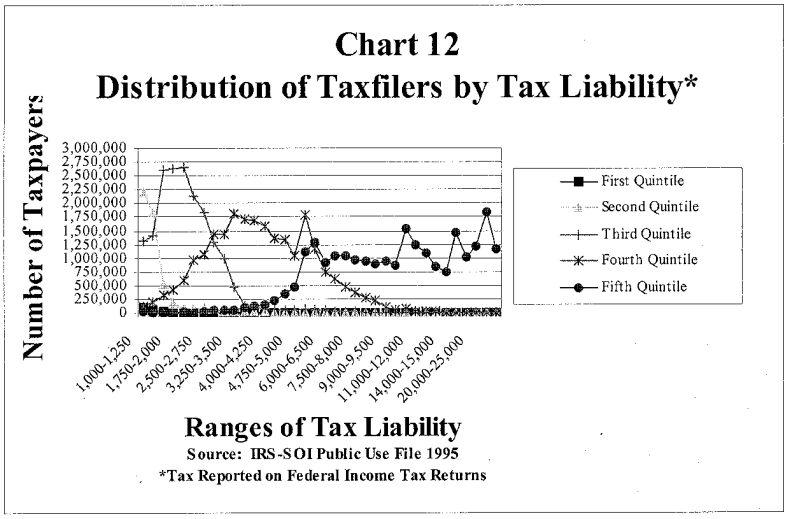


Chart 12 focuses on all tax returns that paid over $1,000 in federal income tax in 1995, ranked by AGI and grouped into quintiles. As the chart shows, there are millions of taxpayers in the third quintile who pay more in taxes than millions of taxpayers in the fourth quintile. Similarly, there are millions of taxpayers in the fourth quintile who pay more in taxes than millions of taxpayers in the fifth quintile.

Based on Chart 12, Chart 13 below shows that there are 2.2 million tax returns in the third quintile that paid $3,000 or more in federal income taxes, compared with 5.4 million tax returns in the fourth quintile that paid less than $3,000, even though these taxpayers are in a higher income quintile.

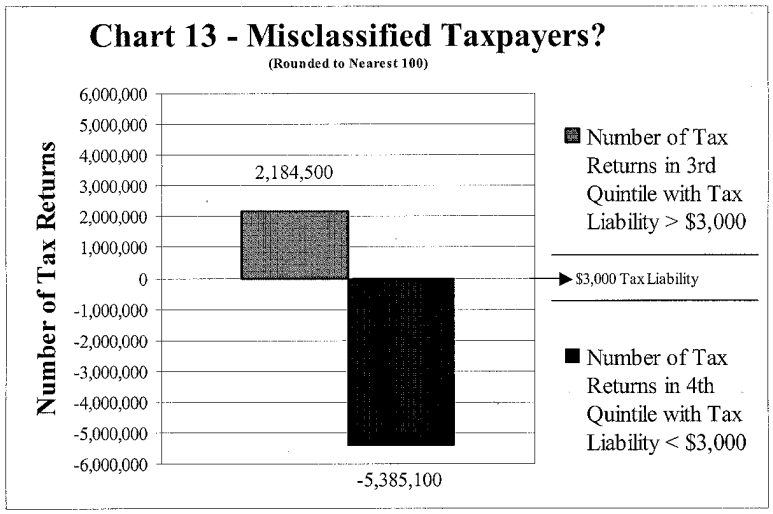
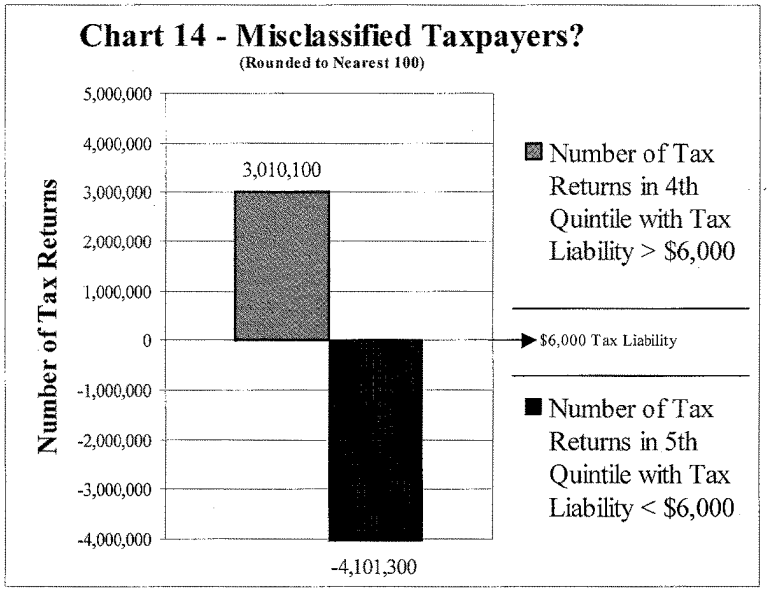


Chart 14 below sheds light on a similar story between the fourth and fifth quintiles. Even though they are in a lower income quintile, 3 million tax returns in the fourth quintile paid over $6,000 in federal income tax in 1995, compared with 4.1 million tax returns in the fifth and "richest" quintile that paid less than $6,000.



For tax year 1995, there were roughly 118 million federal tax returns. This amounts to about 23.6 million tax returns per quintile. Chart 13 above suggests that based on tax liability, 5.4 million taxpayers in the fourth quintile have more in common with 21.4 million taxpayers in the third quintile than they do with the other members of the fourth quintile. Similarly, Chart 14 suggests that 4.1 million taxpayers in the fifth quintile have more in common with 20.3 million taxpayers in the fourth quintile than they do with the rest of the 19 million taxpayers in their own quintile.

Ultimately, since tax distribution tables are concerned with the amount of tax currently paid and the amount of tax that is to be paid after a proposed tax legislation is enacted, it is questionable whether policy makers and the public are best served by classifying taxpayers into rigid income categories. This is especially the case when, based on income measures alone, millions of taxpayers have less in common with taxpayers of their own income categories because the amount of tax they pay is more

similar to taxpayers in other income categories. Along with the use of averages, the use of income categories without detailed descriptive language detailing their limitations misleads the public by suggesting that the numbers detailed in tax distribution tables are accurate, precise and reflect an accurate picture of the American taxpaying population.

VI. CONCLUSION

A former Treasury Deputy Assistant Secretary for Tax Policy, Michael J. Graetz, argues that due to the current opaque nature of communicating even the simplest facts about tax policy to the American public, distributional tax tables should be abandoned as a basis for legislative decision-making.[11] The statistical evidence demonstrates that the process, development, presentation and release of tax distribution tables need fundamental reform.

Lastly, tax changes can alter the after-tax prices and costs of goods and services, thereby adjusting the relative mix of inputs used in production, the types of goods and services businesses offer, as well as the amount of labor and capital. Tax changes can also alter the growth path of the economy and can produce broad economic effects that are not reflected in distributional analyses. Therefore, attempts to ascertain the distributional impact of proposed tax legislation should consider the possible macroeconomic effects. Furthermore, if distributional analysis is used, it should be in a much broader context in which the effects on efficiency and the economy are fully considered.

This paper has demonstrated how the use of averages and income classifications in tax distribution tables can mislead the public. This has the effect of supporting arguments based on class conflict paradigms and fails to illuminate the public as to the nuances of the actual distribution of tax liability across the income spectrum. Unless there is greater public recognition of the improper use of averages with income and tax data and the problems associated with using broad sweeping income categories to group "like" taxpayers, the current practice of using tax distribution tables will continue to mislead the public. At the very minimum, the use of the median as a more appropriate measure of central tendency will help to illuminate the public and contribute to a more open and honest tax policy debate

Specifically, this report finds:

- Income and tax information based on tax returns filed with the IRS do not follow the pattern of a normal distribution. Hence, the use of averages is an inappropriate measure of central tendency.

[11] Michael J. Graetz. "Distributional Tables, Tax Legislation, and the Illusion of Precision." In David F. Bradford (Editor). *Distributional Analysis of Tax Policy*, pages 75 and 76.

- Over 22 percent of all 1995 tax returns claimed zero tax liability.
- The Joint Committee on Taxation estimates that for calendar year 2000, 48.7 million taxpayers out of 140.2 million taxpayers overall, or 34.7 percent, will have zero or negative federal income tax liability.
- For all taxpayers, the use of the average as the measure of central tendency overstates the tax liability for the "representative" taxpayer by almost 3 times the median value.
- The dispersion of taxpayers within any income group is impossible to determine from the information presented in tax distribution tables, but is shown to vary considerably.
- The grouping of taxpayers into income categories provide a false sense of precision and misleadingly suggest that taxpayers within the same groups necessarily have similar federal income tax liability.
- In four out of five income groups examined, a majority of taxpayers had tax liabilities that were either 25 percent greater than the average or 25 percent less than the average tax liability for each income group.
- In comparing federal income tax liabilities, distribution tables often misclassify millions of taxpayers into quintiles in which they have little tax liability in common.
    - Approximately 2.2 million taxpayers in the third quintile pay more in federal income taxes than 5.4 million taxpayers classified in the fourth quintile.
    - Over 3 million taxpayers in the fourth quintile pay more in federal income taxes than 4.1 million taxpayers classified in the fifth quintile.
- The use of averages in tax distribution tables obscures the simplest facts about proposed tax policy initiatives to the public.

In addition to the use of averages (or the omission of the median as a measure of central tendency), tax distribution tables can mislead the public in other areas as well. The points made in this paper and the following 11 questions will assist taxpayers in reviewing distribution tables of proposed tax legislation. If citizens evaluating the merits of tax distribution tables are unable to determine the answers to the following 11 questions, more information should be requested from the authoring agency or organization. Only with the answers to all of the following questions can taxpayers make informed decisions about the merits of tax proposals.

1. Is the median presented as the correct measure of central tendency (or at least provided in addition to the average)?
2. What measure of income is being used (<u>If adjusted gross income (AGI) is not presented, or some other measure that taxpayers understand, ask that it be provided</u>)?

3. What taxes are being included in the analysis in both the before and after columns, and are they identical (i.e., comparing apples to apples)?
4. How many taxpayers reside within the displayed income categories?
5. What is the range of income and tax liability associated with each category?
6. What is the current and proposed (after full enactment of the proposed tax legislation) level of taxation (percent of total taxes paid to the government) paid by each income category?
7. What is the current and proposed (after full enactment of the proposed tax legislation) effective tax rate for each income category?
8. What are the ranges of tax cuts each income group is estimated to receive after full enactment of the tax legislation (ranges and medians should be provided instead of the often-presented average tax cut)?
9. Are the estimates presented free of imputations? If not, what imputations have been made to arrive at the estimates presented in the distributional tax tables?
10. What are the accuracy and reliability of the estimates presented in the distributional tax tables, and are data limitations disclosed or are they hidden?
11. What are some additional or hidden burdens that are not captured in the distributional tax tables (the hidden economic gains or losses resulting from a tax change, e.g., the economic increase in the stock of capital that would result from a repeal of the estate tax or the hidden burden of hiring lawyers and accountants to avoid the estate tax)?

Using the answers to these 11 questions, taxpayers will be able to unveil the information that is not always contained in tax distribution tables and evaluate the economic merits of proposed tax legislation. Distributional tax tables that are presented in such a manner that withhold or omit the answers to these questions, misuse the average as the sole measure of central tendency, or are based on statistically compromised data sources, should seriously be questioned on the issues of transparency, accuracy and reliability.

This is another paper in a Joint Economic Committee series on distributional tax analysis. For more information and details on how taxpayers can effectively evaluate the merits of different presentations used in distributional analysis, see the previous paper in the series, **"A Guide to Tax Policy Analysis: Problems with Distributional Tax Tables,"** is available online at: http://www.house.gov/jec

APPENDIX I - TABLE I

Major Tax Cut Provisions in the Senate Finance Committee Chairman's Mark [1]

(1998 Income Levels)

Family Economic Income Quintile (2)	Number of Families (millions)	Average Tax Change ($)	Total Tax Change		Tax Change as a Percent of:	
			Amount (3) ($M)	Percent Distribution (%)	Current Federal Taxes (4) (%)	Family Economic Income (%)
Lowest (5)	21.5	-12	-264	0.4	-2.10	-0.13
Second	22.2	-64	-1428	2.3	-2.32	-0.26
Third	22.3	-274	-5095	10.0	-3.86	-0.64
Fourth	22.3	-583	-12964	21.3	-4.20	-0.81
Highest	22.3	-1789	-39837	65.5	-4.38	-0.97
Total (5)	111.3	-547	-60836	100.0	-4.19	-0.82
Top 10%	11.1	-2338	-26036	42.8	-3.93	-0.89
Top 5%	5.6	-3137	-17489	28.7	-3.58	-0.83
Top 1%	1.1	-7081	-7945	13.1	-3.06	-0.75

Source: Department of the Treasury – Office of Tax Analysis. June 16, 1997.

(1) This table distributes the estimated change in tax burdens due to the major tax cut proposals in the Senate Finance Committee Chairman Mark which include the following: i) a child credit; ii) a modified HOPE scholarship tax credit; iii) a deduction for student loan interest; iv) deduction for education expenses paid through State-sponsored prepaid tuition programs; v) permanent extension of Section 127; vi) education investment accounts and private prepaid tuition programs; vii) expanded front-loaded and new back-loaded IRAs; viii) Capital gains provision (lower individual rates, extension of S. 1202, and $500,000 exclusion for gains on a principal residence; and ix) changes in the individual AMT.
(2) Family Economic Income (FEI) is a broad-based income concept. FEI is constructed by adding to AGI unreported and under-reported income; IRA and Keogh deductions; nontaxable transfer payments such as Social Security and AFDC; employer-provided fringe benefits; inside build-up on pensions, IRAs, Keoghs, and life insurance; tax-exempt interest; and imputed rent on owner-occupied housing. Capital gains are computed on an accrual basis, adjusted for inflation to the extent that reliable data allow. Inflationary losses of lenders are subtracted and gains of borrowers are added. There is also an adjustment for accelerated depreciation of noncorporate businesses. FEI is shown on a family rather than a tax-return basis. The economic incomes of all members of a family unit are added to arrive at the family's economic income used in the distributions.
(3) The change in Federal taxes is estimated at 1998 income levels but assuming fully phased in (2007) law and behavior. For the IRA provisions and education accounts, the change is measured as the present value of the tax savings from one year's contributions. The effect of the capital gains provision is based on the level of capital gains realizations under current law.
(4) The taxes included are individual and corporate income, payroll (Social Security and unemployment), and excises. Estate and gift taxes and customs duties are excluded. The individual income tax is assumed to be borne by payors, the corporate income tax by capital income generally, payroll taxes (employer and employee shares) by labor (wages and self-employment income), excises on purchases by individuals by the purchaser, and excises on purchases by business in proportion to total consumption expenditures. Federal taxes are estimated at 1998 income levels but assuming 2007 law and, therefore, exclude provision that expire prior to the end of the Budget period and are adjusted for the effects of unindexed parameters.
(5) Families with negative incomes are excluded from the lowest quintile but included in the total line.

NOTE: Quintiles begin at FEI of: Second $16,950: Third $32,583; Fourth $54,758; Highest $93,222; top 10% $127,373; Top 5% $170,103; top 1% $408,551.

Does the table show the answers to the following 11 essential questions?	Yes	No
1. Is the median presented as the correct measure of central tendency?		X
2. What measure of income is used?	X	
3. What taxes are included?	X	
4. How many taxpayers are in each income category?	X	
5. What income range is associated with each income category?		X
6. What are the current and proposed levels of taxation for each category?		X
7. What are the current and proposed effective tax rates for each category?		X
8. What are the estimated ranges of tax cuts for each category?		X
9. Are the estimates presented free of imputations?		X
10. Are measures of error provided relating to the precision, accuracy and reliability?		X
11. Do the estimates provided account for hidden burdens?		X

The FEI concept is used in this analysis, and families with negative incomes are excluded from the lowest quintile, biasing the analysis. Furthermore, this Treasury table excludes information relating to the percentage *change* in after after-tax income, which is considered by the Treasury Department to be the most important piece of information to include in a distributional tax table. As one of the Office of Tax Analysis' own economists writes:

> The only tax burden measure with some theoretical basis is the percentage change in after-tax income. It alone provides some indication of a family's change in welfare, because after-tax income represents the family's consumption possibilities in either the current or future years. In contrast, the share of the total change in tax burdens, which is often quoted in the popular press, does not convey information on a family's initial welfare position.[12]

The opaque nature of the exclusion of this information prevents citizens from having an informed debate regarding the "fairness" of the tax proposal under analysis.

[12] Julie-Anne Cronin. "U.S. Treasury Distributional Analysis Methodology." Office of Tax Analysis. Department of Tax Analysis. OTA Paper 85. September 1999. Page 34.

APPENDIX I – TABLE II

Effects of the House GOP Tax Plan

Income Group	Income Range	Average Income	Tax Cut (billions)	Average Tax Cut	% of Total Tax Cut
Lowest 20%	Less than $13,300	$8,400	$-0.7	$-29	0.5%
Second 20%	$13,300 – 23,800	18,300	-3.6	-144	2.4%
Middle 20%	23,800 – 38,200	30,300	-8.9	-350	5.8%
Fourth 20%	38,200 – 62,800	49,100	-18.1	-712	11.8%
Next 15%	62,800 – 124,000	83,600	-28.8	-1,513	18.8%
Next 4%	124,000 – 301,000	173,000	-24.7	-4,866	16.1%
Top 1%	301,000 or more	837,000	-68.3	-54,027	44.6%
ALL		**$48,700**	**$-153.1**	**$-1,199**	**100.0%**
Addendum					
Bottom 60%	Less than $38,200	$19,000	$-13.3	$-174	8.7%
Top 10%	$89,000 or more	204,000	-105.8	-8,355	69.1%

Source: Citizens for Tax Justice. "House GOP Tax Plan: The Rich Get Richer." July 27, 1999

Notes: Figures show the annual effects of (1) a 10% cut in personal income tax rates; (2) a reduction in the income tax rates on realized capital gains, from 20% to 15% (for those in all but the bottom regular tax bracket) and from 10% to 7.5% (for those in the bottom regular tax bracket); (3) elimination of the estate tax; (4) repeal of the individual Alternative Minimum Tax; (5) a $200 interest and dividend exclusion ($400 for couples); (6) an increase in the standard deduction for couples to double the single amount; (7) increased contribution and benefit limits for pensions and 401(k)s; (8) deductions for health insurance for people without employer plans; and (9) various corporate tax breaks. Not included are about $3 billion a year in miscellaneous tax breaks, mostly for certain health and education expenses. All figures are at 1999 levels, showing full-year effects after phase-ins are completed.

Does the table show the answers to the following 11 essential questions?	Yes	No
1. Is the median presented as the correct measure of central tendency?		X
2. What measure of income is used?		X
3. What taxes are included?	X	
4. How many taxpayers are in each income category?		X
5. What income range is associated with each income category?	X	
6. What are the current and proposed levels of taxation for each category?		X
7. What are the current and proposed effective tax rates for each category?		X
8. What are the estimated ranges of tax cuts for each category?		X
9. Are the estimates presented free of imputations?		X
10. Are measures of error provided relating to the precision, accuracy and reliability?		X
11. Do the estimates provided account for hidden burdens?		X

The CTJ table misuses the average as the appropriate measure of central tendency, provides no detail as to the income measure used and whether taxpayers with negative incomes are excluded from the lowest income category, nor does it identify whether "taxpayers" who don't file tax returns are included in the analysis. As the checklist above details, the lack of transparency and the exclusion of essential information from the CTJ distributional tax table, as is the case with many of the distributional tax tables released by the CTJ, only serves to bias the reader towards the preconceived notions of the CTJ.

APPENDIX II
1995 STATISTICS OF INCOME PUBLIC USE TAX FILE

"The Internal Revenue Service 1995 Public Use Tax File, which contains 103,117 records, was selected as part of the Statistics of Income program that was designed to tabulate and present statistical information for the 118.2 million Form 1040, Form 1040A, and Form 1040EZ Federal Individual Income Tax Returns filed for Tax Year 1995.

The Tax Files which have been produced since 1960, consist of detailed information taken from SOI sample records. The public use versions of these sample files are sold in an unidentifiable form, with names, Social Security Numbers (SSN), and other similar information omitted. The primary uses made of these files have been to simulate the administrative and revenue impact of tax law changes, as well as to provide general statistical tabulations relating to sources of income and taxes paid by individuals."[13]

Furthermore, the public use file is adjusted to comply with IRS disclosure procedures. First, taxpayers in the sample with total income or loss of $5,000,000 or more; those with business plus farm receipts of $50,000,000 or more; and nontaxable returns with adjusted gross incomes or expanded incomes of $200,000 or more were subsampled at a 33 percent rate to project the identity of individual taxpayers. Second, those returns that remain in the public use file after the subsampling procedure are combined with other high income returns in a blending process to further protect the identity of individual taxpayers. Third, all lower income returns have been blurred for alimony paid and alimony received and home mortgage interest paid to financial institutions. Finally, all fields in the returns have been rounded to the four most significant digits (e.g., $14,371 = $14,370 and $228,867 = $228,900). These are the main differences between the public use file and the microdata files used by the Treasury Department's Office of Tax Analysis and the Congress' Joint Committee on Taxation.

However, all sample data are subject to further sampling and measurement error. To properly use the statistical data presented in distributional tax tables, the magnitude of the potential sampling error must be known; coefficients of variation (CVs) are used to measure that magnitude. Based on the microdata, the table below highlights selected coefficients of variation (CVs) for selected items, tax year 1995 at a 95-percent confidence level. The CVs and subsequent standard errors associated with the public use file will be equal to or greater than the CVs listed in the table below due to the disclosure procedures applied to the public use file by SOI as detailed above. For more information

[13] Mike Weber. United States Internal Revenue Service, Statistics of Income Division. "General Description Booklet for the 1995 Public Use Tax File."

on SOI sampling methodology and data limitation with reference to the tax year 1995 data, please see *SOI Bulletin – Fall 1997*, page 245.

Coefficients of Variation for Selected Items, Tax Year 1995
(Number of returns is in thousands – money amounts are in millions of dollars – CVs are percentages)

Item	Number of Returns	Coefficient of Variation	Amount	Coefficient of Variation
Adjusted Gross Income (less deficit	118,218	0.12	4,189,354	0.34
Salaries and Wages	101,139	0.36	3,201,457	0.56
Net capital gain	10,151	2.36	176,473	1.74
Net capital loss	5,134	3.56	9,715	3.84
Taxable social security benefits	6,598	3.12	45,715	3.78
Total statutory adjustments	18,209	1.56	41,140	2.48
Total standard deduction	83,223	0.48	413,585	0.62
Total itemized deductions after limitations	34,008	1.12	527,374	1.10
Taxable income	94,612	0.44	2,813,826	0.44
Total income tax	89,253	0.54	588,419	0.48

Source: SOI Bulletin. Fall 1997. "Individual Income Tax Returns, 1995." Page 20.
Note: SOI publishes CVs at the 68-percent confidence level. The CVs above have been changed to reflect a 95-percent confidence level.

BIBLIOGRAPHY

Auerbach, Alan J. "Public Finance and Tax Policy." in Bradford, David F. (Ed.) *Distributional Analysis of Tax Policy.* Washington, DC: The AEI Press, 1995.

Barthold, A., James R. Nunns and Eric J. Toder. "A Comparison of Distribution Methodologies." in Bradford, David F. (Ed.) *Distributional Analysis of Tax Policy.* Washington, DC: The AEI Press, 1995.

Barthold, Thomas A. "Distributional Analysis at the Joint Committee on Taxation." in Bradford, David F. (Ed.) *Distributional Analysis of Tax Policy.* Washington, DC: The AEI Press, 1995.

Bradford, David F. (Ed.) *Blueprints for Basic Tax Reform.* Arlington, VA: Tax Analysts, 1984.

———. *Distributional Analysis of Tax Policy.* Washington, DC: The AEI Press, 1995

Bartlett, Bruce. Brief Analysis #303: "Income Distribution." National Center for Policy Analysis. Washington, DC. August 10, 1999.

Browning, Edgar K. "Tax Incidence Analysis for Policy Makers." in Bradford, David F. (Ed.) *Distributional Analysis of Tax Policy.* Washington, DC: The AEI Press, 1995.

Cronin, Julie-Anne. "U.S. Treasury Distributional Analysis Methodology." U.S. Department of the Treasury. Office of Tax Analysis. OTA Paper 85. September 1999.

Frenze, Christopher. "Income Mobility and the U.S. Economy: Open Society or Caste System?" Joint Economic Committee. United States Congress. January 1992.

———. "Income Mobility and Economic Opportunity." Joint Economic Committee. United States Congress. June 1992.

———. "Treasury Department Estimates of Tax Changes: A Review and Analysis." A Joint Economic Committee Brief. Washington, DC: Joint Economic Committee. United States Congress, July 1997.

Graetz, Michael J. "Distributional Tables, Tax Legislation, and the Illusion of Precision." in Bradford, David F. (Ed.) *Distributional Analysis of Tax Policy.* Washington, DC: The AEI Press, 1995.

Hubbard, R. Glenn. "Distributional Tables and Tax Policy." in Bradford, David F. (Ed.) *Distributional Analysis of Tax Policy.* Washington, DC: The AEI Press, 1995.

Kasten, Richard A. and Eric J. Toder. "Distributional Analysis at the Congressional Budget Office." in Bradford, David F. (Ed.) *Distributional Analysis of Tax Policy.* Washington, DC: The AEI Press, 1995.

Kennedy, Peter. *A Guide to Econometrics.* Cambridge, MA: The MIT Press, 1992.

Maier, Mark H. *The Data Game – Controversies in Social Science Statistics.* Armonk, New York: M.E. Sharpe, Inc, 1991.

McIntyre, Bob. "Bush Scales Back Tax Cut Plan to Trim Cost. New $1.8 Trillion Plan Tilts Even More to Very Top." Citizens for Tax Justice. Released May 11, 2000.

———. "House GOP Minimum Wage Plan Offers $11 in Upper-Income Tax Brakes for Every $1 in Wage Hikes for Low Earners." Citizens for Tax Justice. March 7, 2000.

———. "CTJ Releases Distributional Analysis of GOP/Dems Marriage Penalty Bills." CTJ News, released February 11, 2000.

———. "House GOP Tax Plan: The Rich Get Richer." Citizens for Tax Justice. CTJ News, released July 27, 1999.

Nunns, James R. "Distributional Analysis at the Office of Tax Analysis." in Bradford, David F. (Ed.) *Distributional Analysis of Tax Policy.* Washington, DC: The AEI Press, 1995.

Pechman, Joseph A. *Federal Tax Policy (5th Edition).* Washington, DC: The Brookings Institution, 1987.

Robbins, Gary and Aldona. "An Analysis of the Financial Freedom Act of 1999." Institute for Policy Innovation. Issue Brief. July 30, 1999.

United States Congress, Joint Committee on Taxation. *Distribution of Certain Federal Tax Liabilities by Income Class for Calendar Year 2000* (JCX-45-00), April 11, 2000.

———. *Methodology and Issues in Measuring Changes in the Distribution of Tax Burdens* (JCS-7-93), June 14, 1993

United States General Accounting Office. *Quantitative Data Analysis: An Introduction.* (GAO/PEMD-10.1.11), June 1992.

———. *Using Statistical Sampling.* (GAO/PEMD-10.1.6), May 1992.

———. *Tax Expenditures: A Primer.* (PAD 80-26), 1979.

United States Internal Revenue Service. Publication 17. *Your Federal Income Tax.* Washington, DC.

———. *Statistics of Income Bulletin.* Spring 1999. Washington, DC 1999.

———. *Statistics of Income Bulletin.* Winter 1998-1999. Washington, DC 1999.

———. *Statistics of Income Bulletin.* Fall 1997. Washington, DC 1997.

HIDDEN COSTS OF GOVERNMENT SPENDING

I. INTRODUCTION

Government policy and the slowing U.S. economy. The U.S. economy has been slowing down since the summer of 2000, and it is now in a recession.[1] Most other large economies are also close to recession or at best growing only slowly. The economic situation and the terrorist attacks of September 11, which have contributed to it, have changed Congressional attitudes towards fiscal policy. There has been bipartisan agreement that the so-called Social Security lockbox, which committed Social Security surpluses to paying off publicly held federal debt, is no longer appropriate. An early product of changed attitudes was Public Law 107-38, which commits up to $40 billion for increased airport security, counterterrorism activity, and assisting victims of the attacks.

Government influences economic activity through three main channels: monetary policy, regulatory policy, and fiscal policy. Monetary policy is the job of the Federal Reserve System, although the Fed reports periodically to Congress. Regulatory policy is outlined by Congress, but it is the executive branch that fills in the details. Fiscal policy is the area in which Congress has the clearest and most direct ability to influence economic activity.

Emphasize higher government spending, or incentives to work and produce? What can fiscal policy do to encourage a return to the sustained economic growth that the United States has enjoyed for most of the last 20 years? There are two major points of view on the subject. One emphasizes higher government spending. According to it, during recessions the main problem is that people are not spending enough money; in economic jargon, aggregate demand is deficient. Government can get the economy moving again by in a sense spending for the public. Government spending should therefore be higher than it currently is. Some advocates of higher spending propose reducing tax rates or moving from a budget surplus to a budget deficit, while others do not. However, they are united in advocating more government spending.[2] Many are not particular whether it takes the form of spending on defense, education, transportation, or any of various other competing priorities. This point of view has its roots in ideas developed by the English economist John Maynard Keynes (1883-1946) during the Great Depression.

The other major point of view emphasizes incentives to work and produce goods. According to it, during recessions the main problem is that government policies impose barriers to growth. The barriers hinder people's attempts to produce existing goods efficiently and to develop new goods people will want to buy, which will therefore

---

[1] As defined by the National Bureau of Economic Research, a nonprofit organization whose judgments are widely recognized as authoritative.
[2] Madrick (2001), Stiglitz (2001).

generate new jobs and wealth. The best way to get the economy moving again is to reduce the barriers. The implication for fiscal policy is that government should focus on cutting tax rates, particularly tax rates that deter investment.[3] Spending more in particular areas may be desirable (for instance, spending more to improve airport baggage scanning machines or monitor terrorist groups), but there is no *general* case that higher government spending simply for the sake of spending stimulates the economy.[4] This point of view has roots in ideas of the "classical" economists of the 1700s and 1800s, such as Adam Smith (1723-1790). It has enjoyed a strong revival since the mid 1970s, under the label of supply-side economics.

Both viewpoints agree that recessions can sometimes occur because of factors beyond the ability of government to influence. In small economies, natural disasters or declines in the world price of a major export sometimes cause recessions. However, in an economy as big and diverse as the United States, such problems are usually small compared to the overall economy, though they may be quite important in particular areas of the country. There is no factor of this sort that has had an obvious role in *creating* the current recession, though the political and economic uncertainty resulting from the September 11 terrorist attacks has *aggravated* it.

The major flaw of the view that emphasizes higher government spending is that it looks at the benefits of spending without taking account of the costs. When government spends, it uses resources that could be used for other purposes. Government spending is not free. Substantial research exists to suggest that total government spending in the United States is higher than the level that would maximize economic growth. Responding to the current recession by emphasizing more spending rather than lower tax rates is a recipe for prolonging the recession.

II. BENEFITS AND COSTS OF GOVERNMENT SPENDING

Need to consider costs as well as benefits of government spending. Many people think of government spending only in terms of its benefits. Money the federal government spends building roads produces interstate highways; money it spends on crop subsidies increases the incomes of at least some farmers; money it spends on medical research produces vaccines.

However, government spending also has costs. Every dollar the government spends has to come from somewhere. A dollar the government spends buying what it wants is a dollar that somebody in the private sector cannot spend buying what he or she wants.[5] A full picture of government spending must look at its costs as well as its

[3] Kemp and Miller (2001), Joint Economic Committee (2001).

[4] Contrary to a Keynesian criticism, the classical/supply-side point of view does not assume that all resources are fully employed. Resources can be underemployed on a wide scale if people make systematic mistakes about economic conditions. The major preventable cause of systematic mistakes is inappropriate government policy. If government spending simply for the sake of spending *does* stimulate the economy in a way that adds to the economy's long-term capacity for production, the likely cause is that the government has corrected a mistake it has made elsewhere, such as deflationary monetary policy. See Hutt (1977).

[5] Again, see the previous footnote.

benefits. Doing so involves thinking about points that are fundamental but often neglected.

Voluntary exchange versus taxation. Government differs from the private sector in how it obtains revenue. In the private sector, people have to provide something that other people are willing to pay for. Without customers, there are no businesses or workers. Businesses cannot force customers to deal with them; customers can go to competitors or, if they wish, refuse to buy what the businesses are selling. Because customers, workers, and businesses in the private sector can choose whether or not to buy and sell from one another, the presumption is that they will make deals only to the extent they think the deals will be mutually beneficial.

Government collects its revenue through taxes.[6] In the short term, it can borrow rather than tax, but borrowing just shifts the need to tax from the present into the future. The ability to borrow is important, but it does not eliminate government's ultimate reliance on taxation. Creating inflation, another way of raising revenue, is a kind of tax—a complex and hidden one, but a tax nonetheless. Unlike businesses, government can force people to deal with it, and part with some of their earnings. The presumption that exists with private-sector activity, that it is mutually beneficial to the parties involved, does not exist for compulsory payment of taxes. The presumption is in fact the opposite, namely, that some people would rather not pay taxes because they do not think they get enough personal benefit from government activities.

What is the economic justification for government spending? The economic justification for government spending must be that the government can provide some goods better than the private sector. "Better" does not necessarily mean more cheaply; it also may mean more comprehensively or in a manner that most people perceive as being more fair. What kind of goods are we talking about? Over the course of U.S. history, the federal government has grown from doing little besides maintaining an army, navy, courts, and post office to engaging in a huge range of activities that consume more of national income than food, housing, medicine, or any other single category of Americans' personal consumption spending.[7]

Debate about the proper size and functions of government is, of course, one of the main topics of political debate. What an economic perspective can add to the debate is an estimate of just what we gain or give up when the government shifts a dollar of spending from the private sector to itself. This involves thinking about what is known as the "deadweight loss" or "excess burden" of taxation.

---

[6] Some revenue comes from user fees. Unlike taxes, people can easily avoid many user fees: somebody who does not want to pay the entrance fee to Yellowstone National Park can simply not visit the park. It is hard to conceive of a government funded entirely by user fees, though: it would look more like a business than like a typical government.

[7] President of the United States (2001), pp. 294-5, 369.

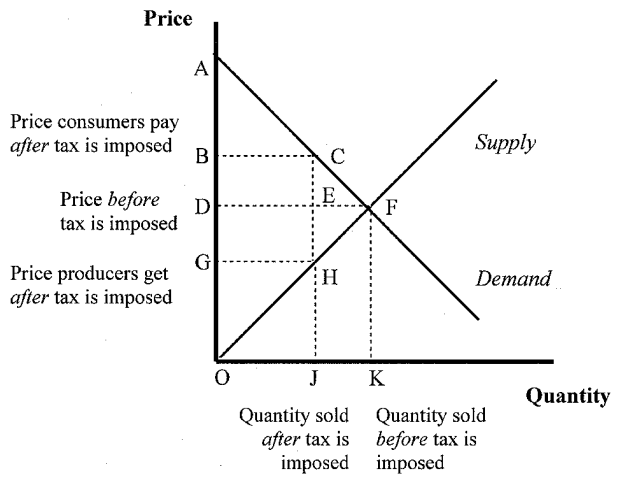
III. THE DEADWEIGHT LOSS OF TAXES

An explanation of the deadweight loss. The deadweight loss of a tax is a measure of the value that consumers and producers of a good lose from the imposition of the tax. Because of deadweight losses, the taxpayers' losses exceed the government's gain. Comparing a good without tax to the same good when the government imposes a tax, the tax operates as a wedge between the price consumers pay and the price producers receive. The government collects the wedge. Besides generating revenue, though, the wedge changes how consumers and producers behave. Let us use a hypothetical example to illustrate. Suppose the good being taxed is gasoline, and before the tax is imposed, gasoline sells for $1.00 a gallon at the pump. Consumers and producers each receive a kind of benefit from the price being where it is. Consumers receive what economists call consumer surplus because the price of gasoline is lower than what some consumers would be willing to pay. A consumer who would be willing to pay as much as $1.20 a gallon, for instance, enjoys 20 cents a gallon in consumer surplus from the price being $1.20 a gallon. Similarly, a producer that is efficient enough to be able to produce gasoline at 80 cents a gallon enjoys 20 cents a gallon in what economists call producer surplus from the price being $1.00 a gallon. (Producer surplus is different from profit. Profit accrues to the owners of a business, while producer surplus includes the net gains of everyone who helped produce the good, including employees.)

Now suppose there is a tax of 40 cents a gallon (roughly what combined state and federal taxes for gasoline are, on average). With the tax, the price of a gallon of gasoline rises to, say, $1.20. Why doesn't it rise to $1.40? Typically, in the short run producers cannot simply pass along the full amount of a tax to consumers because the higher price leads consumers to buy less of the good. High-cost producers have to cut back production or even go out of business. Lower-cost producers stay in business. Where consumers are highly sensitive to changes in the price of a good (or, as economists say, when their demand is highly elastic), the price consumers pay may rise only a little, or in the extreme case, not at all. Accordingly, people sometimes claim that in such cases producers rather than consumers bear the burden of the tax. In the final analysis, though, somebody somewhere bears the burden in his role as a consumer. If gasoline refiners have to lay off workers because a tax reduces demand for gasoline, those workers have less ability to consume.

With the tax, gasoline now costs $1.20 gallon, but gasoline stations only receive 80 cents a gallon in revenue for themselves. The 40-cent wedge that the gasoline tax imposes means that some buying and selling that went on before the tax now ceases. Consider what would happen if the tax did not exist. There are some consumers who would be willing to pay 90 cents, $1.00, $1.10, or even $1.19 for an extra gallon of gasoline, but do not buy the extra gallon because at $1.20 a gallon they consider it too expensive. On the other hand, there are some gasoline stations that would be willing to sell gasoline at $1.10, $1.00, 90 cents, or even 81 cents a gallon without the tax, but do not, because at 80 cents a gallon in revenue the price is too low for them. Hence the demand for gasoline falls. Lower demand for gasoline means lower demand for workers

Figure 1. Deadweight loss from a tax



Consumer surplus *before* tax = triangle ADF; *after* tax = triangle ABC.
Producer surplus *before* tax = triangle DFO; *after* tax = triangle GHO.
Government's revenue resulting from tax = rectangle BCHG.
Deadweight loss resulting from tax = triangle CFH.

who explore for oil, pump it out of the ground, refine it into gasoline, transport the gasoline, and sell it to motorists. The tax reduces economic activity.

The other side of the imposition of the tax is that consumer surplus and producer surplus fall. Consumer surplus falls 20 cents a gallon, and for those consumers who formerly enjoyed 1 to 20 cents a gallon in consumer surplus, the surplus disappears. Producer surplus also falls 20 cents a gallon, and for those producers that formerly enjoyed 1 to 20 cents a gallon in producer surplus, the surplus disappears. (Note that in this example producers and consumers alike lost 20 cents a gallon in surplus, but taxes need not always affect producer and consumer surplus equally.)

A graph showing the deadweight loss from a tax. It is possible to use a graph with supply and demand curves to illustrate the concept of the deadweight loss from a tax. Figure 1 does so. Some readers may find it helpful to think in terms of the graph. Readers who are not interested in the graph can skip to the next section (called "Types of deadweight losses") without missing the essential points of this study.

Continuing with the example of the gasoline tax, before the tax is imposed, consumers pay $1 a gallon and producers receive $1 a gallon. The amount of gasoline sold at that price is, say, 500 million gallons a day (roughly the actual amount of consumption currently in the United States). This is point F of Figure 1. At point F, consumers enjoy a total consumer surplus equal to triangle ADF, while producers enjoy a total producer surplus of DFO.

Now the government imposes a tax of 40 cents a gallon. The higher price causes consumers to use less gasoline, so their consumption falls to 400 million gallons (corresponding to point J in Figure 1). As has been explained, in the short run producers typically cannot pass along the full amount of a tax to consumers. That is the case in this example. The price of gasoline that consumers pay rises from $1 a gallon not to $1.40 a gallon, but to $1.20 (corresponding to point B). The price that producers receive falls from $1 a gallon to 80 cents (corresponding to point G).

The government collects a tax of 40 cents a gallon on each of the 400 million gallons sold every day, for a total of $160 million. It is represented by rectangle BCHG in the figure. However, total consumer surplus, which was equal to the triangle ADF, is now equal to the smaller triangle ABC. Total producer surplus, which was equal to the triangle DFO, is now equal to the smaller triangle GHO. Triangle CFH represents the deadweight loss—the amount of surplus that, as it were, vanishes into thin air. Consumers and producers lose the surplus, but the government does not gain it. In this example, the deadweight loss is $20 million a day.[8]

Types of deadweight loss. What specifically are the types of deadweight loss involved in taxes?

Substitution into less desirable options. If fishing poles are subject to a special tax (as they are under current federal law[9]), people who do not want to pay the tax can avoid it by making their own poles out of sticks. However, most fishermen prefer store-bought poles, so they lose some degree of satisfaction by using a home-made pole instead.

Reduction of overall economic activity. By driving a wedge between the price consumers pay and the price producers receive, taxes discourage some transactions that would otherwise occur. Rather than accept a less desirable substitute, some people may buy or do nothing at all. For example, a few people may be so attached to fishing with a store-bought pole that they will accept no substitute if a tax makes the price higher than they wish to pay. As a result, fishing pole makers sell fewer poles than before, so they hire fewer employees than they would otherwise have.

---

[8] The area of a triangle is one-half its height times its base. Triangle CFH has a base, CH, equal to 40 cents, and a height, EF, equal to 100 million gallons a day. Therefore the deadweight loss is ½ x $0.40 x 100 million gallons a day = $20 million a day. For simplicity, diagrams often show supply and demand curves as straight lines, but they need not be. When they are not, the excess burden is no longer a triangle, and measuring it becomes harder, particularly since researchers may not know the precise shapes of the supply and demand curves. Auerbach and Rosen (1980) describe different approaches to solving the mathematical problem of measuring the excess burden.

[9] The tax is 10 percent; see 26 United States Code sec. 4161.

Compliance costs. Taxes involve compliance costs, mainly in the form of additional record keeping. In the United States and most other countries, most of the burden of determining how to apply taxes, collecting taxes, and keeping records of collections falls on businesses. Individuals also bear the burden for certain kinds of taxes, notably income tax. The Tax Foundation estimates that the cost of complying with the individual income tax will reach $140 billion this year, or 12 cents for every dollar of tax collected.[10]

Enforcement costs. To ensure that taxpayers are paying the taxes required by law, governments employ small armies of lawyers, accountants, inspectors, and clerks. The more difficult a tax is to enforce, the more the revenue it generates is eaten up by the expense of paying government officials to extract it. The budget of the Internal Revenue Service was $8.6 billion in fiscal 2001.[11]

Tax evasion, economic activity, and government revenue. In general, the higher the tax rate, the more people are tempted to evade it. People who evade a tax also evade part of its deadweight burden, so there is a sense in which tax evasion actually reduces the deadweight loss. Many countries with high tax rates have large underground economies. (The United States, as a relatively low-tax country for its income level, is estimated to have a smaller underground economy than many other industrialized countries.) But with tax evasion come costs of a different kind. A plumber who takes payment only in cash and reports no income may be unable to get a bank loan to hire other plumbers and expand his business because he cannot show evidence of his potential to earn money. The more conspicuous a good, business, or individual is, the harder it is to avoid being noticed by tax collectors. High tax rates create a barrier that discourages people in the underground economy from going above ground and expanding small enterprises into larger ones. As a result, economic growth is lower than it could be.

IV. ESTIMATES OF THE DEADWEIGHT LOSS IN THE UNITED STATES

Concepts of deadweight loss. When economists first began serious estimates of deadweight losses in the 1960s, they limited consideration of the deadweight loss to the relatively small direct loss in economic activity caused by the imposition of a tax. In Figure 1, it is the little triangle CFH. However, further thinking about what the deadweight loss involves led them to realize that the deadweight loss can be much bigger. In general, the more a tax causes people to change their behavior, the larger the deadweight loss.

One way the deadweight loss can be bigger than the little shaded triangle is by using up resources in political activity. Taxes are imposed through political decisions. Lobbying to impose a tax, or to avoid having a tax imposed, generates costs. The direct monetary costs of lobbying and the indirect costs (paying bright people to become lobbyists rather than doctors, for instance). In the extreme case, interest groups may

[10] Moody (2001).
[11] Office of Management and Budget (2001), p. 204.

expend so many resources lobbying to apply a tax to competitors or to prevent it from falling on themselves that the deadweight loss exceeds the tax. Imagine that Congress is considering imposing a tax of $10 million that might fall on either of two highly concentrated industries. Conceivably, it is worth up to $10 million for each industry to avoid the tax. But even if they are willing to spend only $6 million apiece in lobbying expenses, the deadweight loss of $12 million exceeds the tax of $10 million.

Another way the deadweight loss can be bigger than the little triangle is that the changes a tax causes in one part of the economy can spill over into other parts of the economy. The deadweight loss multiplies. For example, income or payroll taxes are taxes on hours worked. If the taxes become too high, some people will reduce the hours they work. Others, particularly people who are near retirement or are not the main wage earner in their households, will stop working altogether and enjoy more leisure. But taxes on labor do not just affect how many hours people work; they affect life choices that determine how productive people are and therefore how productive the economy is. A wife considering going back to paid work after her children are grown may face a choice between continuing to stay at home, working as a cashier without needing additional training, or working as an accountant but needing first to obtain additional training at her own expense. If the tax rate is high enough that investing in more training would not yield much more after-tax income for herself and her husband, she may work in the lower-skilled cashier's job or not work at all. The economy loses the additional value she could have contributed as an accountant.

Estimates of the deadweight loss in the United States. Economists' estimates of the deadweight loss from taxes in the United States have increased over the years as they have become aware of how a deadweight loss in one part of the economy can spill over into other parts and cause additional losses. Arnold Harberger, who pioneered measurement of deadweight losses, initially estimated that income taxes reduced Americans' willingness to work by 5 to 11 percent and that they imposed welfare losses of about 2.5 percent of tax revenue raised. At the time Harberger wrote, in 1964, he used his estimate as the basis for a suggestion to cut tax rates. He estimated that reducing marginal income tax rates by 30 percent within each income tax bracket would raise the same amount of revenue as existing tax rates, because lower rates would encourage people to earn more taxable income.[12]

More recent estimates have arrived at much larger estimates of deadweight losses, and often conclude that the deadweight losses are about equal to or exceed the tax revenue raised. Table 1 lists some studies of deadweight loss and their findings.

In light of the trend to increase estimates of deadweight losses, an earlier Joint Economic Committee report that reviewed some of the studies listed in Table 1 concluded that a *conservative* estimate of the deadweight loss imposed by taxation in the United States was 40 cents for every additional dollar in taxes collected.[13]

---

[12] Harberger (1974 [1964]), pp. 46-7. Federal income tax brackets in 1964 ranged from 16 percent to 77 percent.

[13] Vedder and Gallaway (1999), p. 7.

Table 1. Studies estimating deadweight losses from taxation

Author (year)	*What studied*	*Deadweight loss as % of tax collected*
Harberger (1964)	Taxes affecting U.S. labor	2.5
Browning (1976)	Taxes affecting U.S. labor	8-16
Findlay and Jones (1982)	Australian income, excise, sales taxes	11-160
Stuart (1984)	U.S. payroll, income, excise taxes	21-100
Ballard and others (1985a)	All major U.S. taxes	17-56
Browning (1987—revision of 1976 estimates)	Taxes affecting U.S. labor	8-100
Jorgenson and Yun (1993)	All major U.S. taxes after 1986 reforms	18 (average) 38 (marginal)
Feldstein (1996)	All major U.S. taxes	165
Gravelle and Smetters (2001)	U.S. cigarette and energy taxes	92-861

Sources: References given at end of paper.

V. POLICY IMPLICATIONS

The concept of deadweight loss has several important implications for making tax policy.

An extra dollar of government spending costs the economy more than a dollar. Accordingly, using government to transfer income from one group to another, without a clear rationale in terms of economic efficiency, does not simply reshuffle income; it reduces the overall size of the economy.

Conversely, *reducing taxes by a dollar generates more than a dollar of benefit to the economy.* That is why a previous Joint Economic Committee study concluded that, over a seven-year period, every $1 in lower federal spending and taxes would increase the size of the economy by $2.45. (That is equal to $2.09 in present dollars, since much of the growth would occur some years in the future and needs to be discounted by appropriate rate of interest to reflect that its benefits would not be immediately available.[14])

[14] Gallaway and Vedder (1995).

Another implication of the concept of the deadweight loss is that maximizing the taxes the government collects over the short term is not the same as maximizing growth. In fact, *the level of tax rates that maximizes growth is almost certain to be far below the level that maximizes government revenue.*[15] The reason is that the deadweight loss grows the more tax rates increase beyond the level needed to fund those government functions whose benefits outweigh their costs. So, if the growth-maximizing level of government spending (federal, state, and local combined) is $2 trillion, but the maximum revenue that government could raise is $3 trillion, $1 trillion in revenue involves net deadweight losses that make economic growth lower than it otherwise would be.

Finally, *it is particularly important to be aware of the deadweight loss from taxation in an economy that is only growing slowly or not at all.* Taxation creates deadweight burdens in a fast-growing economy, but the economic environment is more forgiving of errors in policy. In an economy that is growing slowly or not at all, policies that increase the deadweight loss of taxation can delay or in extreme cases prevent recovery. The case for cutting tax rates is particularly strong in such circumstances.

[15] Lindsey (1997).

REFERENCES

Auerbach, Alan J. (1985) "The Theory of Excess Burden and Optimal Taxation," in Alan J. Auerbach and Martin Feldstein, editors, *Handbook of Public Economics,* v. 1, Amsterdam: North-Holland.

Auerbach, Alan J., and James R. Hines, Jr. (2001) "Taxation and Economic Efficiency," National Bureau of Economic Research working paper 8181, available at <http://www.nber.org>.

Auerbach, Alan J., and Harvey S. Rosen (1980) "Will the Real Excess Burden Please Stand Up? (Or, Seven Measures in Search of a Concept)," National Bureau of Economic Research working paper 495, June.

Ballard, Charles L., John B. Shoven, and John Whalley (1985a) "General Equilibrium Computations of the Marginal Welfare Costs of Taxes in the United States," *American Economic Review,* v. 75, no. 1, March, pp. 128-38.

Ballard, Charles L., John B. Shoven, and John Whalley (1985b) "The Total Welfare Cost of the United States Tax System: A General Equilibrium Approach," *National Tax Journal,* v. 38, no. 2, June, pp. 125-40.

Becker, Gary, and Casey B. Mulligan (1998) "Deadweight Costs and the Size of Government," National Bureau of Economic Research working paper 6789, November, available at <http://www.nber.org>.

Browning, Edgar K. (1976) "The Marginal Cost of Public Funds," *Journal of Political Economy,* v. 84, no. 2, April, pp. 283-98.

Browning, Edgar K. (1987) "On the Marginal Welfare Cost of Taxation," *American Economic Review,* v. 77, no. 1, March, pp. 11-23.

Creedy, John, editor (1999) *Economic Welfare, Concepts and Measurement,* v. 2, Cheltenham, England: Edward Elgar.

Feldstein, Martin (1996) "How Big Should Government Be?," National Bureau of Economic Research working paper 5868, December, available at <http://www.nber.org>.

Findlay, C. C., and Jones, R. L. (1982) "The Marginal Cost of Australian Income Taxation," *Economic Record,* v. 58, no. 182, September.

Gallaway, Lowell, and Richard Vedder (1995) "The Impact of the Welfare State on the American Economy," staff report, Joint Economic Committee, Office of the Vice Chairman, December.

Goulder, Lawrence H., and Roberton C. Williams III (1999) "The Usual Excess-Burden Approximation Usually Doesn't Come Close," National Bureau of Economic Research working paper 7034, March, available at <http://www.nber.org>.

Gravelle, Jane, and Kent Smetters (2001) "Who Bears the Burden of the Corporate Tax in the Open Economy?" National Bureau of Economic Research working paper 8280, May, available at <http://www.nber.org>.

Harberger, Arnold C. (1974 [originally published 1964]) "Taxation, Resource Allocation, and Welfare," in Arnold C. Harberger, *Taxation and Welfare,* Chicago: University of Chicago Press, pp. 25-62.

Hines, James R., Jr. (1998) "Three Sides of Harberger Triangles," National Bureau of Economic Research working paper 6852, December, available at <http://www.nber.org>.

Hutt, W. H. (1977) *The Theory of Idle Resources: A Study in Definition,* 2nd edition, Indianapolis: Liberty Press.

Joint Economic Committee (1999) Vice Chairman's staff, "Tax Reduction and the Economy," staff report, July.

Joint Economic Committee (2001) Chairman's staff, "Tax Policy and the Economy," staff report, November.

Jorgenson, Dale, and Kun-Young Yun (1993) "The Excess Burden of Taxation in the United States," in Anthonie Knoester (ed.), *Taxation in the United States and Europe: Theory and*

Practice, New York: St. Martin's Press, pp. 117-36. (A similar paper appeared in the *Journal of Accounting, Auditing and Finance*, v. 6, no. 4, Fall 1991, pp. 487-508.)

Kemp, Jack, and Zell Miller (2001) "Supply-Side Stimulus Can Spur Recovery," *Wall Street Journal,* September 27, p. A18.

Lindsey, Lawrence B. (1997) "Revenue Maximizing Taxation is Not Optimal," staff report, Office of the Chairman, Joint Economic Committee, July.

Madrick, Jeff (2001) "Economic Scene: In Responding to Terrorism, the Administration Is Falling Short on the Economic Front," *New York Times,* September 72, p. C2.

Moody, Scott (2001) Testimony before U.S. House of Representatives Committee on Ways and Means, Subcommittee on Oversight, July 17, available at <http://waysandmeans.house.gov/oversite/107cong/7-17-01/7-17mood.htm>.

Office of Management and Budget (2001b) *Budget of the United States Government,* H. Doc. 107-3, v. 1, Washington: Government Printing Office.

President of the United States (2001) *Economic Report of the President Transmitted to the Congress January 2001, together with the Annual Report of the Council of Economic Advisers,* Washington: Government Printing Office.

Slemrod, Joel, and Shlomo Yitzhaki (1996) "The Costs of Taxation and the Marginal Cost of Funds," *International Monetary Fund Staff Papers,* v. 43, no. 1, March, pp. 172-98.

Stiglitz, Joseph (2001) "A Boost That Goes Nowhere," *Washington Post,* November 11, p. B1.

Stuart, Charles (1984) "Welfare Costs per Dollar of Additional Tax Revenue in the United States," *American Economic Review,* v. 74, no. 3, June, pp. 352-62.

Vedder, Richard K., and Lowell E. Gallaway (1998a) "Some Underlying Principles of Tax Policy," staff report, Office of the Chairman, Joint Economic Committee, September.

Vedder, Richard K., and Lowell E. Gallaway (1998b) "Government Size and Economic Growth," staff report, Office of the Chairman, Joint Economic Committee, December.

Vedder, Richard K., and Lowell E. Gallaway (1999) "Tax Reduction and Economic Welfare," staff report, Office of the Vice Chairman, Joint Economic Committee, April.