The Rising Tide Tax System:
Indexing the Tax System for Changes in Inequality

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"A rising tide lifts all boats."
President John F. Kennedy
Remarks in Pueblo, Colorado, August 17, 1962,
Public Papers of the Presidents: 1962, p. 626.

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The Rising Tide Tax System: Indexing (at Least Partially) Against Changes in Inequality

Abstract

Experience over the past three decades suggests that growing inequality is a serious risk. A change in the tax system to index against changes in inequality is motivated both by financial theory and by classical welfare economics. Inequality indexation would insure, at least partially, against future increases in after-tax inequality. Tax rates would endogenously adjust to changes in inequality to dampen changes in the after-tax "Lorenz curve." We show a practical way of implementing the system using U.S. tax returns data and the Urban-Brookings Tax Policy Center Microsimulation Model. We study the outcomes if inequality indexation had begun in 1979 or 1994. Distributive effects and incentive effects are described. If future inequality is unpredictable and redistribution were costless then it is easy to demonstrate that full indexation would increase social welfare (assuming risk aversion). If redistribution is costly—for example, because high marginal tax rates entail disproportionately large efficiency costs—then partial indexation is optimal. This conclusion also holds if policies that could increase both economic growth and inequality are subject to electoral approval. Basically, the expected winners could use indexation to induce the expected losers to approve pro-growth, but inequality-increasing, policies.

The Rising tide Tax System
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Four times a year, the Commerce Department releases new estimates of gross domestic product—the value of what Americans produce in a year. Although investors and financial analysts are deeply interested in this bellweather of our economic health, most ordinary citizens are more interested in tomorrow's weather forecast. This is rational. For the past 30 years, most Americans' incomes have barely kept up with inflation, and some have lagged far behind. For most people, our increased economic performance is a non-event.

The Rising Tide Tax System would change that.

Aside from its importance as a revenue-raising apparatus, the federal income tax system plays a key role in ameliorating the market's skewed distribution of income. According to the Congressional Budget Office, the top 1 percent of U. S. households earned 13.4 percent of income in 2002 before tax, but 11.4 percent after tax. The top 20 percent had 51.5 percent of pre-tax income, but 48.0 percent of after-tax income. And, while the bottom 40 percent of households earned only 13.5 percent of income before tax, their share increased to 15.5 percent after taxes (and tax credits) were considered.

Although the tax cuts enacted since 2001 have tended to undermine the progressivity of the tax system, we argue that the tax system can improve economic welfare—even among those currently sitting at the top of the income distribution—by serving as a brake on further deterioration of the income distribution.

The Rising Tide Tax System is simple: new legislation would index taxes for inequality. In its purest form, such indexation would provide that in future years income

tax rates and credits would be automatically adjusted regularly so that the percentage distribution of after-tax income remains fixed at a target level, subject to some regularity conditions. If inequality increases, then taxes automatically get more progressive. If inequality lessens, then the need for progressivity diminishes and the tax system automatically adjusts accordingly.

We measure inequality by the Lorenz curve, which is a plot showing, on the vertical axis, the percentage of total income earned by all individuals up to a certain percentile of income against, on the horizontal axis, the percentile of the population. There are two basic kinds of Lorenz curves—a pre-tax Lorenz curve that is computed from pre-tax income and an after-tax Lorenz curve that uses after-tax income. The latter is more important, for it shows the actual inequality people experience after the effect of the progressive tax system is considered.

Figure 1 shows the pre-tax Lorenz curve and Figure 2, the after-tax Lorenz curve, for the United States for the years 1979 to 2002, based on estimates reported by the U.S. Congressional Budget Office (CBO). Figure 2 shows, for example, that the bottom 20 percent of Americans earned only 6.8 percent of after-tax income in 1979, while the bottom 40 percent earned only 19.1 percent of after-tax income in that year. Changes in the Lorenz curve are indicators of changes in inequality; a downward shift in the curve indicates worsening inequality. The after-tax Lorenz curve shifted downward between 1979 and 2002: in 2002 the bottom 20 percent of Americans in earned only 5.1 percent of after-tax income, and the bottom 40 percent earned only 15.5 percent.[1] Figure 3 shows

[1] Both pre- and post-tax Lorenz curves shifted up (that is, became more equal) between 1999 and 2002. That is because the internet bubble inflated incomes in 1999; the bursting of that bubble combined with an economic recession dampened incomes at the top more than incomes in the rest of the distribution.

how the progressive federal tax system reduced inequality in 2002. The after-tax Lorenz curve is everywhere above the pre-tax Lorenz curve.

If the after-tax Lorenz curve continues to shift downward through time at the same rate as it did between 1979 and 2002, then by 2025 the bottom 20 percent of Americans will receive only 3.4 percent of all after-tax income, while the bottom 40 percent will earn only 11.9 percent. Our proposal, in its extreme form, would not let this happen; it would freeze the Lorenz curve. Partial indexing would slow the trend although it would not stop it.

If the legislation implementing our Rising Tide Tax System chose 2002 as the target, the proposal could be that we will not allow the top 1 percent of U.S. households in any future year to earn more than 11.4 percent of income after tax. Individuals could still rise in the income distribution in future years, and we can all become richer. The legislation would merely adopt a rule for future years that instructs the Internal Revenue Service to find a tax schedule each year that would fix the *concentration* of income among high-income people.

Since we wish to impose some regularity conditions on our tax system, it will not absolutely freeze the Lorenz curve. Moreover, as we discuss below, the optimal inequality indexation is likely only partial. We would not guarantee the target level, but instead move a specified fraction of the way to the target, thereby only imperfectly protecting against worsening inequality.

Inequality indexation has several motivations. First, increasing inequality is a fundamentally important concern of our time. There is a risk that the economic system will change so that it becomes more of a “winner-take-all” economy, with a small

number of very rich people and many more poor and struggling families. The risk may be heightened by the rapid growth of information technology, which is augmenting or replacing the human mind in economic activities at an increasing rate, by the globalization of competition, and by our increasingly free-enterprise laws and mores. In addition, to the extent that inequality in economic outcomes is related to social problems such as extreme poverty, crime, poor educational outcomes, and drug use, improving the income distribution can benefit everyone. Indeed, as Lester Thurow (1971) argued, the income distribution has the nature of a pure public good—everyone benefits from a more equal distribution, and everyone pays the price of a less equal one. Thus, government can raise aggregate welfare by improving the distribution of income.

Second, even if one is indifferent to growing inequality, extreme inequality threatens economic prosperity in a democracy. For the history of our republic, populists have railed against industrialization, technological change, and free trade as threats to the well-being of the masses. Those appeals may be most effective when most Americans feel economically threatened. By guaranteeing that households at all income strata share in the gains from economic growth, the Rising Tide Tax System may induce the majority of voters to endorse policies that cause the economy to grow, even if they do not necessarily benefit their particular economic class. Inequality indexation guarantees that a rising tide *actually will* raise all boats, not just the yachts. As a result, it may help build a social consensus in favor of pro-growth economic policies and benefit even those who expect to pay higher taxes under the scheme.

Third, a little known feature of the progressive income tax is that it serves as a kind of insurance mechanism. To the extent that the value of additional dollars of income

tends to decline as income increases, individuals with uncertain incomes would prefer a progressive income tax to a lump-sum tax or proportional income tax because the progressive tax effectively insures against poor economic outcomes (with the cost being increasing shares of income when outcomes are good).

Shiller (2005) carried this concept a step further. He argues that individuals cannot insure against secular changes in the distribution of income. Thus, they would be willing to pay to reduce the uncertainty surrounding future economic outcomes by pooling risks across income strata. That is, someone in the top quintile and someone in the bottom quintile might agree to share future gains in pre-tax income equally rather than take their chances that their own group will do better than average.

In addition, to the extent that people move across income strata, this pooling arrangement has the added advantage of reducing the volatility of after-tax income relative to before-tax income over time.

This paper develops a method that the Internal Revenue Service could practically use, if so instructed by legislation, to automatically adjust the tax system to hold the after-tax distribution of income constant. The paper also discusses economic, administrative, and political aspects of such a scheme, and simulates the effect of implementation on tax rates, economic incentives, and the distribution of tax liabilities, using historical experience as the basis for examination. The paper shows that, if recent experience continues, the economic costs of redistribution could offset all or most of the benefits of full indexation, and concludes that partial indexation is preferable as well as politically more sustainable. Finally, the paper discusses some variants on the basic framework.

Attitudes Toward Inequality

Is unequal distribution of income a problem?

A very unequal distribution of incomes may have economic costs. Alesina and Roderick (1992) concluded based on a cross-country comparison that growth rates decline as the share of national income going to the top 5 percent and top 20 percent of earners increases. Persson and Tabellini (1994) develop a theoretical argument for why inequality should be negatively related with economic growth: more inequality results in redistributive policies that stifle economic incentives and hamper the economy. They conclude that a historical panel of data from nine countries is consistent with the predictions of the theoretical model.

However, others have argued that at least some inequality creates economic incentives that spur growth. Economists back to Adam Smith have argued that inequality stems at least in part from voluntary life choices, such as working longer hours or in a more demanding job, and it would be inefficient to distort those choices.[2] Rosen (1997) goes on to illustrate cases in which people facing a limited number of high-cost and low-cost alternatives might gamble for the chance to consume the high-cost lifestyle. In this situation, people would voluntarily move from the interior of the income distribution to the extremes. Rosen calls this "manufactured inequality" because it arises from voluntary choices of citizens.

Forbes (2000) surveyed this evidence and concluded that although there was an emerging consensus that inequality reduced economic growth, the evidence supporting that conclusion was flawed by measurement error and omitted variable bias. When she used corrected data and panel data estimation techniques to remove the effect of missing

[2] Cited in Rosen (1997).

country-specific variables, the sign of the relationship between inequality and growth changed while remaining strongly statistically significant. She concluded that, at least in the short- to medium-term, "an increase in a country's level of income inequality has a significant positive relationship with subsequent economic growth." (p. 885) She cautions that her panel is not long enough to draw firm conclusions about the effect of inequality on growth over the long run.

Thurow (1971) argues that the income distribution meets all the tests of a pure public good: all members in society face the same income distribution.[3] The benefits of a more equal income distribution might include a sense of distributive justice (i.e., people feel better if they feel that resources are shared more broadly), but also pure self-interest—less crime, fewer panhandlers, etc. Thus income redistribution may be desirable on efficiency grounds because the income distribution is an argument in individual utility functions, and a "better" income distribution creates positive externalities.

Attitudes towards inequality

Ever since the early days of the American republic, taxation has reflected communal values about fair distributions of tax burdens (Brownlee 2000, p. 31).[4] As early as 1798, a progressive property tax was employed to finance the naval buildup against France (Brownlee 2000, p. 32). The federal government first assessed an income tax to finance the Civil War (Brownlee 2000, p. 34). However, it was not until the end of the 19th

[3] Its consumption is nonexclusive and nonrival. And, as for all public goods, individuals have no incentive to reveal how much they would be willing to pay to improve the income distribution (Thurow, p. 329).

[4] Even earlier, Adam Smith endorsed the notion of progressive taxation in *The Wealth of Nations*, writing "it is not very unreasonable that the rich should contribute to the public expense, not only in proportion to their revenue, but something more than in proportion." (Quoted in Brownlee 2000, p. 31).

century when the easing of tax burdens borne by the rich coincided with the 1890's depression that support for using the tax code to redistribute income and wealth took hold (Brownlee 2000, p. 37). A progressive tax on corporate profits and the incomes of the very wealthy was enacted, after much rhetoric about the government's responsibility to punish and discourage special privilege (Brownlee 2000, p. 36). The tax was declared unconstitutional, but the Sixteenth Amendment was passed in 1913, legalizing a federal income tax. Between then and 1917, there was a decided increase in the concentration of incomes and added focus on using the tax system as a tool of redistribution (Brownlee 2000, p. 42). However, with the Republican ascension to power in 1921, substantial, across-the-board tax reductions in taxes on corporations and the rich were enacted (Brownlee 2000, p. 47). Treasury Secretary Mellon advocated the tax cuts on the basis of supply-side arguments (Brownlee 2000, p. 48) rather than opposition to progressivity.

The pendulum swung again during the depression and the implementation of the New Deal. Roosevelt sought "to restrain the growth of unwholesome and sterile accumulations [of wealth] and to lay the burdens of Government where they can best be carried," but his avowed goals went further, namely "to create a broader range of opportunity" (Brownlee 2000, p. 52). World War II converted the income tax from a "class tax"—affecting a small percentage of high-income taxpayers—into a "mass tax," affecting most wage earners—an expansion made possible by the innovation of payroll tax withholding. By the end of the war, there was bipartisan agreement on the essentials of tax policy, rejecting both progressive assaults on corporations and regressive taxes on consumption (Brownlee 2000, p. 60).

Though established through the democratic process, there is widespread dissatisfaction with the tax code. When asked in a 2002 National Election Study survey, almost half of all respondents felt they paid too much in federal income taxes and more than half thought rich people paid too little (Bartels, p. 42).[5] Similarly, a 2003 Kaiser/NPR/Harvard poll found 51 percent of respondents thought middle-income groups face the highest average burden (Penner, p. 10).

Public ignorance about tax policy is pervasive, however. In the 2002 National Election Study survey, more than 40 percent of respondents admitted the 2001 tax cut was something they "haven't thought about" (Bartels, p. 44) and 69 percent of those who favored abolishing the estate tax (57 percent of the sample) felt so inclined because it might affect them someday (Bartels, p. 26).[6] When the Kaiser/NPR/Harvard (2003) poll asked about the term "progressive taxes," 59 percent of respondents had not heard of it, and another 23 percent, though recognizing the phrase, did not know what it meant (Penner, p. 10).

Data on whether the public is aware of and sensitive to increasing income inequality yields mixed conclusions. The results from periodic Gallup polls between 1984 and 1996 are relatively stable: approximately 30 percent felt the (then) current distribution of income and wealth was fair while 60 percent would have liked to see a more even distribution (Ladd and Bowman, p. 110). This is a bit surprising given that

[5] However, when a 1995 Roper Center/Reader's Digest survey asked about the highest combined federal, state, and local tax burden it would be fair to impose on a family of four with $200,000 of income, the mean response was 27 percent and the median was 25 percent—not much different from the actual level (Penner, p. 10).

[6] Slemrod notes that at current levels of the exemption, the estate tax applies to about 2 percent of the decedent population (Slemrod, p. 9). The results in the Kaiser/NPR/Harvard study are equally startling: fully 82 percent favored eliminating the estate tax (Slemrod, p. 8) and 49 percent of respondents say that most families have to pay it (Slemrod, p. 9).

income inequality increased between 1984 and 1996, yet the survey responses do not change substantially over time.

By the 2003 National Election Study survey, most of the public had concluded that inequality had increased. Although 25 percent of respondents did not recognize increasing inequality, 75 percent said the difference in income between rich and poor was larger than 20 years earlier, and 40 percent said it was much larger (Bartels, p. 7). However, when asked whether increasing inequality was a bad thing, 50 percent had not thought about it or did not know, and 7 percent thought it was a good thing (Bartels, p. 40).[7] Results such as these led Bartels to conclude, "most Americans support tax cuts not because they are indifferent to economic inequality, but because they largely fail to connect inequality and public policy" (Bartels, p. 4).[8]

Evidence on Worsening Inequality

Evidence suggests inequality could continue to worsen. Recent increases in inequality appear to be associated with major trends that show no signs of abating.

Goldin and Margo [1992] found that inequality in the United States was decreasing from 1930 to 1970 but increasing from 1970 to 1990. They explained the U-

[7] The public is similarly ambiguous when asked about what causes inequality. Though opportunity for education looms largest, followed closely by self-selection in terms of work effort, there is general belief in a mix of societal and personal factors with no dominant cause (Bartels, p. 41). Importantly, respondents think the role of government is less important in explaining economic inequality than educational opportunities, work effort, innate ability to learn and discrimination, ahead of self-selection in job choice and "God made people different from one another" (Bartels, p. 41).

[8] That is, an explanation for conflicting responses lies in "misplaced self-interest" (Bartels, p. 21). An alternate explanation may lie in Hochschild's (1981) finding that rich and poor respondents "define political freedom as strict equality, but economic freedom as an equal chance to become unequal" (p. 278) (p. 278, cited in Bartels, p. 5). The Council of Economic Advisers (2003) cite data showing considerable movement up and down the income structure, though downward mobility seems to be more extreme than upward mobility (Penner, p. 12).

shaped pattern of inequality as due to the rise and fall of unionization, the decline and recovery of immigration, and the decline and recovery in the share of international trade.

Much of the discussion of the rise in inequality since 1990 has focused on skill-based technical change, that rewards the more capable workers, and, most recently, on the effects of new information technology that foster replication and dissemination, increasing the rewards to the most skilled workers.

Autor, Katz and Kearney (2005) find that after 1987, hourly earnings inequality increases became especially favorable to the top ten percent of earners. They conclude that the factors described by Goldin and Margo and skill-based technical change do not seem to explain this, and they resort instead to factors that lead to a polarization of the labor market. They cite evidence reported by Autor, Levy and Murnane (2003) that computerization may be a cause of polarization, by raising the relative demand for scarce cognitive and interpersonal skills; see also Levy and Murnane (2004).

Dew-Becker and Gordon (2005) find that the growth of labor productivity in the United States from 1966 to 2001 was not shared equally by all workers. In fact, growth of real wage and salary income equal to or above the growth rate of economy-wide productivity over this period was confined to the top ten percent of the income distribution. The authors concluded that skill-based technical change is not the most likely explanation of this concentration of rewards. They attributed rising inequality at least in part to “the economics of superstars where technology has broadened audiences and increased the rewards for the very best as compared with the next best.” (p. 61)

If these conclusions are correct, then this raises serious concerns about the future, because information technology continues to evolve in ways that broaden audiences and

market opportunities for superstars and lead to further polarization of the income distribution. The rising wage inequality experienced in the United States between 1967 and 1996 was not caused by differences in propensity to work (Heathcote et al., 2004).

The increase in consumption inequality has been less severe than income inequality (Heathcote, Storesletten and Violante 2004). People may use various methods to smooth their consumption over time. In years of low income, they postpone durable goods purchases; the cyclical volatility of durable goods consumption in the National Income and Product Accounts is evidence of this. They also postpone maintenance and repairs on their homes in bad years. (Gyourko and Tracy 2003.) But, some of these attempts to smooth consumption may have a long-term nature that suggests risks ahead. The gradual decline in the personal saving rate since 1980, to negative values in 2005, suggests that most people, who find themselves not keeping up with the economic growth that they see around them, are betting on some improvement in their economic status in future decades. There could be important consequences if this does not happen (Iacoviello 2005). Personal bankruptcy rates have been climbing, apparently related wishful thinking that encourages people to try to try too hard to mimic the consumption patterns of richer people (Sullivan Warren and Westbrook, 2001).

Inequality Indexation as a Form of Insurance

Our progressive income tax system is an important risk-managing institution, insuring individuals against unlucky draws in their economic status by collecting from people with high income outcomes (Moss 2004). When viewed from the perspective of a young person, who has not yet learned how he or she will fare in the economy, or when

viewed from the "original position," described by philosopher John Rawls, the progressive tax system is a preeminent risk management system. In Rawlsian philosophy, as clarified by economist John Harsanyi, there is only a fine line between the risk management motivation and moral motivation, for what is often described as altruism is really an act of viewing the situation from the original position, as a matter of sharing risks with others.

Rawlsian logic implies that people would pay for this kind of insurance before they knew their actual position. Since asking people to make their decision before they know their actual position is infeasible, such insurance could only be sponsored by the government.

By the very fact that we are uncertain about the future course of the Lorenz curve, inequality indexation is best thought of as risk management or, in rough terms, as a form of insurance. If people already knew the future–and whether they will be richer or poorer—it would not be risk management. It would be redistribution.

If there is no knowledge about the future shocks to the Lorenz curve and redistribution is costless, then a policy that optimally manages the risk of these future shocks will have the effect of pegging the Lorenz curve. We need to define what we mean by "no knowledge" about the future shocks to the Lorenz curve. We mean that, while we expect to see shocks, the mathematical expectation today of each point on the future Lorenz curve is the same as today's value. We have no prior expectation about whether inequality will get better or worse.

Suppose we divide up the Lorenz curve by drawing n equally-spaced horizontal lines, and drop vertical lines where these intersect the Lorenz curve. The case n=10 is

shown in Figure 4, which shows a simple hypothetical Lorenz curve for an economy with some inequality (although less than in the U.S.). This hypothetical Lorenz curve shown is a parabola, the fraction of total income earned by people up to the *x*th percentile is x^2. Thus, the bottom ten percent of income is earned by the bottom 31.6 percent (0.316 is the square root of 0.1) of the population, the next ten percent of income is earned by 13.1 percent (the square root of 0.2 minus the square root of .1) of the population and the top ten percent of income is earned by 5.1 percent (1 minus the square root of 0.9) of the population. All ten groups have the same total income, though they have different numbers of people. Suppose that *n* agents, one for each of these *n* groups of people, come together to consider risk management for a shock (or shocks) to incomes that will hit one or more of the groups, which is unknown *a priori*. These are shocks that have no effect *ex ante* on the mathematical expectation of the Lorenz curve.

If people are risk-averse, the optimal risk-management solution, which would be obvious to the agents for the *n* groups, would be to agree in advance that all groups will share equally in any shock. A shock that hits only one group will be divided up into *n* parts and spread out over all groups. Each group would get 1/*n* of the income shock, whether positive or negative, and divide the shock up among its people. Such a risk-management solution will peg the Lorenz curve where it was when the agents met to agree on a risk management contract.

This tax would then be more progressive if the rich win, less progressive if the poor win. That is why Shiller (2003) originally called the idea of pegging the income distribution “inequality insurance.”

It is critical to bear this in mind when considering the motivation for inequality indexation. It is not a Robin Hood proposal to steal from the rich and give to the poor. Moreover, the premise is not necessarily that inequality is a bad thing. The idea is instead that there is a target level of inequality. Indeed, it is possible that after the risk management deal is struck we will discover that a big negative shock hits the top group of people. Then, the bottom group would have to bear 1/*n* of that loss. This would not be so hard for them to bear, since it is only 1/*n* of the loss, and since there are many more people in the bottom group among whom to divide up the loss. They will have the consolation of knowing that if in the future a negative shock were to hit *them*, they would see the rich people sharing in that.

By the logic of the risk management story, if redistribution is costless, the target Lorenz curve should be just the current Lorenz curve when the plan was adopted, for that represents the wealth distribution that the agents bring to the bargaining table. There is no need to consider what is the *optimal* Lorenz curve. To be in everyone's self interest, the contract must take the *existing* Lorenz curve as the target.

If the future income distribution is unknown and redistribution is costless, full insurance—that is, pegging the Lorenz curve at current levels—would be optimal for risk-averse agents. Relaxing those unrealistic assumptions would make less than full insurance optimal, but an *ex ante* agreement to share in some of future economic gains is still likely to be desirable under a range of assumptions.

Inequality indexing as compensation mechanism

First, consider the situation where the income distribution is expected to deteriorate under a continuation of current policies. As noted, this is a plausible description of reality. It may be desirable on purely normative grounds to commit to retarding future increases in inequality, but there is also a positive justification for at least partial indexing. Suppose that further inequality arises from policies that produce economic growth and, furthermore, that they increase the variance of incomes across the income spectrum. (Alternatively, we could assume that they reduce incomes for a majority of people, even though they increase aggregate income.) Arguably, free trade falls in that category, at least in the perception of populist lawmakers and a growing number of voters. In that case, assuming that lawmakers represent voter wishes, the policies will only be adopted if the median voter benefits from the program or is compensated for his or her expected losses. The winners would have to agree to a convincing mechanism for sharing at least a portion of income gains with losers. Put differently, high-income voters have a reason to favor this form of *ex ante* redistribution out of pure self-interest—because they would expect higher after-tax income than if there were no indexation and pro-growth policies were abandoned.

There is also an ethical argument for building in such a compensation mechanism. Economists J.R. Hicks and Nicholas Kaldor argued in the 1930s that economic policies for which the benefits exceed the costs were desirable, even if the people who receive the benefits differ from those who incur the costs, because the winners could compensate the losers making everyone better off. In that sense, such policies were deemed "potential pareto opima"—that is, policies that raise economic welfare and are thus desirable .[9]

[9] Other issues arise that can change this calculus. For example, a policy that is admissible on cost-benefit grounds might not be desirable if it precludes another policy with an even larger net social benefit.

Oxford economist I.M.D. Little (1950), however, argued that there was a fundamental flaw in the cost-benefit calculus. If the winners did not actually compensate the losers, then the desirability of the policy depends on interpersonal comparison of utility—i.e., an assessment that one person's gain adds more to society than another person's loss subtracts. Such a comparison is inherently subjective and cannot be justified on objective grounds. Moreover, in some (possibly many) cases, compensation may be very costly or even impossible because of the high cost of assigning gains and losses to individuals as well as costs from the compensation mechanism itself.[10]

Little's critique undermines the ethical underpinning of a number of pro-growth policies. For example, almost all economists favor free trade because it makes society much richer, but there is no guarantee that everyone is better off with unimpeded commerce. Indeed, in the public mind, free trade is associated with a great deal of dislocation and, for that reason, free trade policies often face considerable political opposition. In the case of trade, explicit policies are aimed at partially compensating those who lose jobs because of trade, but those policies have been criticized as poorly targeted and as incurring large economic costs because they can delay individuals' adaptation to circumstances altered by trade.

An advantage of the Rising Tide Tax System is that it would build in a kind of compensation mechanism for pro-growth policies. If the economy grows, people at every income stratum would be guaranteed of sharing a portion of the gains, even if the pre-tax gains are highly concentrated. The rising tide system would not prevent individual dislocations—for example, a job loss that would move someone down the income

[10] For example, if the compensation is done in the form of tax and transfer policy, both may distort economic incentives and also involve administrative and compliance costs.

distribution—but it would prevent policies from causing a secular shift in the distribution of (after-tax) income.

With the Rising Tide Tax System in place, the ethical justification for pro-growth policies would be stronger (although not absolute because there could still be individual winners and losers). Perhaps more important, as noted, the new tax system would strengthen the stake of individuals at all income levels in pro-growth policies. That is, it would attenuate the class divisions in support for particular policies, increasing the odds that pro-growth policies could succeed politically.

Optimality of Partial Indexation with Costly Redistribution

It is also unrealistic to posit costless redistribution, especially if the income distribution is expected to deteriorate further. If the income distribution continues to follow past practice, top tax rates would have to become very high to preserve the current income distribution as shown below. This would entail a substantial excess burden.

Gruber and Saez (2000), after reviewing the literature on the responsiveness of taxable income to marginal tax rates concluded that the elasticity of taxable income with respect to the tax rate is likely to range from 0.18 to 0.57, with the highest elasticities applying at the highest income levels. An elasticity of 0.3, for example, means that a 1 percent increase in tax rates would result in about a 0.3 percent reduction in taxable income.

The economic costs of taxation are highly uncertain. Some researchers suggest that the marginal excess burden of the income tax – that is, the efficiency cost over and

above the amount of revenue collected – is as much as a dollar or more for every dollar raised. (Browning 1987) Other estimates put the costs far lower. Slemrod (1996) points out that the costs depend in part on the nature of the economic response. Timing responses—shifting income from one year to another to reduce one's tax bill are fairly easy, involve little cost, and are likely to be most sensitive to tax incentives. Real responses – such as working harder or saving more – are likely to be least responsive and carry the greatest social cost.

The excess burden of taxation constrains the degree of redistribution even if the social welfare function is one where more equal distributions are preferred to less equal ones. The optimal level of indexing would balance the gains from insurance, promoting pro-growth policies, and possibly from explicit redistribution against the costs of potentially high marginal tax rates. Effectively, this is a standard insurance problem, except that the deadweight loss of the income tax is the constraint rather than moral hazard. As in the standard insurance problem, the solution is less than full insurance—that is, some degree of coinsurance on the part of the insured individuals. The optimal degree of coinsurance—that is, the extent of indexing—depends on the degree of risk aversion (the value of insurance), the expected gains from advancing pro-growth public policies, and the cost of redistribution.

There is also a political benefit of partial indexation. Full indexation implies fixing the Lorenz curve at current levels. That would mean that the lowest-income fifth of the population would never receive more than 5.1 percent of after-tax income if the base year is 2002. With partial indexation, lower-income people would be guaranteed at least some growth dividend—either in the form of higher wages or a smaller tax bill (or

larger refundable tax credits)—but their share of the pie would increase if their group's pre-tax income rose. If the pre-tax income distribution became more equal, the tax system would become less progressive (because there would be less need for redistribution), but low-income people would keep a share of the gains (to the extent that the tax system is unindexed). This appears to be a politically much more sustainable system.

Other Considerations

The Advantage of Framing

An underlying motivation of the proposal to index tax rates to a measure of inequality is that it should be easier to get an electorate to agree to making taxes more progressive in response to increased inequality if they were asked to decide to do this *in advance*, before the increase in inequality actually transpires, by deciding on a *rule* for doing this, and so as to *frame* the tax system as a tool against inequality. Substantial research, from psychology, economics, and political science, supports this.

First of all, psychological research has confirmed that people are more principled, idealistic and altruistic about decisions that do not require immediate action. The experiments with human subjects by psychologists Liberman and Trope (1998) and their colleagues confirm this.

Underlying their experiments is a "temporal construal theory" which, in the authors' words, proposes that "construals of distant future events are likely to be more abstract and consist of features that are central to the meaning of the event, whereas the

construal of near future events is likely to be more concrete and include more peripheral and incidental features." (Liberman and Trope, 1998, p. 8) Judgments about risk management, as well as about altruistic principles, are based on abstract deliberations and so they are more likely to be made about future events. In contrast, these judgments tend to get brushed aside in decisions about immediate events, because of the salience of other concerns.

Eyal *et al.* (2005) tested the temporal construal theory with a number of experiments. For example, in one experiment, they asked their student subjects to respond to the following question:

> "Try to think of yourself next week (in a week a year from now) deliberating on the following dilemma: On the one hand, you are considering working extra hours in order to improve your chances for promotion. On the other hand, you could help a friend who asked for your help (for example, help him/her with school work, with family issues, with the job.)" (p. 9)

The subjects were assigned to two treatment groups, one read the question about next week, the other read the question about a week a year from now. They found that the subjects who were asked about a year from now were significantly more likely to choose to help the friend. The subjects were also asked to fill out the Schwartz (1992) values questionnaire, which scored them on their achievement values versus their universalism values. It was found that the differences across individuals in values (abstract considerations closer to the real meaning of the choice) had a bigger effect on the differences across individuals in decisions made for a year from now than in decisions made for next week. Thus, in accordance with temporal construal theory, individual abstract values emerge more strongly in influencing decisions about the distant future than about the near future.

Secondly, another dimension of the proposed inequality indexation is the reframing of concepts that it entails. Political psychologists have demonstrated experimentally that exposure to a framing of thought about core values affects the frequency of thoughts that are consistent with the values and the political decisions that are made. Brewer and Gross (2005)] conducted an experiment about the school voucher controversy in which each participant was randomly assigned to one of four conditions that differed only in value framing. Two frames of school vouchers were considered: an equality frame, that assumes school vouchers promote equality of opportunity, and an inequality frame, that assumes vouchers undermine equality. The participants were then read versions of an article extracted from real newspaper articles about school vouchers, but in one of four different forms (conditions) altered in terms of framing. The four conditions were no frame, first frame, second frame, and both frames. Subjects were then asked to write comments about the school voucher proposal, and their comments were assessed for reference to an equality frame. Only five percent of those who were not given either frame used equality language in their responses, contrasted with 23 percent of those receiving pro-voucher equality frames, 24 percent of those using anti-voucher equality frames, and 41 percent of those using both.

Thirdly, there are human impulses that resemble concern with inequality but do not always take that form, unless there is a framing that melds the two. Lerner and Simmons (1966), in a highly influential article, argued that people have a need to believe in a "just world," to reassure themselves about their own safety, but that this belief does not always have the effect of impelling them to promote equality as a value. It has emerged through a number of experiments that, when subjects observe others' suffering,

there is an initial empathic emotional involvement with the victim, but as time progresses, and if there are no immediate means to help the victim, the subjects tend to denigrate the victim and invent shortcomings in the victim that are thought to have brought on the suffering. Belief in a just world is an essential human impulse, but may not lead to sustained efforts to combat injustice unless there is some institution that frames these efforts as part of a just world.

Another psychological literature concerns aspirations and social comparisons. The social psychologist Leon Festinger described an innate human comparison drive, a drive to compare oneself with others around them and continually rate one's own performance against others. Festinger argued (1954) that this is an innate human drive, present in all societies and cultures, though the measures of success that are compared vary widely: comparisons are highly subject to framing changes. This innate drive works against the emotions of empathy that promote egalitarian thinking, and is a fundamental obstacle towards dealing with the problem of economic inequality, but implies that framing changes can make a fundmental difference.

Benjamin Friedman, in his book *The Moral Consequences of Economic Growth* (2005) argued that many of the social comparisons that people make are actually not with other people today but with their memories of the past. People compare themselves with their parents or others they knew from their parents' generations, and with themselves in the past. Friedman argued that when growth stalls, the comparisons become unfavorable, and the resulting malaise can have deleterious effects, notably, social intolerance can be magnified.

For Friedman, the conclusion was that economic growth should be pursued along a steady, sustained rate. But, another conclusion also follows from his line of argument, namely that all elements of society should see their incomes grow steadily, and not suffer reversals. The current *ad hoc* system of Congress judgmentally adjusting income tax brackets from time to time, means that any government response to sharply worsening inequality would necessarily involve moving people whose incomes had suddenly jumped up back down on the socioeconomic ladder, bringing on unpleasant comparisons. A system of indexation of the tax system to inequality would assure that responses to changing inequality would be made smoothly, and so that no one would have to see after-tax income taken away so as to make for unpleasant comparisons.

Another psychological literature concerns a human tendency towards vengeance. If an action is perceived as coming from hostile behavior of others, then the reaction may be strong and visceral. Matthew Rabin (1993) has effected a small revolution in game theory by postulating that the axioms of the theory should involve that people are willing to sacrifice their own well being to punish those who are being unkind to them. Any after-the-fact measures to redress sudden increases in income inequality may tend to be viewed as the result of self-interested hostile behavior of others, while, in contrast, a set of abstract rules that were made before the outcomes in terms of inequality were known could not be so interpreted.

Political Sustainability

A key question is whether symmetric indexing is politically sustainable. It is key for several reasons. First, the economic benefits of the rising tide system depend in large

measure on symmetry. If the tax system may only be indexed in one direction, e.g., in favor of a more equal distribution of income, then it would tend to reduce expected after-tax income for people at the top of the income distribution, would not reduce the variability of after-tax income by as much as symmetric indexing (that is, would be a far less effective insurance mechanism), and would tend to increase top marginal tax rates, thus increasing the deadweight loss of the income tax. Moreover, many taxpayers would not perceive it as fair *ex ante* and so it would be a less effective framing mechanism.

The political pressures for asymmetric indexing could be strong under certain circumstances. For example, during a recession in which total income fell but the share of income earned by those with low incomes increased (as in the great depression), symmetric indexing would call for cutting top rates and increasing rates (or reducing credits) for people with lower incomes. Advocates for low-income people would be tempted to argue that this would be adding insult to injury—those least able to manage the difficulties of a recession would see their taxes increase (or subsidies fall) while those most able would receive a tax cut. Such a redistribution could also tend to deepen a recession since the tax increases on lower-income people would tend to reduce aggregate consumption by much more than the offsetting tax cuts on high-income people would increase consumption.[11]

This problem could be mitigated by committing to a countercyclical tax policy—that is, running deficits during recessions and surpluses (or smaller deficits) during economic expansions. The stimulative policy during the recession could be explicitly designed to guarantee that no one paid higher taxes or received smaller credits because of

[11] High-income people save a much larger share of their income than low-income people, who spend virtually all of their income.

the automatic indexing during recessions.[12] Tax increases could be deferred until aggregate income had risen for a specified number of quarters and then phased in. If the pre-tax income distribution reversed its course during the expansion, any deferred tax increases would be reduced.

Another issue is that it is impossible, barring a constitutional amendment, to bar politicians from fiddling with the tax code, and it is unlikely that this plan would terminate their tendency to micromanage. However, it is possible that it would limit the dimensions by which they would manipulate the code. For example, after the Economic Relief Tax Act of 1981 indexed various income tax parameters for inflation, it was still possible that legislators could have undone the effect. But, despite numerous tax changes, the rate brackets, exemptions, etc. have remained subject to annual indexation. One might expect a similar response to the inequality indexation scheme, especially if it commanded widespread support and people perceived it as inherently fair. As long as political tinkering is not aimed at undoing the indexation scheme, its effect should not diminish the advantages of this proposal.

Difficulty of contemporaneous adjustment (and risk of adding uncertainty)

One of the practical problems with indexing for inequality is that the income distribution will not be known until after the end of the tax year. Currently, there is about a two year lag between the end of a filing season and the release of preliminary income tax statistics by the IRS. Thus, it is infeasible to adjust current year income tax rates, brackets, and credits to adjust for current changes in the income distribution. It would, however, be possible to adjust after the end of the tax year.

[12] A practical problem is that recessions are often not identified until after the fact.

One option would be to include an inequality insurance premium in individuals' base tax liability—say one percent of taxable income. When the IRS has compiled statistics on the actual after-tax income distribution, it could issue rebates (insurance payouts).[13] Those rebates could be mailed to taxpayers or deposited into an account specified by the taxpayer. Taxpayers might be encouraged to specify that all or a portion of their payout be deposited into a Roth IRA.[14] These contributions might be allowed without regard for income or contribution limits that otherwise apply. This could provide another incentive for higher-income people to support the rising tide system, and might also prove an effective way to induce lower-income people to save, since it would be relatively painless.

Another issue is whether the distribution should be adjusted based only on current year income, or based on a moving average. The argument for using a moving average is that it could reduce the size of average adjustments. A single anomalous year would have a smaller effect on tax liabilities, and it would reduce the effect of cyclical factors on tax burdens. However, smoothing would also diminish the insurance value of the proposal. The process would adjust only for secular changes in the income distribution.[15]

[13] The IRS could probably make a rough estimate of the income distribution shortly after annual income tax returns were filed, based on unaudited income tax returns. There would be errors due to inadvertent mistakes (not caught in the course of regular math-error processing) and fraud on tax returns, transcription errors for returns filed on paper, and missing data because of late-filed returns, but the IRS could presumably make adjustments for these factors based on historical experience. Alternatively, the tax authorities could wait for two years to make the rebates when better data are available.

[14] Roth IRA's are retirement savings accounts for which contributions are made out of after-tax income. That is, contributions are not tax deductible, but earnings accrue tax free and as long as withdrawals are made after age 59 ½, they are tax-free as well. (In traditional IRAs, contributions are deductible, but withdrawals are taxable.)

[15] If averaging is employed, the adjustments would have to be phased in over the moving average period.

How it would work (theory)

We describe here a system with endogenous tax rates that are adjusted automatically so as either to peg a level of inequality or at least to slow its worsening.

The proposal here, an extension of a proposal made by Shiller (2003), is to index the tax rates in such a way that the Lorenz curve is systematically stabilized in future years, arresting or at least slowing its decline. With 100-percent indexing, tax legislation would direct the tax authorities to find a set of tax rates and tax brackets that would peg the Lorenz curve for after-tax income forever at a specified level, perhaps the actual level at the time of the legislation, halting its downward shift. With partial indexing, let us say ¼ indexation, the legislation would direct the tax authorities to find a set of tax rates and tax brackets that would reduce the movement in the Lorenz curve by the specified factor (here ¼) from what it would be under existing legislation. Partial inequality indexation can also take the form of protecting only the left side of the Lorenz curve, that is protecting lower-income people while allowing inequality to increase at higher income levels.

Whether inequality indexation is full or partial, it would be a concrete step towards arresting the deterioration in the income distribution, a step that can be taken in advance, before the deterioration occurs.

The proposal here could be a far more effective measure than the minimum wage or the living wage proposals that have occupied so much attention. Those do not involve a tax subsidy to low-income people. They merely forbid employers to pay less than the minimum, and could actually be counterproductive if they reduced employment among low-skilled workers. They will not stop a major deterioration of income inequality. This

proposal is far more effective than specific proposals to alter the tax system, such as proposals to raise the earned income tax credit, because the adjustments would not be ad hoc and would not manipulate market prices. By putting in place a passive tax structure that will automatically make whatever changes in taxes are necessary to achieve a Lorenz curve target, the changes are guaranteed to move fast and to be effective.

The trend towards privatization and increased reliance on free markets since the 1970s has resulted in a partial dismantling of our risk-management institutions. Hacker (2004) documents a drift within social welfare since 1970 towards less effective management of social risks without any obvious change in the structure of the institutions. In the absence of political will to take initiatives to maintain the effectiveness of the institutions, they are gradually fading away. That is why setting in place structures that automatically manage inequality risk itself will be more effective, even if the structures could be changed later by Congress. The inequality indexation structure is very robust and does not depend for its success on a political will for Congress to deal with a thousand changes in an enlightened way. As long as they do not take the active step of dismantling inequality indexation, it will be effective.

An inequality-indexed tax system could be adopted as part of a compromise to make other structural changes in the tax system, such as changes that improve individual incentives for economic achievement or that encourage entrepreneurship, that might otherwise work to increase inequality. It is possible that inequality insurance could eliminate the effect of worsening inequality while at the same time encouraging these incentive effects.

A Conceptual "Spreadsheet Method" of Implementing Inequality Indexing

One way of imagining how this tax system could work, abstracting from real world details of our tax system, was described in Shiller (2003). Imagine that the tax collector has a spreadsheet containing the pre-tax income of every person, arranged these into a column of numbers and then sorted the rows of the spreadsheet from lowest to highest, lowest incomes on top, highest on bottom. To decide on taxes, the tax authority would construct a program on this spreadsheet that calculates a tax on each individual that would cause the after-tax incomes of all individuals to fall on a target Lorenz curve without changing the ordering of anyone's income.

To illustrate, a hypothetical example is shown in Table 1. This very simple example of the spreadsheet method should help the reader appreciate the issues, and to interpret the results we show later in the paper. In the table, there are only ten people in the entire economy. The number was kept small so that we can show the entire spreadsheet on one page. The persons, arranged in order of their incomes, are numbered in Column A, the numbers are converted to income percentiles (which will appear along the horizontal axis of the Lorenz curve plot) in Column B. Their pre-tax incomes appear in Column C. We have created fictional incomes that are extremely unequal and erratic, so that we see vividly what targeting the after-tax Lorenz curve might mean. The total national income, the sum of the elements of Column C, is $400,000. The partial sum of their incomes is shown in Column D, and the pre-tax Lorenz curve (which is the partial sum divided by the national income) is shown in Column E.

The target Lorenz Curve is shown in Column F. We chose as a target Lorenz curve just the square of the percentile, that is, a simple parabola, as was shown also in

Figure 3, just to make calculations transparent. It is not a Lorenz curve that we would propose as an actual target: it is only used to simplify an extreme illustration that shows how the method works. The change in the target Lorenz curve from one person to the next is shown in Column G. Note that the elements of Column G are linear in income percentile in the particular target Lorenz that we have chosen as our example, because the derivative of a parabola is a straight line. We suppose that taxes raised must be $100,000, and hence there is an after-tax national income of $300,000 to be allocated across people. Column H shows the after-tax income of each individual, which is just Column G times the after-tax national income of $300,000. Then, each person's tax, Column I, is the difference between actual income and the allocated after-tax income, Column C minus Column H. Taxes as a fraction of income, Column I divided by Column C, are shown in Column J and marginal tax rates, the change in Column I divided by the change in Column C, are shown in Column K.

Note that the tax authority did not impose any structure to the tax system; there were no pre-specified tax rates or brackets. (In practice, since people need to know their tax rates in advance, these spreadsheet calculations would need to be done somewhat in advance with forecasts of income, but that is not the same as legislating tax brackets.) All the structure came from the target Lorenz curve. Any implied tax rates or brackets that emerge from this system are fully endogenous, and would change every time the tax authority calculates them. There would be no preconceived notion what is a fair or reasonable or plausible tax rate or bracket, these would always be nothing more than the product of the calculation based on the target Lorenz curve. Thus, we can expect that

outcomes with inequality targeting might be very different from outcomes of the usual tax legislative process.

The ranking of everyone by income would be the same, both before and after tax. We have operated on the spreadsheet only upon rows, so there is no way that the ordering of people would change. The marginal and average tax rates are negative for low income people in our example, but they can never be above 100 percent for anyone, for that would cause people to switch in the ranking. Marginal tax rates could, however, become very high for high-income people. Here they reach 93 percent for person 10.

The marginal tax rates that we see from this simple spreadsheet example look rather wild. The problem is not that some people have negative tax rates, for many low-income people face negative tax rates because of the refundable earned income and child tax credits. The problem is the arbitrary shifts that occur from one person to the next. We see that person 2 is in the 0 percent marginal tax bracket while person 3 is in the -1400 percent tax bracket. This happened because person 3 (30^{th} percentile) was not earning much more than person 2 (20^{th} percentile), but, by the target Lorenz curve, should be making almost twice as much. Of course, this spreadsheet example is extreme, but it illustrates something that we believe should not be allowed to happen. Some kind of restrictions on the tax rates will be necessary, we need to impose regularity conditions on the tax system, and indeed this is what we will propose for The Rising Tide Tax System below.

Moreover, this idea of the tax authority calculating everything on a gigantic spreadsheet is too much of an idealization. There is too much complexity already in the tax code that is hard to change. For the Rising Tide Tax System, therefore, we drop this

idealized spreadsheet story and speak instead of parsimonious changes to the existing tax code that could be used to stabilize some measure of the after-tax Lorenz curve. We will restrict the changes in the tax code to a select few, and to have a sensible pattern, as described below.

Simulating Inequality Indexing

The above conceptual method of implementing the Rising Tide Tax System is too stylized to be actually implemented. Here, we propose a method of implementing the Rising Tide Tax System while making only parsimonious adjustments in our present tax system. Then, we examine how inequality indexing might play out based on historical experience.

The Method of Implementing Inequality Indexing

We want to start from the existing tax system, leaving as many of its features intact, and find a method that the Internal Revenue Service could use if so instructed to implement the Rising Tide Tax System. We need a program to do this, and we need sources of data that the program will use to derive changes in the tax system that achieve inequality indexation.

The prototype program does this in the simplest way possible. This means preserving as much as possible of the present system. There are millions of reasons, some good, some bad, for the complexity of the tax system we have today. Our society has chosen to subsidize some economic activities and discourage others, and if we make it a

prerequisite for change that all of these choices be reviewed, then the change will never occur.

Our method of implementing inequality indexation therefore depends critically on a model of the existing tax system, so that we can simulate the effects on income inequality of the parsimonious changes in the tax system that we choose to make. For this, we will use the Tax Policy Center's Microsimulation Tax Model.

The method begins by finding the tax rates that, according to the model, best match the target distribution of income assuming that taxable income does not change with the tax rate—that is, the initial simulations are static. Next, the method uses a Gaussian nonlinear optimization algorithm to minimize the sum of squared differences between the target after-tax income levels and the actuals, minimizing over parameters that consist of income tax rates for the various tax brackets (measured in percent), as well as a demogrant (that is, a refundable credit available to all households measured in dollars). The rate bracket thresholds are assumed given exogenously for each filing status, at the current levels.

The method is to use the model to calculate income and payroll tax liability for a sample of individual income tax returns in the current year (for our simulations 2002), augmented with data from the Current Population Survey to reflect nonfiling households.[16] The sample is a stratified random sample of tax returns produced by the Statistics of Income (SOI) division of the Internal Revenue Service. SOI includes a set of sampling weights that can be used to create population estimates based on the sample. To speed simulations, we use only a random one-in-five subsample of our matched SOI-

[16] See Rohaly, Carasso, and Saleem (2005) for a description of the TPC microsimulation tax model and underlying databases.

CPS dataset. After subsampling, our sample includes 19,976 returns. For the simulations, we exclude dependent tax returns.[17]

Since the CBO target taxes include not only income and payroll taxes, but also corporate income taxes (assumed to be borne by recipients of capital income) and excise taxes, we add imputed values of those taxes to income and payroll taxes to calculate total tax liability for the household. When we simulate the effect of endogenous behavioral responses below, we assume that only individual income taxes are affected by individual income tax rates.[18]

There are a number of issues that need to be addressed in designing the indexing rule. (1) What is the target income distribution? Our assumption for purposes of the exercise with full indexation is that the target is the distribution at a particular date (either 1979 or 1994).

(2) How should the target be defined? For the simulations, we construct a measure of pre-tax income that is closely analogous to CBO's comprehensive household income—an expanded measure of income that starts with adjusted gross income and adds in certain income items excluded from AGI such as cash and in-kind transfers, and certain fringe benefits.

Alternatively, a broader measure of income could be used. For example, the Treasury Department for many years used a measure of income called "economic income," which included unrealized capital income (including the imputed rental value of owner-

[17] Ideally, we would like to be able to include dependents' income on their parents' returns, but there is no way to do that with information available on the public use file.

[18] In fact, corporate income taxes and payroll taxes might both be affected by changes in individual income tax rates. When the individual income tax rate is much higher than the corporate income tax rate, there is an incentive to convert individual income into corporate income. For example, sole proprietors might choose to incorporate. To the extent that high income tax rates discourage people from working, that would also reduce payroll tax receipts. In our simulations, we ignore such behavioral responses.

occupied housing). (Cronin 1999) This is arguably a better measure of economic status, but has proven extremely controversial (especially the imputed rent component).

Some would argue that consumption would be a better measure of economic status. The distribution of consumption is much less skewed than the distribution of income (Burman, Gravelle, and Rohaly 2005), but it cannot be measured accurately based on data reported on income tax returns.

Since our target is after-tax income, we then subtract federal taxes from our income measure. The federal taxes we include are the individual and corporate income tax, payroll taxes for Social Security and Medicare, and excise taxes.

(3) How should income be adjusted for family size? The Congressional Budget Office argues that income needs grow approximately with the square root of family size. (CBO 2001) Thus, we assign people to quintiles based on income divided by square root of family size. We base the target distributions on the distributions of after-tax income adjusted for family size estimated by the Congressional Budget Office (2005).

Various other issues arise in the calculations we did to compute the necessary tax changes and measure their effects. First, taxable income is very different from economic status. Thus, there is not a one-to-one correspondence between tax rates and after-tax income. For example, raising the top tax rate will affect people in all income categories (although mostly people in the top). This means that finding the set of tax rates that matches changes in the distribution of income is not straightforward. Our minimization algorithm allows us to match as closely as possible the target distribution of after-tax income, and we shall see from this exercise how closely we can match it with our method.

Second, some complexities in the current tax system that may be only temporary make it harder to retarget the after-tax income distribution. Rather than assume that these complexities are immutable, we feel it is better for illustrative purposes to simplify the tax system slightly so that changes in the distribution of tax burdens closely follow tax rates. To that end, we eliminate the alternative minimum tax (AMT) and tax capital gains and dividends the same as ordinary income and recalibrate income tax rates so that the distribution of tax burdens in our base year -- 2002 -- is the same as under actual law.

Third, we have to decide how the demogrant is defined. We assume that the demogrant varies with the square root of family size. Thus, if the base demogrant is $1,000 for a single person, it is $1,414 for a couple and $2,000 for a family of four.

Regularity Conditions

We saw from the discussion of the spreadsheet method that pegging the Lorenz curve can cause erratic behavior of marginal tax rates, and proposed that regularity conditions be imposed to prevent this. Fortunately, the Rising tide Tax System method allows us to do this in a rigorous way, because the method does not actually peg the Lorenz curve, it only minimizes the sum of squared distances of the Lorenz curve from a target Lorenz curve. Thus, we can impose regularity conditions on the tax rate structure by solving a constrained optimization problem: it finds the way to get us as close as possible to the target subject to the regularity conditions.

For our base simulations, we constrain the tax rate schedule to be a non-decreasing function of taxable income. That is, each marginal tax bracket has to be at least as high as the next lower one. This is consistent with the shape of the statutory rate

schedule for as far back as we can remember.[19] This is feasible because there is not a one-to-one correspondence between taxable income and economic status; thus, there are likely an infinity of tax schedules that could mimic the distribution of income taxes.[20] We also test an alternative regularity condition that no rate can be less than 90 percent of the rate applying to the next lower tax bracket, and that there be no negative tax rates.

Endogenous Income

Probably the single greatest drawback to income redistribution is that high marginal tax rates can discourage working and saving, and encourage unproductive tax avoidance and evasion—all of which serve as a drag on the economy. Of particular concern are timing responses, which involve relatively low cost and thus are easiest to accomplish. (Slemrod 1990) Burman, Clausing, and O'Hare (1994), for example, found a huge response of capital gains at the end of 1986 to the increase in rates enacted in August, 1986, but not effective until 1987. The response basically involved accelerating realizations of gains on assets that would have otherwise been sold within a few years of 1986.

To the extent that the inequality indexation implicit in the rising tide system involves more frequent changes in marginal tax rates, it might produce timing responses, especially if the rate changes can be anticipated in advance. But, if changes in marginal tax rates are made each year as inequality indexation would require and indexation is only partial, the changes will be more gradual than is often the case today, and timing

[19] Implicit tax rates do not, however, always follow a monotonic path. For example, the phase-out of the benefit of the 15-percent tax bracket in effect from 1988 to 1990 created a phantom 33-percent tax bracket for taxpayers with incomes in the phase-out range (known as "the bubble"). Currently, the phase-out of the AMT exemption has the same effect on AMT taxpayers in the phase-out range.

[20] In fact, simulations conducted in Stata suggest that this is true. When the solution is unconstrained, there are numerous very different tax vectors that produce very similar distributions of income taxes.

responses are likely to be decreased, not increased. Of greater concern is that higher marginal tax rates could produce much more real and financial responses designed to shelter income from tax. As noted earlier, if the elasticity of income with respect to tax rates is constant, then since redistribution does not affect the overall amount of tax to be collected, the higher tax rates applied to some income would be exactly offset by the effect of lower rates applied to other income. It is likely, however, that the elasticity is an increasing function of the tax rate—i.e., that at a rate of 5 percent, there is little incentive to avoid tax; at a rate of 35 percent, there is a larger incentive. What's more, taxpayers whose income primarily comes from wages, interest, and mutual funds, have little potential for tax evasion or avoidance since that income is reported to the IRS on information returns and it is difficult if not impossible to convert such income into lower-taxed or untaxed forms.

To illustrate the effect of tax avoidance and evasion under the indexing scheme, we apply a simple model of taxable income determination. We assume that taxable income is determined by a simple semi-log model:

$$TI_i = K_i e^{-at} \tag{1}$$

Where TI_i is taxable income for individual i, t_i is the marginal tax rate for household i, K_i is a constant that reflects differences in preferences, wealth, and ability to earn income for individual i, and a is a parameter assumed to be constant across the population. In the semi-log model, the elasticity of taxable income with respect to the tax rate is simply at—that is, it grows with the tax rate.

For our simulations with behavioral response, we choose $a = 4/3$, which implies that the elasticity is 0.4 at a tax rate of 30 percent. The revenue maximizing tax rate is 75

percent, at which point the elasticity is -1.0. Further increases in the tax rate would be counterproductive in the sense that tax revenue would decrease. The elasticity of 0.4 is broadly consistent with the findings of Gruber and Saez (2005) and CBO (2005), although our calibration of the elasticity to apply at a rate of 30 percent is somewhat arbitrary.[21]

Under the assumption of zero income elasticity of taxable income, a straightforward simulation methodology may be derived consistent with equation (1). For each tax unit, K is chosen so that TI equals actual baseline income (TI^0) when the marginal tax rate is set at the baseline level (t_0). That is,

$$K = TI_0 e^{\frac{4}{3}t_0} \tag{2}$$

To simulate changes in tax rates, we are searching for a tax rate that is consistent with endogenous taxable income. Figure 5 shows the solution process for the two most common cases. In Figure 5a, the equilibrium tax rate (for a married couple filing jointly in 2002) is 15 percent, which corresponds to a desired taxable income of about $90,000. Since the 15 percent bracket spans from $46,700 to $112,850, the desired income is consistent with the tax rate so this is an equilibrium. In Figure 5b, there is no desired income consistent with a single tax bracket. At a tax rate of 15 percent, the taxpayer desires to earn more income than $112,850, the top of the tax bracket, but at a tax rate of 25 percent, the taxpayer desires taxable income less than $112,850. The solution in this case is for the taxpayer to earn exactly $112,850—that is, just up the income at which he would be pushed into the higher tax bracket.

[21] In Gruber and Saez (2005), the elasticity increases in absolute value with income, but does not vary with the marginal tax rate. For the sample they examined, this might be an appropriate approximation, but if tax rates increased as much as contemplated here, there would almost surely be a more elastic response.

A third possible case (Figure 5c) arises when tax rates decline with income. In that case, there may be multiple equilibria. Since we generally constrain rate schedules to be non-decreasing in income, this is not usually a problem. When it occurs, we choose the equilibrium closest to the initial taxable income.

To simplify the simulations, we assume that changes to taxable income do not change any other item on the income tax return.[22]

Results

Static

Our first step is to estimate a set of tax rates under the modified law (excluding the AMT and taxing capital gains and dividends as ordinary income) that generates a distribution of after-tax income that matches the one under actual law for 2002 (See Table 2). For this baseline simulation, we not only constrain the tax rates to be non-decreasing in taxable income but also restrict the demogrant to equal zero. Since the AMT was a relatively minor aspect of the tax code in 2002, it is the treatment of capital gains as ordinary income that has the most impact on our modified rate structure. The vast majority of capital gains are reported by individuals in the top tax bracket. Thus,

[22] This is a significant simplification relative to current law. Technically, we are assuming that the income changes affect taxable income, but not necessarily adjusted gross income (AGI). Changes to itemized deductions (for example, if the taxpayer decides to give more or less to charity) or below-the-line deductions such as IRA contributions would be in this category, but a change in wages and salaries, interest, or dividends would not. We assume that AGI does not change under the simulations because, when AGI changes, other things like itemized deductions, personal exemptions, AMT exemption, taxable portion of Social Security, IRA deductions, and a host of credits can also change because of various AGI-related phase-ins and phase-outs. The result is that the effective marginal tax rate can vary significantly from statutory rates, which would vastly complicate modeling the behavioral response. The assumption would also be approximately valid if taxpayers responded to their statutory rate, rather than their marginal effective tax rate. (There would still be a problem that, if the actual behavioral response affected AGI, we would be mismeasuring tax liabilities for affected taxpayers—probably by about 1 percent of income.)

removing the preferential treatment for capital gains means that the top rate must fall from 38.6 percent to 34.7 percent to preserve the distribution of after-tax income observed under current law. Other rates do not differ greatly from their current-law values.

The next step is to estimate what the tax rate structure would be like in 2002 if we implemented our indexation proposal with the target distribution of after-tax income chosen to be that which prevailed in one of two specific past years, 1994 and 1979. We chose 1979 since it is the earliest year for which the CBO data on the distribution of after-tax income are available. We chose 1994 because it provides a distribution that is more similar to the one that existed in 2002 given that it is before the huge run-up in the stock market that occurred in the late 1990s. For both of the two years, we examine what the tax system would look like under degrees of indexation ranging from full indexation – eliminating all differences between the 2002 distribution and that of the given year – to $1/16^{th}$ indexation, in which tax rates are altered to eliminate $1/16^{th}$ of the difference in the income distribution.[23]

Table 2 presents our results assuming no microeconomic behavioral response to the required changes in tax rates. Going from the 2002 distribution of after-tax income to the 1979 distribution requires large increases in the top tax rate – from 34.7 percent to 77 percent in the case of full indexation. This is not surprising given that returning to the 1979 distribution requires the share of after-tax income going to the top one percent of the population to fall by more than 50 percent, from 11.4 percent to 7.5 percent. The

[23] Suppose that the share of after-tax income for a given quintile of the population were to rise from 10 percent to 11.6 percent (a 16 percent increase). Under full indexation, we would alter tax rates so that the quintile's share remains at its original 10 percent. Under $1/16^{th}$ indexation, we would alter tax rates so that the quintile's share rises by only 15/16ths of that original change or 15 percent, resulting in a share of after-tax income of 11.5 percent.

substantial demogrant, $2,452, is necessary to raise the share of after-tax income going to the bottom quintile; virtually no tax units in that income range are affected by changes in statutory rates since they do not actually pay a positive amount of individual income tax. This in turn means that the bottom two tax rates must be raised – to 18.4 percent – in order to offset the effects of the large demogrant on individuals in the second and middle quintiles of the income distribution whose after-tax incomes do not need to rise proportionately as much as those in the bottom quintile.

As expected, for partial indexation, the general pattern remains the same, but the required changes in tax rates are smaller. But the sheer magnitude of the difference in the 1979 and 2002 distributions of after-tax income can be seen by the fact that even under $1/16^{th}$ indexation, the top rate would need to rise by almost 20 percent, from 34.7 to 41.6 percent, two percentage points higher than the top rate before the 2001 tax cuts were implemented.

If we target the 1994 distribution of after-tax income – since it is more similar to the 2002 distribution – the required changes in tax rates are also smaller. Under full indexation, the top three rates would rise to between 42.3 and 54 percent, still substantially higher than any rates in place for the last two decades. Since the share of after-tax income going to the bottom quintile did not fall nearly as much between 1994 and 2002 as it did between 1979 and 2002, the required demogrant is significantly smaller here, only $414. Partly because of the demogrant's small size, and partly because the second and middle quintiles saw their share of after-tax income change by roughly the same proportion as the bottom quintile, the lowest tax rate actually falls in this case, to

5.6 percent from 9.8 percent, as opposed to the increase observed when indexing to the 1979 distribution.

With Behavioral Response

Given the magnitude of the changes in statutory rates required to match the distributions of both 1994 and 1979 – particularly in the top brackets – allowing for a behavioral response of tax rates on reported income could have a potentially large impact on our simulation results.

For our simulations with endogenous taxable income, we again constrain tax rates to be non-decreasing in taxable income and allow for a demogrant that increases with the square root of the number of members of the tax unit.

Table 3 presents our results for the simulations allowing for behavioral response. Targeting the 1994 distribution of after-tax income – which is not strikingly dissimilar from the baseline distribution in 2002 – requires very large increases in each of the top four tax rates; all are greater than 60 percent. One interesting result is that for the case of full indexation, the required bottom tax rate is negative. We allowed a negative bottom tax rate for simplicity – accepting that it implies some counter-intuitive tax-minimizing behavior such as not taking any deductions – and believe that it is best interpreted as indicating that a more generous earned income tax credit (EITC) could accomplish the same result.

The tax rates required to return the distribution of after-tax income to the one that existed in 1979 are even higher. Under full indexation, the top four tax rates would need to rise to 69.5 percent.

Tables 4 through 8 summarize how well we can hit the targets in the various cases, as well as give further information about the tax brackets that would do so. Usually, we are quite successful. But not always. For example, Table 8 shows that when we include a behavioral response, then even with the large increases in high-tax-bracket rates, our optimization algorithm was unable to come up with a set of tax rates that brought the share of after-tax income for the top one percent of earners down close to its share in 1979. Even after the minimization algorithm was finished, we still have that the share of after-tax income going to the top one percent exceeding its 1979 value by more than one-third. And even eliminating only $1/16^{th}$ of the difference in the distribution between 2002 and 1979 requires each of the top three tax rates to rise to more than 40 percent. This bolsters the case for partial indexation rather than full indexation.

Tables 9 through 11 report a similar exercise but where the optimization criterion is asked to preserve the Lorenz curve by quintiles only (that is, dropping the deviation of the target for the top 90 percent, top 95 and top 90 percent from the loss function for the minimization). We did this variation on our theme because of the difficulty just noted in hitting the target for the top one percent when there was a behavioral response. Presumably, the distribution of incomes within the top 20 percent is less central to our concerns about income inequality, and so the calculations in these tables ask less of the inequality indexation. We see then that we were able to hit the targets in all cases, even the 1979 target case with behavioral effects, though, once again, in that case the top tax bracket is very high.

It is worth noting that the simulations with behavioral response assume that the responses do not change underlying economic status—only the amount that is reported as

taxable income. To the extent that responses are real—people working or saving less, for example—the target Lorenz curve may be achieved with smaller rate changes since before-tax income of top earners actually declines (moving it closer to the target after-tax income). This is not reassuring, however, since it also means that the deadweight loss is larger. Redistribution is undermining economic growth. This may be mitigated to the extent that the Rising Tide Tax System is enabling more pro-growth policies, but it reinforces our belief that partial indexation is preferable.

Possible Enhancements

A drawback of this approach is the disconnect between taxable income and economic status. A significant fraction of low tax bracket individuals have high cash incomes—for example, because they earn significant tax-exempt interest—and some higher-bracket individuals have more modest economic status—for example, because they do not own a home and choose not to itemize deductions. (See Table 12.) Indexing existing tax brackets would mean that many beneficiaries of indexing would, in fact, not be falling behind in the income distribution and others who are losing ground might get no benefit or even face higher taxes. What is more, taxable income is a narrower base than cash income, since it is after all the deductions from income allowed for tax purposes, only some of which are related to economic status. As a result, the changes in tax rates needed to achieve distributional targets are larger than they would be if applied to a broader base. And, finally, adjusting income tax rates means that those who lose from indexation would face not only higher penalties on work and saving, but also larger

rewards for claiming deductions and electing other methods of sheltering income from tax.

This problem might be eliminated by tying indexing adjustments to a broader measure of income. One option would be to require taxpayers to calculate cash income and pay a fraction of that income as an inequality insurance premium. Once the actual distribution of pre-tax income is determined, the IRS could send rebate checks based on reported cash income and the degree of indexation. This would make tax filing more complex; in some ways, it is analogous to the add-on minimum tax that was the precursor to the current alternative minimum tax. However, unlike the AMT, which serves little or no legitimate policy rationale, inequality insurance advances several legitimate policy ends.

The ideal solution might be to pair the Rising Tide Tax System with a more comprehensive reform of the income tax. One such reform, advocated by Batchelder, Goldberg, and Orszag (2006), would convert into refundable tax credits all income tax deductions that are not related to the measurement of ability to pay. Under that scheme, tax liability before credits would be based on a measure of income much closer to cash income. In that case, adjustment to tax rates would accurately adjust after-tax income within cash income classes. And the combination of the Batchelder, et al, proposal and the Rising Tide Tax System would be considerably simpler than present law.

Conclusions and Recommendations

We have presented a case for adopting partial inequality indexation in our tax system, and argued that if we do so it can improve the prospects for growth-enhancing economic policies. The rising tide that lifts all boats may then become a reality rather than a slogan.

Although full indexation might be optimal if future income inequality is unpredictable and redistribution were costless, our simulations show that behavioral responses to taxation could undermine some or all of the efficiency gains from full indexation. For that reason and others, partial indexation appears to be the optimal strategy.

There are some key implementation issues, including the basis upon which indexing adjustments would apply (e.g., taxable income or a broader measure of income, such as cash income) and the time frame over which such adjustments would occur. Perfect indexation could only occur after a lag because it takes several years for the government to measure the distribution of pre-tax income. Imperfect indexation could be based on lagged or a moving average of the distribution of income, or the scheme could be implemented as pure insurance, with individuals paying "premiums" based on incomes and receiving insurance settlements once the insurable event (changing inequality) could be verified. It may also be desirable to tie the Rising Tide Tax System to a broader income tax reform that would connect taxable income more closely with economic status, although we worry that this could derail the whole enterprise. We do not wish for the perfect to be the enemy of the good.

In future research, we plan to develop a model to derive the determinants of the optimal extent of indexation, but uncertainty about key parameters, such as the behavioral response to taxation, the degree of risk aversion, and the costs and benefits of pro-growth

policies, will make pinpoint calculations of the degree of indexation highly imprecise. The best approach may, indeed, be to set the parameter as part of the political process, subject to revision over time. The "fair share"—that is, the portion of future economic growth that is guaranteed to each income group—might initially be set low to test the program, but it could also be set higher. As long as top tax rates are not increasing much, it could stay close to 1. If pre-tax inequality worsens, however, and tax rates increase significantly, it would be appropriate to adjust the fair share down as the marginal economic costs of future redistribution increase.

We do not argue that the Rising Tide Tax System should be the only or even the most important policy aimed at reducing inequality. The best policies would be those that dealt with the underlying sources of economic inequality, including disparities in human and physical capital accumulation. To the extent that those inequities are addressed successfully, the inequality of pre-tax income will decrease (or increase less slowly), meaning that the indexing adjustments would automatically be reversed (or moderated). The Rising Tide Tax System is a complement, not a substitute, for policies aimed at improving economic opportunity.

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Figure 1. Pre-Tax Lorenz Curves, Selected Years, 1979-2002

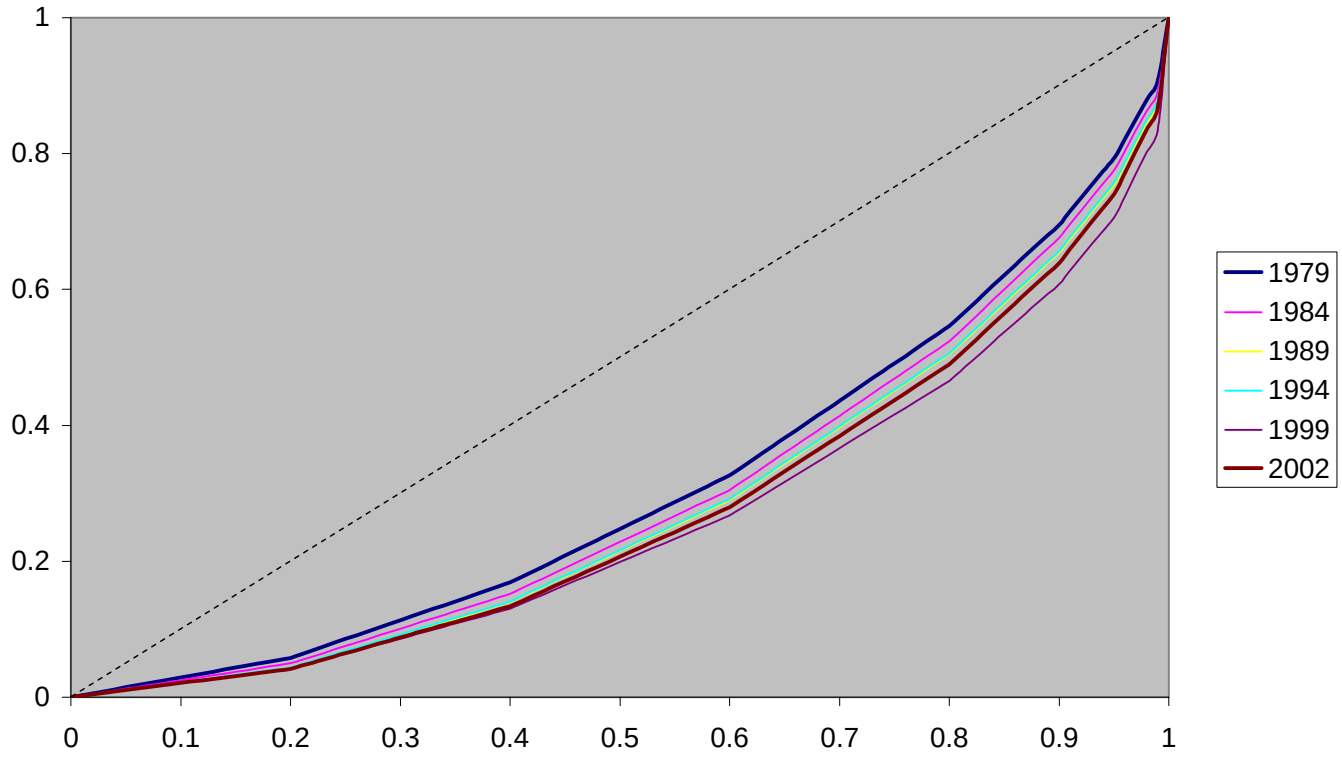


Figure 2. Post-Tax Lorenz Curves, Selected Years, 1979-2002

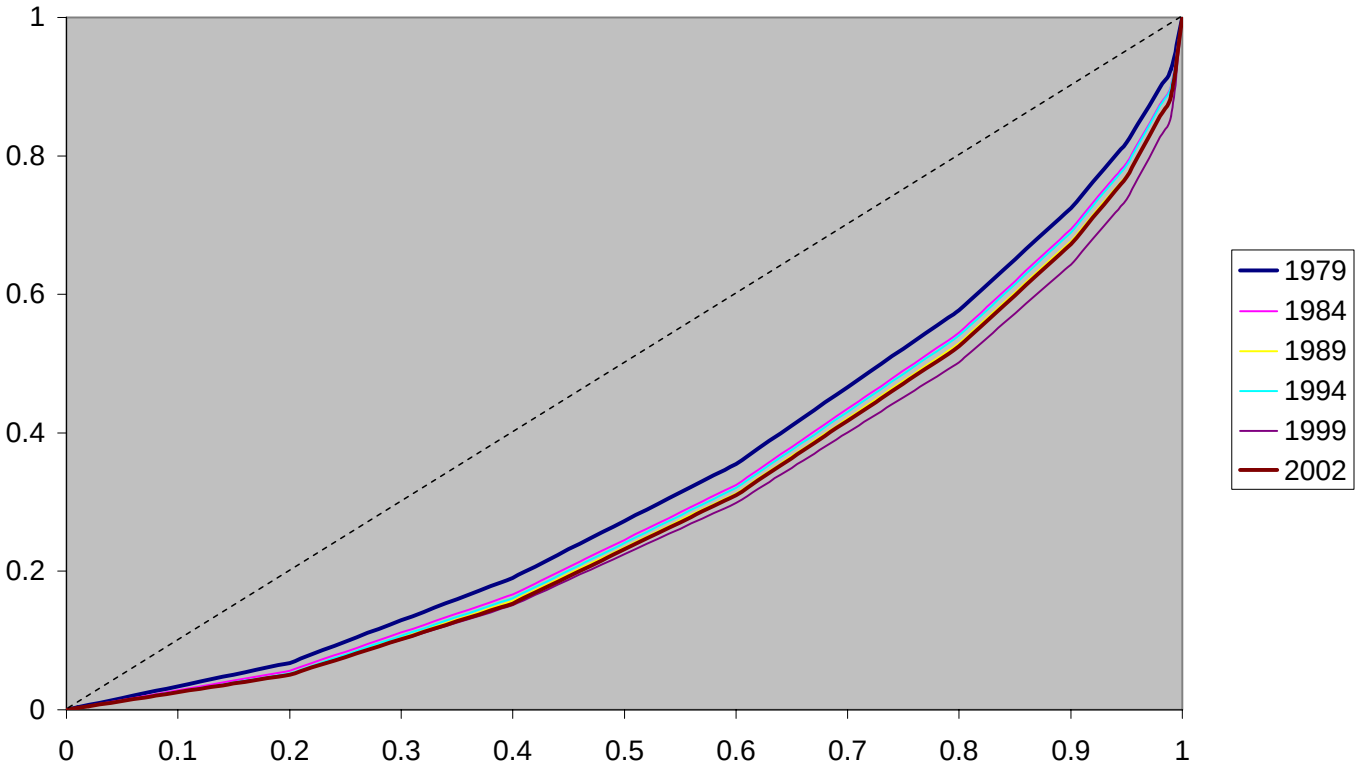


Figure 3. Pre- Versus Post-Tax Lorenz Curves, 2002

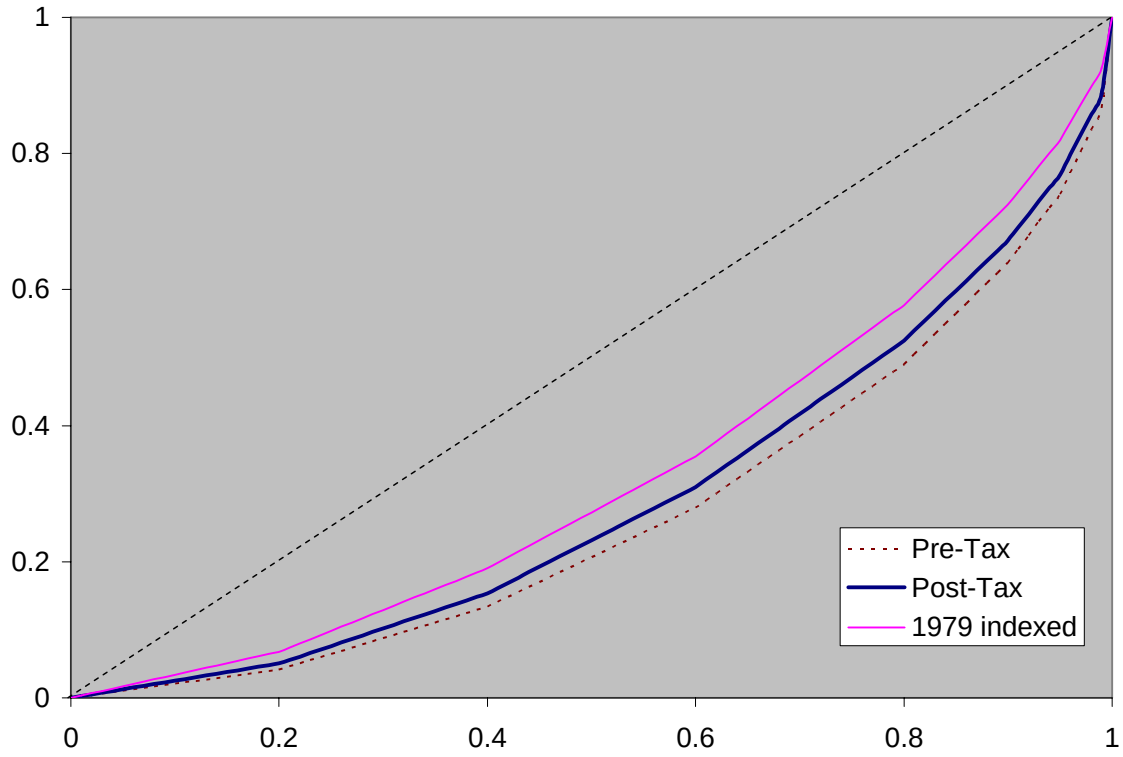
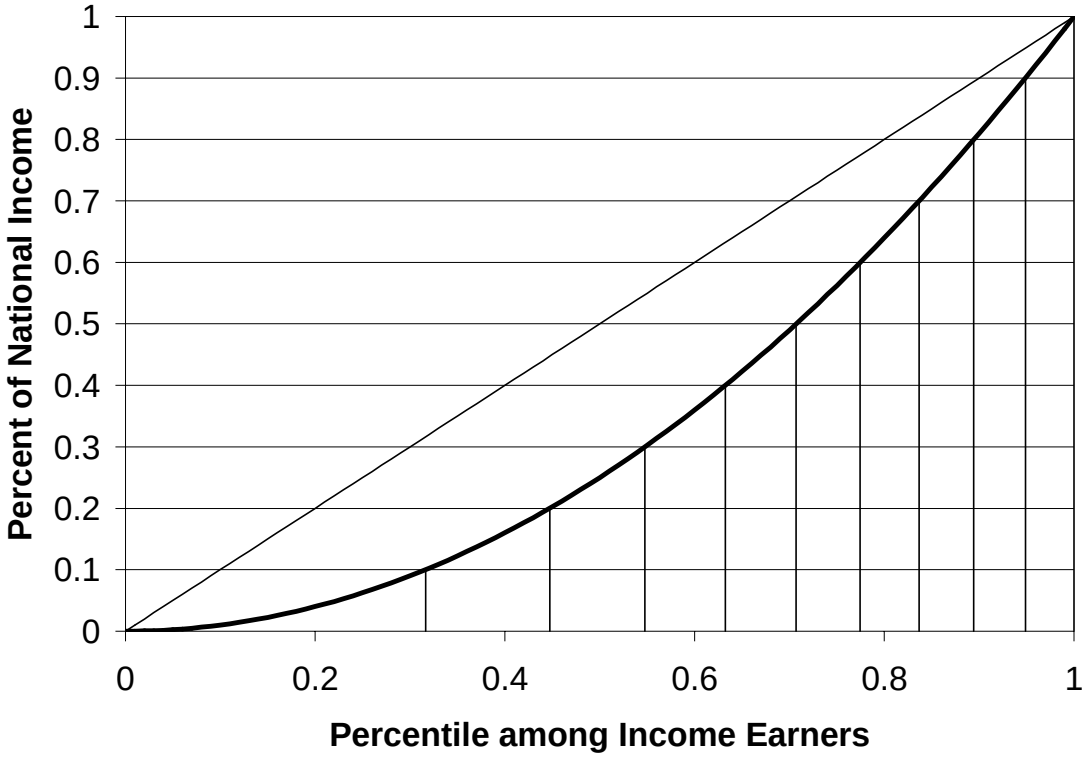


Figure 4. Hypothetical Lorenz Curve for Economy with Parabolic Distribution of Income



Note: The curve divides the population into ten groups on the horizontal axis, each one of which earns the same total income. Because the income distribution is unequal, groups get successively smaller as incomes increase (to the right). If ten agents, one for each of the ten groups, bargained together to manage the risk of an income shock that has an equal probability of hitting any of the ten groups, then the optimal risk management solution would be to agree in advance to divide up the shock equally over all ten groups. This "insurance" solution would then have the effect of pegging the Lorenz curve at its pre-shock level.

Figure 5a. Determination of Taxable Income (Interior Solution)

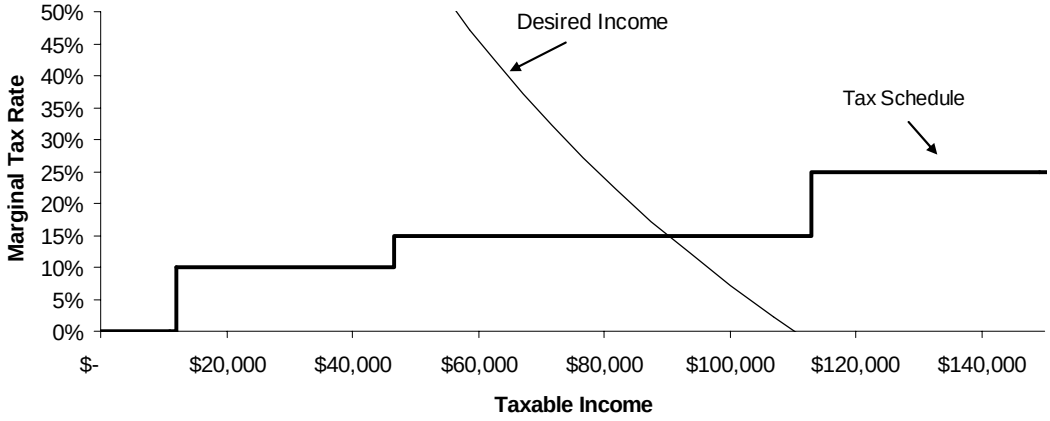


Figure 5b. Determination of Taxable Income (Corner Solution)

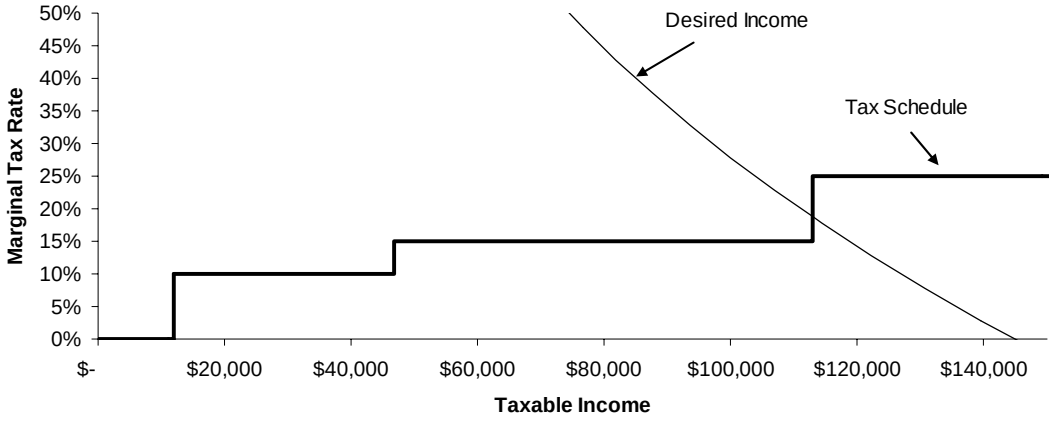


Figure 5c. Determination of Taxable Income (Multiple Equilibria)

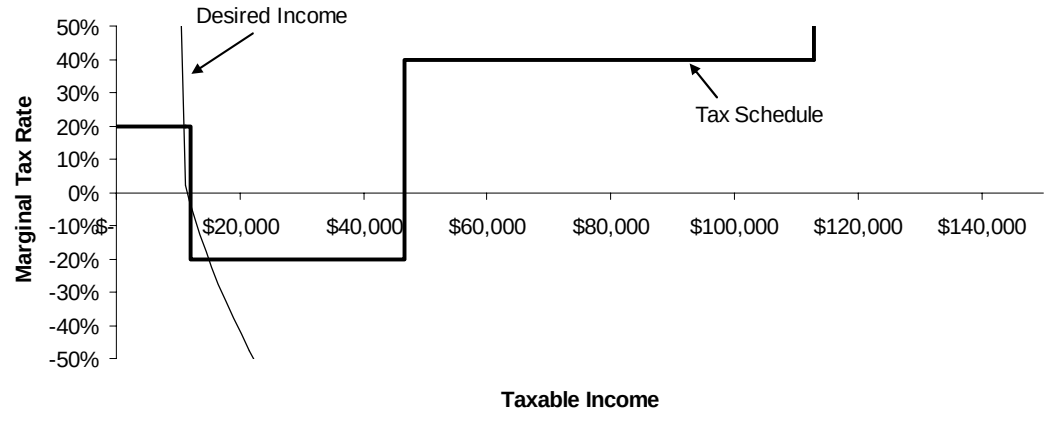


Table 1. Hypothetical Example of Spreadsheet Method of Computing Inequality-Indexed Tax Rates

Person	Percentile	Pre-Tax Income	Partial Sum	Pre-Tax Lorenz	Target Lorenz	Delta Target	After-Tax Income	Tax	Tax Rate	Marginal Tax Rate
0	0%	$0	$0	0.0%	0.0%	0.0%	$0	$0		
1	10%	$2,000	$2,000	0.5%	1.0%	1.0%	$3,000	-$1,000	-50%	-50%
2	20%	$8,000	$10,000	2.5%	4.0%	3.0%	$9,000	-$1,000	-13%	0%
3	30%	$8,400	$18,400	4.6%	9.0%	5.0%	$15,000	-$6,600	-79%	-1400%
4	40%	$9,300	$27,700	6.9%	16.0%	7.0%	$21,000	-$11,700	-126%	-567%
5	50%	$13,300	$41,000	10.3%	25.0%	9.0%	$27,000	-$13,700	-103%	-50%
6	60%	$18,000	$59,000	14.8%	36.0%	11.0%	$33,000	-$15,000	-83%	-28%
7	70%	$25,000	$84,000	21.0%	49.0%	13.0%	$39,000	-$14,000	-56%	14%
8	80%	$40,000	$124,000	31.0%	64.0%	15.0%	$45,000	-$5,000	-13%	60%
9	90%	$92,000	$216,000	54.0%	81.0%	17.0%	$51,000	$41,000	45%	88%
10	100%	$184,000	$400,000	100.0%	100.0%	19.0%	$57,000	$127,000	69%	93%
	Sum	$400,000						$100,000		
	Tax	$100,000								
	After tax	$300,000								

Table 2. Individual Income Tax Rates Required to Match Prior-Year Distributions of After-Tax Income

Target Distribution of After-Tax Income	Required Tax Rates In Modified Individual Income Tax System[1]						Demogrant (Dollars)[2]
2002 Current Law Baseline	**10**	**15**	**27**	**30**	**35**	**38.6**	**0**
Imposing Non-Decreasing Tax Rates							
2002 Current Law[3]	9.8	15.1	26.9	31.1	34.7	34.7	0
1994 Current Law							
Full Indexation	5.6	14.6	26.4	42.3	42.3	54.0	414
1/2 Indexation	7.6	14.9	26.7	37.0	37.0	46.6	204
1/4 Indexation	8.8	15.0	26.8	34.4	34.4	42.9	101
1/8 Indexation	11.1	12.9	28.9	28.9	37.1	40.4	58
1/16 Indexation	9.7	15.0	26.9	32.4	32.4	40.1	24
1979 Current Law							
Full Indexation	18.4	18.4	27.7	65.3	65.3	77.0	2,452
1/2 Indexation	14.7	16.5	27.4	48.5	48.5	58.2	1,231
1/4 Indexation	12.5	15.7	27.2	40.1	40.1	48.7	617
1/8 Indexation	11.3	15.3	27.1	35.9	35.9	44.0	309
1/16 Indexation	10.7	15.2	27.0	33.8	33.8	41.6	154
No Restriction on Tax Rates							
2002 Current Law[3]	10.0	15.0	27.3	21.1	53.6	31.2	0
1994 Current Law	4.3	15.6	23.4	115.4	-65.3	73.2	406
1979 Current Law	17.8	19.1	25.1	130.8	-40.4	96.3	2,449
No Negative Rate Except Bottom Rate							
2002 Current Law[3]	10.0	15.0	27.3	20.9	54.1	31.1	0
1994 Current Law	5.1	14.9	25.5	64.8	0.0	62.0	411
1979 Current Law	18.2	18.7	26.4	100.0	0.0	89.3	2,452
Rates No Less Than 90% of Previous Rate							
2002 Current Law[3]	9.9	15.1	27.0	29.4	37.9	34.1	0
1994 Current Law	5.5	14.6	26.4	43.8	39.4	54.6	414
1979 Current Law	19.9	17.9	28.0	67.4	60.7	77.9	2,472

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0305-3A)

Notes:

(1) Modified individual income tax system is 2002 current law with the following changes: the individual alternative minimum tax (AMT) is repealed; long-term capital gains are taxed at the same rate as ordinary income.

(2) Demogrant is multiplied by the square root of the number of members of the tax unit. Thus a tax unit with four members receives twice the demogrant shown. The demogrant is constrained to be non-negative.

(3) The demogrant is constrained to equal 0 in this case.

Table 3. Individual Income Tax Rates Required to Match Prior-Year Distributions of After-Tax Income Allowing For Behavioral Response[1]

Target Distribution of After-Tax Income	Required Tax Rates In Modified Individual Income Tax System[2]						Demogrant (Dollars)[3]
2002 Current Law Baseline	**10**	**15**	**27**	**30**	**35**	**38.6**	**0**
Imposing Non-Decreasing Tax Rates							
1994 Current Law							
Full Indexation	-8.7	27.0	62.2	64.8	64.8	64.8	118
1/2 Indexation	5.8	17.8	40.0	56.5	56.5	56.5	193
1/16 Indexation	9.7	15.1	28.0	33.4	38.5	38.5	25
1979 Current Law							
Full Indexation	0.0	55.2	69.5	69.5	69.5	69.5	2,137
1/2 Indexation	1.7	33.3	65.6	65.6	65.6	65.6	1,083
1/16 Indexation	10.6	15.7	29.8	40.6	40.6	40.6	154
Imposing Non-Negative Tax Rates Except Bottom Rate							
1979 Current Law							
Full Indexation	9.4	75.0	75.0	75.0	75.0	50.3	2,235
1/2 Indexation	-0.9	36.6	72.8	75.0	75.0	48.5	1,034
1/16 Indexation	10.4	15.9	30.5	55.8	42.6	32.8	153

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0305-3A)

Notes:

(1) Taxable income is assumed to change based on the percentage difference between the tax unit's marginal tax rate under current law and under the indexation proposal. The elasticity of taxable income with respect to the marginal tax rate is assumed to be proportional to the tax rate and equals 0.4 at a rate of 30 percent.

(2) Modified individual income tax system is 2002 current law with the following changes: the individual alternative minimum tax (AMT) is repealed; long-term capital gains are taxed at the same rate as ordinary income.

(3) Demogrant is multiplied by the square root of the number of members of the tax unit. Thus a tax unit with four members receives twice the demogrant shown. The demogrant is constrained to be non-negative.

Table 4. Comparison of After-Tax Income Targets and Actual Values After Optimization Algorithm, 2002 Current Law

Income Percentile	After-Tax Income ($ millions)								
		Actual							
	Target	Non-Decreasing Rates	Difference (Percent)	Unrestricted Rates	Difference (Percent)	Non-negative Rates	Difference (Percent)	Rates at least 90% of Previous Rates	Difference (Percent)
0-20	19,864.8	19,865.1	0.0	19,865.0	0.0	19,865.0	0.0	19,865.0	0.0
20-40	41,886.6	41,895.9	0.0	41,888.2	0.0	41,888.2	0.0	41,888.2	0.0
40-60	62,717.4	62,717.4	0.0	62,716.2	0.0	62,716.2	0.0	62,716.2	0.0
60-80	97,870.3	97,857.0	0.0	97,870.8	0.0	97,870.8	0.0	97,870.8	0.0
80-90	70,367.9	70,400.1	0.0	70,367.8	0.0	70,367.8	0.0	70,367.8	0.0
90-95	47,449.9	47,423.4	-0.1	47,449.9	0.0	47,449.9	0.0	47,449.9	0.0
95-99	62,677.1	62,679.2	0.0	62,677.1	0.0	62,677.1	0.0	62,677.1	0.0
99-100	65,501.7	65,501.5	0.0	65,501.7	0.0	65,501.7	0.0	65,501.7	0.0
All	466,862.7	468,339.6	0.3	468,336.7	0.3	468,336.7	0.3	468,336.7	0.3

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0305-3A)

Table 5. Comparison of After-Tax Income Targets and Actual Values After Optimization Algorithm, 1994

Income Percentile	After-Tax Income ($ millions)																			
	1994 Current Law Full Indexation									1994 Current Law 1/2 Indexation			1994 Current Law 1/4 Indexation			1994 Current Law 1/8 Indexation			1994 Current Law 1/16 Indexation		
		Actual									Actual			Actual			Actual			Actual	
	Target	Non-Decreasing Rates	Difference (Percent)	Unrestricted Rates	Difference (Percent)	Non-negative Rates	Difference (Percent)	Rates at least 90% of Previous	Difference (Percent)	Target	Non-Decreasing Rates	Difference (Percent)	Target	Non-Decreasing Rates	Difference (Percent)	Target	Non-Decreasing Rates	Difference (Percent)	Target	Non-Decreasing Rates	Difference (Percent)
0-20	20,684.1	21,198.7	2.5	21,172.6	2.4	21,189.8	2.4	21,198.2	2.5	20,272.0	20,521.2	1.2	20,066.4	20,189.2	0.6	19,963.6	20,050.5	0.4	19,912.2	19,941.7	0.1
20-40	44,392.9	43,458.8	-2.1	43,501.2	-2.0	43,472.4	-2.1	43,459.7	-2.1	43,135.8	42,673.5	-1.1	42,508.3	42,278.8	-0.5	42,194.8	42,014.5	-0.4	42,038.1	41,982.3	-0.1
40-60	64,039.4	64,660.2	1.0	64,673.7	1.0	64,665.1	1.0	64,660.4	1.0	63,374.8	63,691.7	0.5	63,043.0	63,202.2	0.3	62,877.2	63,046.0	0.3	62,794.3	62,834.3	0.1
60-80	100,351.1	100,209.5	-0.1	100,106.0	-0.2	100,176.7	-0.2	100,207.3	-0.1	99,114.6	99,040.6	-0.1	98,497.4	98,459.0	0.0	98,819.0	98,703.9	-0.1	98,034.9	98,023.5	0.0
80-90	71,866.2	71,689.9	-0.2	71,928.6	0.1	71,764.0	-0.1	71,695.0	-0.2	71,137.9	71,051.4	-0.1	70,774.4	70,733.8	-0.1	70,592.7	70,723.1	0.2	70,502.0	70,495.9	0.0
90-95	47,832.8	48,017.7	0.4	47,828.3	0.0	47,962.9	0.3	48,014.0	0.4	47,631.0	47,722.6	0.2	47,530.2	47,574.0	0.1	47,479.9	47,397.0	-0.2	47,454.7	47,462.4	0.0
95-99	61,502.1	61,492.4	0.0	61,502.1	0.0	61,492.0	0.0	61,492.3	0.0	62,133.4	62,128.6	0.0	62,448.5	62,446.2	0.0	62,605.9	62,606.1	0.0	62,684.6	62,684.2	0.0
99-100	56,194.4	56,194.5	0.0	56,194.4	0.0	56,194.5	0.0	56,194.5	0.0	60,063.1	60,063.2	0.0	61,994.5	61,994.5	0.0	62,959.5	62,959.5	0.0	63,441.8	63,441.8	0.0
All	466,862.7	466,921.7	0.0	466,906.9	0.0	464,075.8	-0.6	464,079.9	-0.6	466,862.7	466,892.8	0.0	466,862.7	466,877.7	0.0	466,862.7	467,500.6	0.1	466,862.7	466,866.1	0.0

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0305-3A)

Table 6. Comparison of After-Tax Income Targets and Actual Values After Optimization Algorithm With Behavioral Response, 1994

Income Percentile	After-Tax Income ($ millions)								
	1994 Current Law Full Indexation			1994 Current Law 1/2 Indexation			1994 Current Law 1/16 Indexation		
	Target	Actual		Target	Actual		Target	Actual	
		Non-Decreasing Rates	Difference (Percent)		Non-Decreasing Rates	Difference (Percent)		Non-Decreasing Rates	Difference (Percent)
0-20	20,684.1	20,636.4	-0.2	20,272.0	20,487.9	1.1	19,912.2	19,945.5	0.2
20-40	44,392.9	44,013.9	-0.9	43,135.8	42,738.8	-0.9	42,038.1	41,981.3	-0.1
40-60	64,039.4	65,220.1	1.8	63,374.8	63,661.3	0.5	62,794.3	62,821.2	0.0
60-80	100,351.1	99,182.5	-1.2	99,114.6	98,964.4	-0.2	98,034.9	98,038.4	0.0
80-90	71,866.2	72,423.2	0.8	71,137.9	71,361.1	0.3	70,502.0	70,489.8	0.0
90-95	47,832.8	48,582.4	1.6	47,631.0	47,335.1	-0.6	47,454.7	47,453.8	0.0
95-99	61,502.1	60,842.6	-1.1	62,133.4	62,178.7	0.1	62,684.6	62,683.5	0.0
99-100	56,194.4	58,842.9	4.7	60,063.1	60,165.9	0.2	63,441.8	63,441.5	0.0
All	466,862.7	469,744.0	0.6	466,862.7	466,893.2	0.0	466,862.7	466,855.0	0.0

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0305-3A)

Table 7. Comparison of After-Tax Income Targets and Actual Values After Optimization Algorithm, 1979

Income Percentile	After-Tax Income ($ millions)																			
	1979 Current Law Full Indexation									1979 Current Law 1/2 Indexation			1979 Current Law 1/4 Indexation			1979 Current Law 1/8 Indexation			1979 Current Law 1/16 Indexation		
		Actual									Actual			Actual			Actual			Actual	
	Target	Non-Decreasing Rates	Difference (Percent)	Unrestricted Rates	Difference (Percent)	Non-negative Rates	Difference (Percent)	Rates at least 90% of Previous	Difference (Percent)	Target	Non-Decreasing Rates	Difference (Percent)	Target	Non-Decreasing Rates	Difference (Percent)	Target	Non-Decreasing Rates	Difference (Percent)	Target	Non-Decreasing Rates	Difference (Percent)
0-20	26,988.3	27,720.6	2.7	27,711.7	2.7	27,722.2	2.7	27,782.8	2.9	23,425.3	23,808.0	1.6	21,643.3	21,842.8	0.9	20,752.1	20,853.3	0.5	20,306.5	20,357.3	0.3
20-40	50,481.4	48,896.7	-3.1	48,931.3	-3.1	48,911.4	-3.1	48,858.5	-3.2	46,182.3	45,385.6	-1.7	44,032.1	43,632.5	-0.9	42,956.9	42,757.6	-0.5	42,419.2	42,320.3	-0.2
40-60	66,743.9	68,081.8	2.0	68,071.0	2.0	68,069.3	2.0	68,014.5	1.9	64,728.1	65,374.3	1.0	63,719.9	64,031.9	0.5	63,215.7	63,368.8	0.2	62,963.6	63,039.0	0.1
60-80	102,513.3	102,074.4	-0.4	101,991.0	-0.5	102,033.1	-0.5	102,107.5	-0.4	100,197.5	99,985.0	-0.2	99,039.3	98,935.2	-0.1	98,460.1	98,407.7	-0.1	98,170.4	98,143.4	0.0
80-90	72,170.7	72,084.5	-0.1	72,303.5	0.2	72,202.6	0.0	72,109.1	-0.1	71,291.1	71,256.0	0.0	70,851.2	70,838.8	0.0	70,631.2	70,628.4	0.0	70,521.2	70,522.8	0.0
90-95	47,666.9	47,833.7	0.3	47,657.5	0.0	47,740.3	0.2	47,805.3	0.3	47,548.3	47,623.1	0.2	47,489.0	47,521.4	0.1	47,459.3	47,472.6	0.0	47,444.4	47,448.6	0.0
95-99	57,437.7	57,428.7	0.0	57,437.7	0.0	57,431.5	0.0	57,430.0	0.0	60,099.9	60,095.9	0.0	61,431.5	61,429.7	0.0	62,097.4	62,096.7	0.0	62,430.3	62,430.1	0.0
99-100	42,860.5	42,860.6	0.0	42,860.5	0.0	42,860.6	0.0	42,860.6	0.0	53,390.1	53,390.1	0.0	58,656.5	58,656.5	0.0	61,290.0	61,290.0	0.0	62,606.9	62,606.9	0.0
All	466,862.7	466,981.0	0.0	466,964.2	0.0	464,263.2	-0.6	464,261.8	-0.6	466,862.7	466,918.0	0.0	466,862.7	466,888.8	0.0	466,862.7	466,875.1	0.0	466,862.7	466,868.4	0.0

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0305-3A)

Table 8. Comparison of After-Tax Income Targets and Actual Values After Optimization Algorithm With Behavioral Response, 1979

Income Percentile	After-Tax Income ($ millions)												
	1979 Current Law Full Indexation					1979 Current Law 1/2 Indexation					1979 Current Law 1/16 I		
	Target	Actual				Target	Actual				Target	Act	
		Non-Decreasing Rates	Difference (Percent)	Non-negative Rates	Difference (Percent)		Non-Decreasing Rates	Difference (Percent)	Non-negative Rates	Difference (Percent)		Non-Decreasing Rates	Difference (Percent)
0-20	26,988.3	26,730.3	-1.0	27,035.7	0.2	23,425.3	23,348.3	-0.3	23,229.1	-0.8	20,306.5	20,357.8	0.3
20-40	50,481.4	49,239.8	-2.5	49,015.5	-2.9	46,182.3	45,801.5	-0.8	45,872.2	-0.7	42,419.2	42,329.1	-0.2
40-60	66,743.9	70,489.2	5.6	70,730.8	6.0	64,728.1	66,343.3	2.5	66,617.0	2.9	62,963.6	63,015.3	0.1
60-80	102,513.3	101,260.2	-1.2	102,245.1	-0.3	100,197.5	98,648.8	-1.5	98,510.9	-1.7	98,170.4	98,160.2	0.0
80-90	72,170.7	69,090.6	-4.3	68,380.3	-5.3	71,291.1	71,293.2	0.0	70,966.9	-0.5	70,521.2	70,527.4	0.0
90-95	47,666.9	46,407.4	-2.6	44,659.8	-6.3	47,548.3	48,212.5	1.4	48,669.6	2.4	47,444.4	47,420.5	-0.1
95-99	57,437.7	58,902.8	2.6	56,907.7	-0.9	60,099.9	60,305.3	0.3	60,720.3	1.0	62,430.3	62,436.2	0.0
99-100	42,860.5	58,039.5	35.4	55,293.9	29.0	53,390.1	58,541.7	9.6	56,379.5	5.6	62,606.9	62,607.5	0.0
All	466,862.7	480,159.8	2.8	474,268.8	1.6	466,862.7	472,494.6	1.2	470,965.5	0.9	466,862.7	466,854.0	0.0

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0305-3A)

Table 9. Individual Income Tax Rates Required to Match Prior-Year Distributions of After-Tax Income by Quintiles Only

Target Distribution of After-Tax Income	Required Tax Rates In Modified Individual Income Tax System[1]						Demogrant (Dollars)[2]
2002 Current Law Baseline	**10**	**15**	**27**	**30**	**35**	**38.6**	**0**
Imposing Non-Decreasing Tax Rates							
1994 Current Law Full Indexation							
Without Behavioral Response	4.3	16.1	16.1	29.9	52.3	68.1	408
With Behavioral Response[3]	-9.4	27.3	47.4	50.6	50.6	50.6	102
1979 Current Law Full Indexation							
Without Behavioral Response	18.7	19.0	19.0	39.7	73.1	96.1	2,459
With Behavioral Response[3]	33.6	74.2	74.2	74.2	74.2	74.2	2,590

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0305-3A)

Notes:

(1) Modified individual income tax system is 2002 current law with the following changes: the individual alternative minimum tax (AMT) is repealed; long-term capital gains are taxed at the same rate as ordinary income.

(2) Demogrant is multiplied by the square root of the number of members of the tax unit. Thus a tax unit with four members receives twice the demogrant shown. The demogrant is constrained to be non-negative.

(3) Taxable income is assumed to change based on the percentage difference between the tax unit's marginal tax rate under current law and under the indexation proposal. The elasticity of taxable income with respect to the marginal tax rate is assumed to be proportional to the tax rate and equals 0.4 at a rate of 30 percent.

Table 10. Comparison of After-Tax Income Targets and Actual Values After Optimization Algorithm With Behavioral Response, 1979

Income Percentile	After-Tax Income ($ millions)				
	1979 Current Law Full Indexation				
	Target	Actual			
		Without Behavioral Responses	Difference (Percent)	With Behavioral Responses	Difference (Percent)
0-20	26,988.3	27,742.3	2.8	28,617.8	6.0
20-40	50,481.4	48,897.8	-3.1	48,923.0	-3.1
40-60	66,743.9	67,989.1	1.9	67,144.5	0.6
60-80	102,513.3	102,136.4	-0.4	96,721.4	-5.6
80-100	220,135.8	220,135.8	0.0	221,467.1	0.6
All	466,862.7	466,901.4	0.0	462,873.8	-0.9

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0305-3A)

Table 11. Comparison of After-Tax Income Targets and Actual Values After Optimization Algorithm With Behavioral Response, 1994

Income Percentile	After-Tax Income ($ millions)				
	1979 Current Law Full Indexation				
	Target	Actual			
		Without Behavioral Responses	Difference (Percent)	With Behavioral Responses	Difference (Percent)
0-20	20,684.1	21,180.9	2.4	20,614.0	-0.3
20-40	44,392.9	43,505.8	-2.0	44,051.7	-0.8
40-60	64,039.4	64,613.6	0.9	65,266.2	1.9
60-80	100,351.1	100,180.7	-0.2	99,094.7	-1.3
80-100	237,395.2	237,395.2	0.0	237,892.2	0.2
All	466,862.7	466,876.2	0.0	466,918.8	0.0

Source: Urban-Brookings Tax Policy Center Microsimulation Model (version 0305-3A)

Table 12. Correspondence Between Taxable Income and Cash Income, 2002

		Taxable Income Percentile								
		0-30.21	**30.21-40**	**40-60**	**60-80**	**80-90**	**90-95**	**95-99**	**99-100**	**All**
Cash Income Percentile	**0-20**	**20.89**	1.76	0.00	0.00	0.00	0.00	0.00	0.00	22.65
	20-40	6.80	**6.66**	6.94	0.00	0.00	0.00	0.00	0.00	20.40
	40-60	1.95	1.04	**10.66**	5.31	0.01	0.00	0.00	0.00	18.98
	60-80	0.35	0.26	2.14	**12.24**	3.92	0.19	0.00	0.00	19.11
	80-90	0.11	0.04	0.15	2.13	**4.63**	2.23	0.21	0.00	9.50
	90-95	0.05	0.01	0.06	0.22	1.21	**1.96**	1.26	0.00	4.76
	95-99	0.03	0.02	0.04	0.08	0.20	0.60	**2.40**	0.33	3.70
	99-100	0.01	0.00	0.01	0.02	0.02	0.03	0.13	**0.67**	0.91
	All	30.21	9.79	20.00	20.00	10.00	5.00	4.00	1.00	100.00

Notes:

(1) Taxable income percentile from 0-30.21 includes all tax units with 0 taxable income.

(2) Cash Income percentile breaks put equal numbers of persons, not equal numbers of tax units, into quintiles. So, for example, the bottom quintile of cash income includes 20 percent of persons, but 22.65 percent of tax units.