Can the Graduated Income Tax Survive Optimal Tax Analysis?

LAWRENCE ZELENAK* and KEMPER MORELAND**

I. INTRODUCTION

It would be easy for a utilitarian to design the ideal tax-and-transfer system—*if* taxation of earnings did not discourage work. Assuming everyone derives the same utility from any given amount of money, and that money has declining marginal utility, the ideal system would tax all earnings at 100% and then distribute an equal share of the tax revenue to every person.[1] Until incomes are completely equalized, the sum of individual utilities always can be increased by transfers from those with more to those with less. The problem, of course, is that taxation does affect work effort. Faced with a 100% tax, people would decide not to earn any taxable income, and the otherwise ideal system would be a complete disaster.

What, then, is the ideal tax-and-transfer system, retaining the goal of maximizing the sum of the utilities of individuals with identical preferences, but taking into account the work disincentive effect of an income tax? That is the question James Mirrlees addressed in his classic 1971 article, which invented optimal income tax analysis.[2] As originated by him, and developed by him and others,[3] optimal income tax analysis provides sophisticated mathematical techniques for finding the tax-and-transfer system that best balances the utility gains

* Reef C. Ivey Professor of Law, University of North Carolina.

** Professor of Economics, Eastern Michigan University.

Thanks to Anne Alstott, David Bradford, Marvin Chirelstein, Doug Kahn, Jeff Lehman, Kyle Logue, Julie Roin, and Dan Shaviro for their comments on earlier versions of this Article.

1 This assumes the government has no need for revenue for purposes other than redistribution. The optimality of income equalization, in the absence of incentive effects of taxation, was first noted over a century ago. F.Y. Edgeworth, The Pure Theory of Progressive Taxation, in Economic Justice 371, 373-74 (E. Phelps ed., 1973). The analysis is summarized in Matti Tuomala, Optimal Income Tax and Redistribution 1-3 (1990).

2 James Mirrlees, An Exploration in the Theory of Optimum Income Taxation, 38 Rev. Econ. Stud. 175 (1971). Mirrlees received the 1996 Nobel Prize in Economic Science in recognition of his optimal income tax work. Peter Passell, 2 Theorists of Real-Life Problems Get Nobel, N.Y. Times, Oct. 9, 1996, at D-1.

3 See, e.g., A.B. Atkinson, Public Economics in Action: the Basic Income/Flat Tax Proposal 20-23 (1995).

from income redistribution against the efficiency losses from the disincentive effect of taxation.

If the tax administrator could observe individuals' ability levels (that is, wage rates), a tax could be imposed directly on ability. Under such an endowment tax, tax liability would depend only on ability, without regard to an individual's chosen mix of work and leisure. Because tax liability would be unaffected by labor effort, an endowment tax would not discourage market work relative to leisure. Optimal tax analysis, however, is based on the realistic assumption that the tax administrator can observe taxpayers' incomes, but not their wage rates.[4]

Optimal tax analysis depends critically on a few assumptions about the state of the world: the distribution of income-earning ability in society, the rate at which the marginal utility of income declines, and how much the imposition of an income tax causes individuals to curtail their work effort.[5] For any set of assumptions, an optimal tax analyst can derive the utility-maximizing tax-transfer system, in the form of a tax rate schedule and a universal cash grant ("demogrant") of some specified amount per person. The model may or may not also provide for taxation to fund government activities other than redistribution.

In the utilitarian version of optimal tax analysis, the optimal tax-transfer system is the one that maximizes the sum of individuals' utilities. Each individual's utility is a function of her leisure[6] and her con-

[4] Tuomala, note 1, at 4-5.

[5] More precisely, the key question in terms of work effort is the extent of the substitution effect (as reflected in the elasticity of substitution between consumption and leisure). Taxation of earned income has two effects on work effort, operating in opposite directions. The *substitution effect* decreases work effort. Confronted with a tax on earned income, people tend to replace it with untaxed imputed income or leisure. But the *income effect* increases work effort since leisure empirically appears to be a normal good (that is, the demand for it increases as income increases). Knowing that taxes reduce their pay, people work harder to replace the lost income. The net result of the two effects may be an increase, a decrease, or no change in labor supply. The efficiency loss from taxation, however, depends solely on the substitution effect—on the wedge that taxation drives between the value of one's labor and the amount one receives for it. Joseph Bankman & Thomas Griffith, Social Welfare and the Rate Structure: A New Look at Progressive Taxation, 75 Cal. L. Rev. 1905, 1920 (1987). A 20% tax on labor income, for example, will cause an individual to reject $100 of pretax labor income ($80 after tax) in favor of leisure or imputed income valued at $85, resulting in an efficiency (deadweight) loss of $15. Although it is counterintuitive, taxation creates an efficiency loss from the substitution effect even if the net result of the substitution and labor effects leaves the amount of labor unchanged. Harvey Rosen, Public Finance 310-12 (4th ed. 1995).

[6] Leisure is any time not devoted to market labor. Unpaid work one does for oneself and one's family—in tax policy jargon, work that produces imputed income—is leisure in this specialized usage.

sumption (with consumption equalling after-tax income). Both leisure and consumption are assumed to have declining marginal utility.[7]

The sharper the decline in the marginal utility of consumption, the greater the potential utility gains from redistribution. But the more taxation causes individuals to replace taxed labor income with untaxed leisure (including imputed income), the greater the efficiency cost of taxation.[8] The interaction of these two forces, pushing in opposite directions, determines the optimal tax rate schedule and the optimal demogrant.

Optimal tax analysis also can incorporate distributive philosophies more egalitarian than simple utilitarianism. For example, one might believe that any individual's marginal utility of income is inversely proportional to the amount of income she already has,[9] but have a social preference for equality that values the utility of the poor more than that of the rich. Incorporating this social welfare function into the analysis, one might treat the *social* marginal utility of each individual's income as declining more rapidly than individual marginal utility declines. For example, one might decide that social marginal utility of income is inversely proportional to the *square* of the income one already has.[10]

There are, of course, infinite possible variations on this theme of weighted utilitarianism. At the extreme, an analyst can determine the optimal tax-transfer system under a leximin or maximin social welfare function, commonly associated with John Rawls,[11] under which the goal is to maximize the utility of the least well-off member of society.[12]

The level of optimal tax rates and the size of the optimal demogrant are very sensitive to the factual assumptions and to the choice of so-

---

[7] Bankman & Griffith, note 5, at 1947.

[8] See note 5. The total deadweight loss from taxation cannot be determined simply by counting the number of hours of market labor lost because of taxation. The correct measure of the loss is the difference in social value between the lost market labor and the leisure that replaces it.

[9] In that case, an additional dollar to a person with $10,000 would have 10 times the utility of an additional dollar to a person with $100,000.

[10] In that case, from a social point of view, an additional dollar to a person with $10,000 has *100* times the utility of an additional dollar to a person with $100,000.

[11] John Rawls, A Theory of Justice 75-83, 152-56 (1971).

[12] See Bankman & Griffith, note 5, at 949-50. Bankman and Griffith describe the leximin as "the most egalitarian of the welfarist theories of distributive justice." Id. at 1950. In one sense, however, the leximin is not egalitarian at all; it has no objection to an unequal distribution of wealth or income, as long as no other distribution would improve the welfare of the least advantaged individual.

At first glance, it may seem that the leximin leads to the Edgeworth solution of 100% tax and complete income equalization. See note 1. In fact, it does not. Income the rich choose not to earn because of high tax rates cannot be redistributed to the least advantaged.

cial welfare function, but one important finding is quite robust. Unlike the actual tax rate structures in the United States and most other advanced economies,[13] optimal marginal tax rates do *not* rise steadily with income. As Matti Tuomala has noted, "One of the main conclusions to be drawn from the Mirrleesian optimal non-linear income tax model is that it is difficult (if at all possible) to find a convincing argument for a progressive marginal tax rate structure throughout."[14] For a wide range of factual assumptions and social welfare functions, the shape of the optimal tax curve is surprisingly robust: The marginal tax rate rises through the bottom decile of the societal wage distribution, and *falls* as income increases thereafter.[15] If the model permits only two rate brackets, instead of unlimited variation in marginal rates, the optimal result is again marginal rate regressivity—that is, the rate that applies at higher income levels should be lower than the rate that applies at lower income levels.[16] Marginal rate regressivity remains optimal even under a maximin social welfare function.[17] Increasing social aversion to inequality increases the size of the demogrant and the level of tax rates, but it does not significantly affect the *shape* of the optimal marginal tax rate schedule.

At first glance, the optimal tax rejection of progressive marginal rates is surprising. It is easy to see how the utility gains from redistribution push the optimal tax in the direction of progressive marginal rates. But there is a powerful countervailing force, the influence of which is less obvious. High tax rates impose an efficiency cost only when they apply at the margin—that is, at the point where a taxpayer actually is choosing between paid work and leisure. When a high tax rate applies to a taxpayers' submarginal earnings, it raises revenue for utility-enhancing redistribution without substitution effect distortion. To that taxpayer, the high rate on submarginal income functions as a nondistorting lump sum tax.

From an efficiency standpoint, then, an attractive income range at which to apply a high marginal rate will be a range where there are many taxpayers for whom that range is submarginal, relative to the number of taxpayers at the margin within that range. Most of the revenue raised by a high tax rate in that range will come without any substitution effect distortion. Conversely, efficiency concerns suggest the tax rate should be low in any income range where the ratio of submarginal taxpayers to marginal taxpayers is low. Because the

---

[13] See, e.g., IRC § 1.

[14] Tuomala, note 1, at 14.

[15] Id. at 95-99.

[16] Joel Slemrod, Shlomo Yitzhaki, Joram Mayshar & Michael Lundholm, The Optimal Two-Bracket Linear Income Tax Model, 53 J. Pub. Econ. 269, 270 (1994).

[17] Tuomala, note 1, at 98-99 tbl. 6.3.

range is marginal for a high percentage of the taxpayers to whom it applies, a high rate tax at that range will impose a high efficiency cost per tax dollar collected. If the ratio of submarginal to marginal taxpayers declines as one moves up the income distribution, the efficiency cost of high marginal rates will be greater in the higher income ranges. Under the standard assumption in the optimal tax literature of a log-normal distribution of wage rates,[18] that ratio does decline as income increases. Although the declining marginal utility of money pushes the optimal tax toward progressive marginal rates, the decreasing submarginality of rates at high income levels pushes strongly in the opposite direction.

In fact, one of the few general results of optimal tax analysis is that the tax rate on the last dollars earned by the most able (that is, highest wage) member of society should be zero.[19] That rate is marginal for one taxpayer, and is not submarginal for anyone. If there were any tax at the margin, the most able worker would choose untaxed leisure over the taxed marginal dollars of income. Eliminating the tax at the margin improves her welfare[20] and harms no one else because the tax would have raised no revenue in any event.

Optimal tax analysis appears to be a death sentence for the graduated (progressive marginal rate) income tax. What is so devastating about this analysis to the case for graduated rates is that it concedes all philosophical issues to the proponents of the graduated tax. If you are a utilitarian who has no rights-based philosophical objection to redistribution, that is fine with optimal tax analysts. If you are a weighted utilitarian who values the utility of the poor above the utility of the rich, that is also fine. It is even fine if you are a Rawlsian who cares about nothing but the welfare of the poorest. Optimal tax analysis grants your philosophical premise, and merely asks you to consider the impact of the efficiency cost of taxation on your ability to achieve your goals through progressive marginal rates. Once those effects are considered, it seems that *no one* should support a graduated income tax.

There is an irony here. The only detailed discussion of optimal tax analysis in the legal (as opposed to economic) literature is a superb article by Joseph Bankman and Thomas Griffith, in which they use

---

[18] Ravi Kanbur & Matti Tuomala, Inherent Inequality and the Optimal Graduation of Marginal Tax Rates, 96 Scand. J. Econ. 275, 275 (1994). The log-normal character of the assumed distribution means the peak of the curve occurs toward the low end of the distribution, with a long tail on the high end of the distribution.

[19] Tuomala, note 1, at 6-7.

[20] At the margin, she values the leisure alternative more than the after-tax labor income (if there is any tax), but less than tax-free labor income.

optimal tax analysis to *defend* progressive income taxation.[21] Their article is a response to the skepticism about progressivity reflected in a classic, decades-old article by Walter Blum and Harry Kalven.[22] How can Bankman and Griffith think that optimal tax analysis supports progressivity? Simply enough, they focus on *average* rate progressivity, rather than *marginal* rate progressivity. They explain that the effect of the demogrant is to make optimal average tax rates rise with income, even as marginal rates fall.[23] If it seems impossible that average rates can be progressive when marginal rates are regressive, consider a simple example. Suppose the demogrant is $10,000, and there are only two tax rates. The first rate is 30%, the second rate is 20%, and the breakpoint between the rates is $50,000. At the breakpoint, the $15,000 tax resulting from the 30% rate is reduced to $5,000 net tax by the demogrant, giving an average tax rate of 10%. Since any income above $50,000 is taxed at a rate higher than 10%, the average rate increases as income increases above $50,000.

Whether standard optimal tax analysis supports a progressive income tax thus becomes a matter of what is meant by progressivity—average rate or marginal rate progressivity. Contrary to Bankman and Griffith, we believe that the more important issue is marginal rate progressivity, at least in the current U.S. political context.

This Article examines whether graduated marginal rates can survive the apparently devastating results of optimal tax analysis. It begins with an explanation of why marginal rate progressivity is an important issue. It then considers six situations that have received little or no attention in the optimal tax literature, in which progressive marginal rates may be optimal, and discusses the significance of each.

The first is that progressive marginal rates may be optimal if demogrants are ruled out on political grounds, so that the only purpose of the income tax is to finance nonredistributive government functions. This result, which is new to the optimal tax literature, comes from a simulation described below. Other optimal tax studies, with their use of demogrants, have an air of political unreality. This study recognizes the political implausibility of demogrants, and modifies the optimal tax analysis in response. It turns out that, in a world without demogrants, the reports of the death of the graduated income tax are greatly exaggerated.

The next four situations in which progressive marginal rates may be optimal are reported in the existing literature, but are not widely

---

[21] Bankman & Griffith, note 5.

[22] Walter J. Blum & Harry Kalven, Jr., The Uneasy Case for Progressive Taxation, 19 U. Chi. L. Rev. 417 (1952).

[23] Id. at 1956-57.

known. Progressive rates may be optimal if envy figures into the social welfare function, if taxation serves as a form of insurance against wage uncertainty, if high income taxpayers are especially nonresponsive to the work disincentive effect of taxation, or if the distribution of ability (wage rates) in the population is different than usually is assumed. The final situation is that progressive marginal rates might be optimal in a labor market consisting in large part of winner-take-all competitions. Such a labor market has yet to be modeled in an optimal tax study.

II. If Average Rates Are Progressive, Why Care About Progressive Marginal Rates?

There is a ships-passing-in-the-night quality to the progressivity debate between Blum and Kalven, and Bankman and Griffith. Blum and Kalven explain—at considerable length—that their interest is in whether a graduated rate structure can be justified; they do not find the average rate progressivity of a flat tax-plus-subsistence exemption of great interest or importance.[24] But Bankman and Griffith believe they have adequately dealt with Blum and Kalven's objections to progressivity, by demonstrating that optimal tax analysis supports a flat tax-plus-demogrant, which has average rate progressivity without graduated rates.[25] Blum and Kalven could object that Bankman and Griffith have done nothing to dispel their skepticism about graduated rates; instead, they have shifted the terms of the debate from marginal rate progressivity to average rate progressivity, without explaining why that shift is appropriate.

Although Bankman and Griffith do not supply an explanation for the shift, it is easy enough to do it for them. Start with the idea that what ultimately matters in determining whether the tax burden is fairly distributed among income classes, is *average* rates[26]—what percentage of income individuals pay in tax at different income levels.[27] If *Dives* is paying an appropriately higher percentage of his income in

[24] Blum & Kalven, note 22, at 420, 506-11. A tax system with a zero rate on subsistence income and a single rate above that level will have modest average rate progressivity. As income increases, the average tax rate approaches, but never quite reaches, the single flat tax rate. This sometimes is called a degressive tax.

[25] Bankman & Griffith, note 5, at 1958-59.

[26] When the question is the behavioral effects of taxation, rather than fairness of the distribution of tax burdens, the focus is on marginal rates.

[27] A utilitarian would argue that even a focus on average rates is too narrow, and that what ultimately matters is the distribution of benefits and burdens produced by an integrated tax-and-transfer system. As explained below, however, we believe that U.S. attitudes to redistribution make it appropriate to consider the distribution of the tax burden on the assumption that revenues will be used only for government purposes other than redistribution. See text accompanying notes 61-80.

taxes than is *Lazarus*, it is irrelevant on fairness grounds how much each pays at the margin.[28] In the world of Blum and Kalven, there are no demogrants,[29] so significant average rate progressivity[30] can be achieved only with graduated rates. Without demogrants, the question of graduated rates and the question of meaningful average rate progressivity are the same. But with the introduction of demogrants, it is possible to have significant average rate progressivity—and significant redistribution—without graduated rates. Hence the belief of Bankman and Griffith that they have answered the objections to progressivity without having answered the objections to graduated rates.

Although we agree with Bankman and Griffith that the ultimate fairness question is about average rates, we disagree with their implication that those who favor progressivity need not be concerned about marginal rates, for two reasons. First, as a technical matter, there is a close relationship between average and marginal rates; some arguably desirable distributions of average rates simply cannot be achieved with a demogrant and a flat tax. Second, and even more important, the political reality in the United States is that there are not going to be any universal cash transfers;[31] once demogrants are politically ruled out, significant average rate progressivity means marginal rate progressivity.

A. The Technical Relationship Between Average and Marginal Rates

In a tax system with a demogrant—or even with merely an exemption—there will be average rate progressivity without graduated rates. What, then, do graduated rates add? One way of explaining the effect of graduated rates is that they increase the rate of increase in average rates. Another explanation is that graduation permits an increase in the average rate of those making more than a given amount, without also affecting those making the given amount or less. In a flat rate

---

[28] But see Atkinson, note 3, at 79 (decrying the unfairness of the "poverty trap" created by high marginal rates at low income levels).

[29] This appears to be because the possibility of demogrants never occurred to them, and not because they considered and rejected demogrants.

[30] Significant average rate progressivity requires more than the minor progression created by a subsistence exemption combined with a flat tax.

[31] This point is made succinctly by the editors of an anthology of tax policy literature. They follow an excerpt from Bankman & Griffith, note 5, with a single rhetorical question: "In the current political climate, how likely is the enactment of the government grant system proposed by Bankman and Griffith?" Paul L. Caron, Karen C. Burke & Grayson M.P. McCouch, Federal Income Tax Anthology 128 (1997).

Differences between demogrants and politically possible forms of redistribution are dissussed at the text accompanying notes 74-80.

system—with a demogrant or exemption—the average rate can never exceed or even quite equal the flat rate. Suppose the tax system was a $10,000 demogrant and a 30% flat tax. Then Bill Gates' average rate would be just below 30%. If we decided that his average rate was too low, what could we do about it if we were committed to a flat tax? We could increase his average rate to just below the level to which we increased the flat rate, but that would also increase the marginal rate on everyone else. With a flat tax, to increase Gates' average rate, we must increase everyone's marginal rate and affect nearly everyone's average rate.[32] By contrast, the use of graduated rates would allow an increase in Gates' average rate without affecting the rates of any lower income taxpayers.

The point, most simply, is that graduated rates permit much greater flexibility in average rate distributions than does a flat tax with a demogrant or an exemption.[33] For example, suppose lawmakers decide that the average rate at $10,000 income should be zero, at $50,000 should be 20%, and at $100,000 should be 30%. They then ask their staff technicians to devise rules to accomplish this. With graduated rates, there are any number of ways to do so, with or without demogrants.[34] But with a flat tax and a demogrant, it simply cannot be done. What is needed is a tax rate t and a demogrant g that satisfy three linear equations:

$$(1) \quad \$\ 10{,}000(t) - g = 0$$
$$(2) \quad \$\ 50{,}000(t) - g = \$10{,}000$$
$$(3) \quad \$100{,}000(t) - g = \$30{,}000.$$

The first two equations intersect at $t = 25\%$ and $g = \$2{,}500$. Putting those values into the left hand side of the third equation gives a value of $22,500. Thus, there is no point (t, g) at which all three equations are satisfied.

The significance of this loss of flexibility in setting average rates is debatable. Are we really so committed to the average rates of zero, 20%, and 30%, that we would not be satisfied with average rates of

---

[32] Although the increase in the flat rate would increase everyone's marginal rate and affect nearly everyone's average rate, it would not necessarily *increase* everyone's average rate. If increasing the flat tax rate increased revenue—which depends on the labor supply response—the higher rate could finance a larger demogrant. In that case, there would be some break-even income level, below which the benefit of the increase in the demogrant would outweigh the detriment of the higher tax rate, and above which the demogrant would not be enough to compensate for the rate increase.

[33] Blum and Kalven make this point, although they do not explain it in detail. Blum & Kalven, note 22, at 510.

[34] For example, there could be a zero bracket up to $10,000 income, a 25% bracket from there to $50,000, and a 40% bracket above there.

zero, 24%, and 27%, which a flat tax of 30% and a demogrant of $3,000 *could* produce? Maybe the flat tax approximation is good enough. But suppose we have a fourth average rate criterion: The average rate on $1 million income should be 60%. With graduated rates, that easily can be accomplished, but the flat tax-demogrant scheme that was a reasonable approximation for the first three criteria is a disaster for the fourth.[35]

B. U.S. Politics

On the one hand, there is a real difference in flexibility in setting average rates between a flat tax with a demogrant and a graduated income tax. On the other hand, if the demogrant is substantial and the flat rate is high, the flat tax and demogrant might be sufficiently progressive and redistributive to satisfy even the most liberal Americans today. Bankman and Griffith may be right that, in a world that permits large demogrants and high flat rates, the extra flexibility of graduated rates is not worth fighting about. But Blum and Kalven thought graduation was worth fighting about because the possibility of demogrants never occurred to them.[36] Perhaps this was a failure of imagination on their part, but it also may have been a bow to political reality. If the political reality precludes demogrants (and exemptions above subsistence), then the fight over progressive marginal rates *is* the fight over progressive average rates.

George McGovern proposed a demogrant of $1,000 per person during the 1972 presidential campaign.[37] It proved to be a political disaster, and he quickly disavowed it.[38] Since then, demogrants have become one of the third rails of U.S. politics—touch them and you die. They have received no serious public discussion in the succeeding quarter century. The politics of demogrants might have been different if McGovern's proposal had been more carefully developed and explained. He appeared ludicrous, for example, when he said there was "no way to estimate the cost of this program."[39] The politics of demogrants also might have been different if they had been proposed by a politician viewed as less liberal than McGovern. But McGovern

---

[35] The average tax rate on $1 million would be only 29.7%.

[36] They did consider the possibility of exemptions well above the subsistence level. Blum & Kalven, note 22, at 512-16. The difference is that high exemptions, unlike demogrants, never result in net transfers from the government to individuals.

[37] Gordon L. Weil, The Long Shot 69-89 (1973) (the story of the demogrant proposal by the McGovern staffer who developed it); Theodore H. White, The Making of the President, 1972, at 117 (1973) ("... the 'thousand-dollar giveaway,' as it came to be known, ... was to haunt McGovern all through the year...").

[38] Weil, note 37, at 88-89.

[39] Id. at 80.

may not be responsible for the stillbirth of the demogrant. In a political climate in which even need-based welfare-as-we-know-it has been drastically curtailed,[40] a system of universal non-need based transfers has no chance. Opinion polling confirms the unpopularity of basic income guarantees.[41] Whether or not McGovern is to blame, there are no demogrants in the U.S. future.[42]

By contrast with the political impossibility of demogrants, progressive marginal rates are politically possible—as a glance at § 1 of the Code confirms.[43] If the income tax is to have meaningfully progressive average rates, it will be because of a graduated rate structure, not because of demogrants. But graduated rates are under serious political attack, as recently demonstrated by the attention given to the flat tax proposals of Steve Forbes and the Kemp Commission.[44] Optimal tax analysis provides intellectual support for the flat tax movement.[45]

---

[40] Personal Responsibility and Work Opportunity Reconciliation Act of 1996, Pub. L. No. 104-193, 110 Stat. 2105.

[41] In 1992, the General Social Survey asked U.S. adults whether they agreed or disagreed that "the government should provide everyone with a guaranteed basic income." Ten percent strongly agreed, 24% agreed, 18% were neutral or unable to choose, 32% disagreed, and 17% disagreed strongly. Nat'l Opinion Research Ctr., General Social Survey 1992, Question #047, available in LEXIS RPOLL File (accession #0196418). Although guaranteed income does not do well in the survey, it is not as unpopular as one might have expected. Interestingly, its popularity in 1992 was significantly higher than when the same question had been asked five years earlier. In 1987, 5% strongly agreed, 15% agreed, 23% were neutral or could not choose, 40% disagreed, and 17% strongly disagreed. Nat'l Opinion Research Ctr., General Social Survey 1987 Supp., Question #051, available in LEXIS RPOLL File (accession #0092778).

[42] Caron, et al, note 31.

[43] There has been much more opinion polling in recent years on graduated rates than on demogrants, for the obvious reason that graduated rates are a live political controversy and demogrants are not. The popularity of graduated rates is very sensitive to the precise phrasing of the question. When the question emphasizes getting rid of the current tax system, the flat tax is quite popular. Asked in April 1996 whether they would vote in favor of "[r]eplacing the current federal income tax system with a flat tax system," 49% of U.S. adults said they would vote for a flat tax, and 39% said they would vote against it. Gallup Poll, 1996, available in LEXIS RPOLL File (accession #0258096). But when the question briefly explains rate graduation and contrasts graduated rates with a flat rate, graduation wins. Asked in March 1996 to choose either "a graduated income tax, where people with higher incomes pay a higher tax rate, or a flat income tax, where everyone pays the same rate no matter what their income," 54% of U.S. adults chose the graduated tax and 45% the flat tax. ABC News-Washington Post Poll, 1996, available in LEXIS RPOLL File (accession #0260264).

[44] See Ernest Tollerson, Bowing Out: Forbes Quits and Offers His Support to Dole, N.Y. Times, Mar. 15, 1996, at A26 (reviewing Forbes campaign); National Comm'n on Economic Growth and Tax Reform, Unleashing America's Potential: A Pro-Growth, Pro-Family Tax System for the 21st Century, reprinted in 70 Tax Notes 413 (Jan. 22, 1996).

[45] "In short, the optimal tax structure, said this left-wing economist [Mirrlees], is a proportional tax, what we now call a flat tax." David R. Henderson, Two Bad Tax Cuts, Fortune, Mar. 17, 1997, 38, at 42. Henderson is affiliated with the Hoover Institution, a conservative think tank and the home of flat tax developers Robert E. Hall and Alvin Rabushka.

The irony is that flat tax proponents embrace optimal tax findings concerning rate structure, but reject optimal tax findings in support of large demogrants.[46] It may be that optimal tax analysis does *not* support a flat tax, if the flat tax is not accompanied by demogrants.

III. A Two-Bracket Simulation With Subsistence Exemption and No Demogrant

This Section describes the structure and the results of a model we developed that was intended to determine whether optimal tax analysis supports progressive marginal rates under real world political constraints.

A. The Structure of the Study

With demogrants nowhere to be found on the political scene, the real world debate about tax progressivity is between a flat tax with a subsistence exemption[47] and the current system of graduated rates above a subsistence exemption. With that in mind, we made the following assumptions: (1) there is no demogrant, (2) there is a subsistence-level exemption (fixed at $12,000[48]), and (3) there may be (at most) two brackets above the exemption. The first two assumptions reflect political reality; the third makes the simulation more manageable. We also assumed the government needed to raise $5,000 per person to fund the government's nonredistributive expenditures.[49] The study grouped wage earners into five hourly wage levels, based on 1994 U.S. wage distribution data. The wage rates ranged from $4.16 for the lowest group to $32.83 for the highest. In the model, each person decides how many hours of labor (from an assumed annual

---

[46] Similarly, Edward McCaffery complains that conservative congressional Republicans "pick up the part of optimal tax theory that recommends generally low tax rates in the interests of economic growth, but not the part that advocates lower rates on married women." Edward J. McCaffery, Taxing Women 202 (1997).

[47] The most prominent legislative proposal to replace the graduated income tax with a flat tax above a subsistence exemption is the Freedom and Fairness Restoration Act of 1995, H.R. 2060 and S. 1050, 104th Cong. (sponsored by Rep. Richard Armey and Sen. Richard C. Shelby).

[48] This is roughly consistent with the effect of the actual standard deduction and personal exemption for 1994. Rev. Proc. 93-49, 1993-2 C.B. 581 (inflation adjustments for 1994). Precise consistency is not possible without a much more complicated model, because the amount of income sheltered by the standard deduction and personal exemptions varies by filing status (married, single, or head of household), IRC §§ 63(c)(2), (3), (5), (6), 151(a), (b), (d)(3)(c), and number of dependents, IRC § 151(c).

[49] As is standard in optimal tax analysis of nonredistributive government expenditures, we assume that it is impossible to allocate the benefits of those expenditures among individuals. The justification for this "common disaster" treatment of nontransfer expenditures is discussed in the text accompanying notes 69-73.

supply of 3,120 hours) to provide at her wage rate, in order to maximize her utility from consumption and leisure combined. More details on the parameters of the model are set forth in the Appendix.

We then determined the optimal tax structure, subject to these constraints, under several social welfare functions (ranging from unweighted utilitarian to a Rawlsian leximin). For each social welfare function, we determined the first rate (above the zero bracket subsistence exemption), the second rate, and the breakpoint between the first and second brackets.[50]

B. Relation to Previous Studies

Our investigation bears some similarity to two earlier studies. A 1992 simulation by one of the authors is the only previous optimal income tax study (of which we are aware) to have ruled out the use of demogrants.[51] Moreland assumed the tax system was to consist of a zero bracket and a single tax rate above the zero bracket.[52] He then calculated the optimal breakpoint between the brackets and the optimal rate for the flat tax.[53] The results favored a higher exemption level and a higher tax rate than those featured in most flat tax proposals.[54] The Moreland study ruled out demogrants for the same reason we do so here.[55] The questions investigated by the two studies, however, are quite different. Moreland *assumed* the structure of an exemption (not fixed at subsistence) and one positive tax rate. The study thus ruled out progressive marginal rates.

Nevertheless, the Moreland results are suggestive in terms of rate graduation. The Moreland model would have permitted a result of no average rate progressivity—that is, the optimal exemption level might have been no exemption. In fact, however, the study indicated exemption levels well above subsistence were optimal, thus creating significant average rate progressivity. With the exemption level fixed at subsistence in our model, comparable average rate progressivity would require that the second bracket rate be higher than the first.

---

[50] Although the model did not permit negative tax rates, it did permit either the first or second bracket rate to be zero. It also permitted the first and second bracket rates to be identical.

[51] Kemper W. Moreland, The Optimal Exemption, 45 Nat'l Tax J. 421 (1992).

[52] Id. at 421.

[53] Id. at 424-26.

[54] Id. at 429 ("Even under welfare functions only mildly averse to inequality, optimal tax rates and exemptions were near 45 percent and 16 thousand dollars respectively.").

[55] Id. at 429 ("It is unlikely that debates on tax issues in the coming decade will revolve around the large guarantees recommended by optimal linear income tax studies.").

The second study, by Joel Slemrod, Shlomo Yitzhaki, Joram Maysher, and Michael Lundhelm,[56] was like ours in that it searched for the optimal two-bracket income tax. Unlike our model, however, theirs followed the normal optimal tax approach of including a demogrant. They determined the optimal level of demogrant, the two bracket rates, and the breakpoint, under several sets of assumptions. In all the cases they studied, they found that marginal rate progressivity was *not* optimal; in every case, the second bracket rate was *lower* than the first bracket rate.[57] They explained the intuition behind their results: "The additional instrument of a second tax bracket allows the lower marginal tax rate on high-wage people to coax out enough additional labor supply so that the optimal demogrant is increased," to the benefit of lower-wage people.[58]

Despite regressive marginal rates, they also found that in every case the optimal tax system featured average rate progressivity.[59] The average tax rate for a taxpayer with income at the breakpoint is a function of the demogrant and the first bracket rate. As long as the demogrant pulls the average rate at the breakpoint below the second bracket rate, the average rate increases as income increases above the breakpoint.[60]

These results are suggestive in terms of our study. The results reflect both regressive marginal rates and progressive average rates. In our model, by contrast, progressive average rates are possible (beyond the small amount of progression introduced by a subsistence exemption) only with progressive marginal rates. In moving from their model to ours, something has to give, and it is not clear whether it will be regressive marginal rates or progressive average rates. Intuition suggests, however, that the change in models might lead to progressive marginal rates. In their model, lowering the rate on high-wage individuals benefits low-wage individuals by increasing tax revenue, and thus increasing the demogrant. In our model, by contrast, the only way decreasing the tax on high-wage individuals can benefit low-wage individuals is if it raises additional revenue to finance a reduction in the marginal rate on low-wage earners. Thus, the justification for lowering the rate on high earners implies lowering the rate on low earners as well, suggesting that regressive marginal rates would not survive the elimination of the demogrant.

---

[56] Slemrod et al., note 16.

[57] Id. at 278.

[58] Id. at 270. Compared with a flat tax, the lower second bracket and larger demogrant benefit both the highest-wage and lowest-wage individuals, but harm a range of middle-wage taxpayers. Id.

[59] Id. at 278.

[60] This is illustrated by the example in the text following note 23.

C. *Do the Constraints of the Model Make Sense?*

The difference in principle between the full utilitarianism of the standard optimal tax model and the limited utilitarianism of our model can be appreciated best by considering the tax system each model would produce if taxation had no labor disincentive effects. As explained earlier, the standard optimal tax model would result in a tax and transfer system that equalized all incomes—a 100% tax, with the resulting revenue distributed evenly throughout the population.[61] Our model, by contrast, assumes that there is to be no redistribution, but that taxation for nontransfer purposes should be based on utilitarian (or weighted utilitarian) principles. In the absence of labor disincentives, the result would be a zero bracket and a 100% bracket above it, with the breakpoint set at $\$X$, so that there was just enough income above the $\$X$ level to finance government operations. A utilitarian would find the constraints of our model inconsistent. If we are willing to fund government operations on a utilitarian basis, by confiscating income with the lowest marginal utility, then why are we not also willing to redistribute income on a utilitarian basis?

Our answer is based more in experience than in logic. The resounding political rejection of demogrants, the longstanding political triumph of at least moderate marginal rate progressivity, and opinion polling rejecting demogrants but accepting graduated rates, all suggest that our model captures prevailing U.S. attitudes and beliefs.[62] Americans reject pure (let alone weighted) utilitarianism. The concept that one has a right to the fruits of one's labors[63] is strong enough to lead to rejection of the utilitarian idea that it is permissible to transfer income from *Richer* to *Poorer*, just because *Poorer*'s utility gain will exceed *Richer*'s utility loss. Redistributive transfers to those *below* the poverty level have some political support, but universal redistribution to those *above* poverty has almost none.[64] Since demogrants result in redistribution to many above the poverty level, they are unacceptable.[65] On the other hand, most Americans accept a limited version

---

[61] See text accompanying note 1.

[62] See Section II.B.

[63] See generally Robert Nozick, Anarchy, State and Utopia (1974).

[64] See Section II.B. Current federal law, of course, does include a number of transfer programs that benefit those not necessarily in poverty. Their significance is discussed in the text accompanying notes 74-80.

[65] Not every optimal tax simulation indicates the optimal demogrant would be above the poverty level. There is nothing in the utilitarian underpinnings of optimal tax, however, that limits redistribution to those in poverty, and some studies find optimal demogrants above the subsistence level. For example, Bankman and Griffith calculate an optimal demogrant for a family of four of about $12,400, compared with a poverty level of $9,862 (using 1982 data). Bankman & Griffith, note 5, at 1965. In any event, even a demogrant well below the poverty level can result in redistribution to those above the poverty level.

of utilitarian taxation. It *is* considered reasonable to require *Richer* to contribute a higher percentage of his income than *Poorer* to fund nonredistributive costs of government, simply because *Richer* will feel the loss of a dollar less than *Poorer*. Thus, progressive marginal rates are acceptable.

The utilitarian might respond that, even if we have our fingers on the pulse of the body politic, the partial utilitarianism we have identified still makes no sense. We start, however, with a reluctance to brand as irrational the attitudes and beliefs inherent in society's practices. In this, we follow Edward McCaffery's call for an interpretive approach to tax policy. He suggests that "the people and our implicit practices [may be] right,"[66] and advocates applying to tax "a style of social theory that looks for norms in society's actual practices and beliefs."[67] This amounts to giving social beliefs and practices the benefit of the doubt. Rather than assuming they reflect uninformed or irrational choices, or unprincipled compromises, an interpretivist tries to find an underlying rationality—perhaps even wisdom.[68]

Sympathetically interpreted, U.S. beliefs and practices reflect a principled compromise between a rights-based ethic and utilitarianism. Redistribution (at least above poverty) is rejected because there is a distribution of earned income, *prior to taxation*, which has sufficient claim to legitimacy to override utilitarian claims for rearrangement of that distribution. My rights-based claim to my own earnings is stronger than any utilitarian claim of lower earners to my earnings.

Suppose, for example, that the poverty level was $10,000, the demogrant was $5,000, and the tax rate was 25%. Although the demogrant would be only one-half of subsistence, anyone earning less than $20,000 (twice subsistence) would be the beneficiary of redistribution. Until income reached $20,000, a person would receive more in demogrant than she paid in tax.

[66] Edward J. McCaffery, The Uneasy Case for Wealth Transfer Taxation, 104 Yale L.J. 283, 361 (1994) [hereinafter Uneasy Case].

[67] Id. at 286; see also Edward J. McCaffery, Cognitive Theory and Tax, 41 UCLA L. Rev. 1861, 1933-37 (1994) [hereinafter Cognitive Theory] (also discussing the interpretive approach to tax policy).

[68] McCaffery notes that under a political-interpretive theory of tax, the goal is not to prove that a proposal is the best of all possible programs: "Rather, it is sufficient to show that the program is at least implicit in our practices and reasonable from a liberal point of view." McCaffrey, Uneasy Case, note 66, at 348.

McCaffery addresses two objections to the interpretive approach. One is the fear that tax interpretivism—turning tax over to the people—inevitably means "soak the rich." Id. at 287. The other is that tax is too complex for interpretivism; people do not understand it well enough to have meaningful opinions. Id. at 287-88. He argues that neither concern applies to the phenomemon he is considering—the unpopularity of wealth transfer taxes. Prevailing opinion is *against* soaking the rich, and the concept of an estate tax is not hard to understand. McCaffery, Uneasy Case, note 66, at 287-88. Similarly, neither objection applies to our use of tax interpretivism. A public in favor of soaking the rich would *favor* demogrants, and neither the concept of demogrants nor the concept of graduated rates is beyond public comprehension.

By contrast, there is no "natural" distribution among taxpayers of the costs of government. Redistribution disturbs a presumptively legitimate pre-existing state of nature, but there is no preexisting state of nature with respect to taxation to finance the nonredistributive costs of government. Since the nontransfer costs of government must be financed somehow, and since no allocation of those costs stands out as the natural (rights-based) allocation, we are free to allocate that burden according to utilitarian concerns (taking into account, of course, the disincentive effects of taxation). Absent a rights-based allocation of the burden, we might as well choose the allocation that causes the least total pain.

Implicit in this argument is the assumption that it is not possible to determine who benefits from nontransfer government spending. This assumption is nearly universal in the optimal tax literature,[69] and also appears in analyses of progressivity predating optimal tax analysis.[70] Blum and Kalven described this approach as "treating the collection of taxes as though it were a common disaster—as though the tax money once collected were thrown into the sea."[71] As stylized as this assumption is, it makes good sense in the absence of any persuasive basis for allocating government expenditures for infrastructure, or interest on government debt, or national defense.[72] If it were possible to determine with reasonable confidence who benefits from government expenditures, tax could be imposed on the basis of benefits received, and anything different from benefits-based taxation would be redistribution—and so forbidden under our interpretation of the U.S. tax ethic.[73] Thus, the meaningfulness of the question we investigate depends critically on the assumption that benefits taxation is a hopeless enterprise.

---

[69] For a rare contrary example, see Kemper Moreland, Public Goods and Optimal Income Taxation, 12 Pub. Fin. 197, 198 (1984) (assuming everyone receives identical benefits from public goods).

[70] See generally Blum & Kalven, note 22, at 452 ("[M]ost benefits from government cannot be particularized and traced. . . .").

[71] Id. at 517.

[72] Blum and Kalven call this the "approach through ignorance," and argue that "since we cannot trace the benefits flowing from the expenditures we should act on the basis of the knowledge we have—knowledge of the consequences of the collection of the tax alone." Id. at 517-18. This conclusion comes after their discussion of the difficulty or impossibility of determining who benefits from many government expenditures. Id. at 451-55.

[73] In addition to being consistent with the U.S. tax ethic, benefits-based taxation would have an additional attraction, if it were practical. Louis Kaplow has demonstrated that "it is possible to finance a public good in a manner that results in no additional distortion, by using an adjustment to the income tax that offsets the benefits of the public good." Louis Kaplow, The Optimal Supply of Public Goods and the Distortionary Cost of Taxation, 49 Nat'l Tax. J. 513, 513 (1996).

We recognize that the political rejection of universal cash transfers does not mean the rejection of all forms of redistribution. Welfare, the earned income tax credit, Social Security, and the recently enacted "Hope Scholarship" tuition tax credit, are important examples of politically acceptable redistribution.[74] Each is far from universal, however. Each program either is phased out as income increases, or is targeted to specific approved behavior and status, or both.[75] Each program except Social Security is subject to phase out, and Social Security is widely viewed as serving an insurance function, rather than a purely utilitarian redistribution function.[76] The approved behavior for both Social Security and the earned income credit is participation in the paid labor force. In the case of Social Security, one also must be elderly or disabled. In the case of the earned income credit, one also must have children in order to receive more than a minimal credit.[77] To an increasing extent, work force participation is also a requirement for welfare.[78] For the Hope scholarship, the approved behavior is attending college.[79]

Although the political insistence on phaseouts may be based more on a technical misunderstanding than on principle,[80] the insistence on targeting specific behavior and status seems fundamental. No existing redistributive program is based on the sort of purely utilitarian redistribution presumed acceptable by standard optimal tax models—taking from *Richer* to give to *Poorer* simply because *Poorer* will enjoy it more.

---

[74] IRC §§ 32 (earned income credit), 25A (Hope scholarship).

[75] IRC §§ 32(a)(2), (b) (earned income credit), 25A(b), (d) (Hope scholarship). For welfare, see, e.g., 42 U.S.C.A. § 602(a)(1)(A)(ii) (a federally assisted family assistance program must require "a parent or caretaker receiving assistance under the program to engage in work (as defined by the State) once the State determines the parent or caretaker is ready to engage in work."). For Social Security, see 42 U.S.C.A. § 415 (benefits available under federal Old-Age, Survivors & Disability Insurance Benefits (Social Security) positively correlated to one's earnings).

[76] This view of Social Security is discussed in note 150.

[77] IRC § 32(b).

[78] 42 U.S.C.A. § 602(a)(1)(A) (state's plan for aid to needy families with children must include work skills training program, and must require certain aid recipients to participate in the program).

[79] IRC § 25A(b)(3).

[80] The technical misunderstanding is that the goal of limiting benefits to the poor requires that benefits be phased out as income increases. Daniel Shaviro has argued persuasively that the earned income credit (for example) should not be phased out as income increases because explicit phaseouts create irrational marginal tax rate "bubbles." Viewing the credit and the income tax as an integrated tax-and-transfer system, the benefit of the credit will be fully taxed away from higher income taxpayers, even without the rate bubble of an explicit phaseout. Daniel Shaviro, The Minimum Wage, the Earned Income Tax Credit, and Optimal Subsidy Policy, 64 U. Chi. L. Rev. 405, 408-09, 462-66 (1997).

Our model is admittedly unrealistic in its assumption that no redistribution of any kind is politically acceptable. We believe, however, that it is closer to reality than the standard optimal tax assumption that there are no political constraints on universal transfers, and that it can serve as a useful corrective to the standard assumption. We leave for others the daunting task of constructing an optimal tax model for a society with some, but sharply limited, tolerance for redistribution.

D. The Results of the Simulation

The results of the simulation are summarized below, and are set forth in detail in the Appendix. Under the unweighted utilitarian social welfare function, the first tax rate above the $12,000 zero bracket is 11.8%, the second rate is 39%, and the breakpoint between the rates is at $18,240.[81] The effect of weighting the social welfare function (in favor of the welfare of lower ability workers) is to decrease the rate of tax on the lower income bracket and to increase the rate on the higher bracket. In fact, the lower rate drops to zero with even moderate weighting of the social welfare function.[82] At the maximin extreme, the first bracket rate is zero and the second is 73.6%. The breakpoint remains almost constant at about $18,000 until the weighting of the social welfare function becomes quite heavy, and then rises moderately. In the maximin case, the breakpoint is $22,424. In the unweighted case, and in the first four weighted cases,[83] the breakpoint equals the income of a member of the second lowest wage group. In the two simulations with the most heavily weighted social welfare functions,[84] the breakpoint is above the income level of the second lowest group. In the maximin case, the breakpoint equals the income of a member of the middle wage group, so that only members of the two highest groups are subject to the higher rate—and since the lower rate is zero, only members of the two highest groups pay tax.

The results are not everything defenders of the current rate structure might hope for. The results do show that progressive marginal rates—with the second rate much higher than the first—may be optimal in the absence of demogrants. But the low level of the breakpoint, resulting in most of the population (60% of wage earners,

---

[81] The rates are close to the bottom and top rates under the current income tax (15% and 39.6%), although the breakpoint is much lower. For single taxpayers whose taxable year begins in 1998, the 15% bracket ends at $25,350 taxable income and the 39.6% bracket begins at $278,450 taxable income. IRC § 1(c); Rev. Proc. 97-57, 1997-52 I.R.B. 20 (1998 inflation adjustments).

[82] When $\Sigma = 0.4$, the lower rate is zero and the higher rate is 44.6%. Σ serves as an index of aversion to inequality. A larger Σ indicates greater aversion to inequality.

[83] $\Sigma = 0$, 0.1, 0.2, 0.4, and 0.8.

[84] $\Sigma = 2.0$ and the maximin.

in all cases but the maximin) being subject to the top marginal rate, does not resemble most graduated rate prescriptions. On the other hand, the result of the unweighted utilitarian simulation bears a notable resemblance to the two-bracket structure of the Tax Reform Act of 1986, in terms of both rates and breakpoint. For a single taxpayer, the break between the 15% and 28% brackets was at $17,850 taxable income—or, taking into account the standard deduction ($3,000) and one personal exemption ($1,900 in 1987), $22,750 gross income.[85] With an inflation adjustment (from 1987 to 1994), and with the reality that most taxpayers have a larger zero bracket than an unmarried person with no dependents, it is clear that the breakpoint is substantially lower in the simulation than under the 1986 Act. Still, the resemblance between the simulation results and the Act is striking.

The simulation does not prove, of course, that the optimal tax system should have two brackets. The two-bracket structure was a stipulation of the model, not a finding. But the study does suggest that if the goal is the optimal rate structure, subject to the constraints of only two brackets and no demogrants, the 1986 Act is a reasonable approximation.

Some proponents of graduated rates may prefer the simulation results where the first tax rate is positive to the results under the more egalitarian social welfare functions, where the first rate is zero. The former results are clearly graduated rate structures, whereas the latter can be viewed as just flat taxes with unusually large zero brackets. That reaction, however, would make a fetish of graduated rates—to treat a graduated rate structure as an end in itself, rather than merely as a means to the end of average rate progressivity. As noted earlier, in the absence of demogrants significant average rate progressivity can be produced either by graduated rates or by a flat tax above a very large (well above subsistence) zero bracket.[86] As it happens, the simulation results in which the first-bracket rate is zero have greater average rate progressivity than do the results with two positive tax rates.

A two-bracket simulation cannot prove that a multi-bracket rate schedule should have progressive marginal rates throughout. It is very possible that if the simulation permitted more rate brackets, marginal rates would decline at higher income levels.[87] It would be interesting (but difficult) to run a simulation permitting a larger number of brackets. Nevertheless, the two-bracket result is significant for two reasons. First, it shows that the conclusion of Slemrod, Yitzhaki, Mayshar, and

---

[85] The Tax Reform Act of 1986, Pub. L. No. 99-514, §§ 101-103, 100 Stat. 2085, 2096-2103.

[86] See text accompanying notes 51-55.

[87] For some intuition as to why this seems likely, see text accompanying notes 19-20.

Lundholm, that even a two-bracket system should have regressive marginal rates,[88] does not obtain if demogrants are not permitted. Second, it shows that if political constraints limit the rate structure to two brackets (as was the case in 1986, and as may be the case again), the second rate should be higher than the first.

IV. Envy, or the Relative Income Hypothesis

A. Optimal Tax Studies of Utility Interdependence

The standard assumption in the optimal tax literature is that each person's utility depends only on her own levels of consumption and leisure; her well-being is unaffected by how her consumption compares with that of others in the society.[89] As convenient as that assumption may be, it seems unrealistic. For most people, the utility of their own consumption is probably reduced by the knowledge that it compares unfavorably with the higher consumption of others. This response commonly is called envy.[90] The term is concise and memorable, but its inevitable pejorative aspect—envy is, after all, one of the seven deadly sins—suggests the need for a more neutral label, such as utility interdependence[91] or the relative income hypothesis.[92]

How utility is affected by knowledge of the *lower* consumption of others is more ambiguous. Bankman and Griffith suggest the response is sympathy—disutility from the knowledge of other's low consumption.[93] That may be right, especially with respect to those near the bottom of the income distribution, but there may also be gloating (to use another loaded term)—utility from knowing one is better off than others.

There have been only a handful of attempts to incorporate utility interdependence into optimal tax analysis. Michael J. Boskin and Eytan Sheshinski assume individual utility is a function of both relative and absolute consumption, with diminishing marginal utility of each.[94] They limit their investigation to finding the optimal demogrant and linear (flat rate) income tax. Intuitively, the direction of the effect of including relative consumption in the analysis seems clear. Since relative consumption has declining marginal utility, its in-

---

[88] Slemrod et al., note 16, at 270.

[89] See, e.g., Michael J. Boskin & Eytan Sheshinski, Optimal Redistrubutive Taxation When Individual Welfare Depends Upon Relative Income, 92 Q.J. Econ. 589, 590 (1978).

[90] Tuomala, note 1, at 122; Bankman & Griffith, note 5, at 1961; Geoffrey Brennan, Pareto Desirable Redistribution: The Case of Malice and Envy, 2 J. Pub. Econ. 173 (1973).

[91] Tuomala, note 1, at 122.

[92] Boskin & Sheshinski, note 89, at 590.

[93] Bankman & Griffith, note 5, at 1961.

[94] Boskin & Sheshinksi, note 89, at 590. More specifically, they assume each individual compares his own consumption with the *average* consumption in the population. Id. at 592.

clusion should increase the tendency to pull everyone toward the middle of the income distribution. In other words, the demogrant should be larger, and the tax rate should be higher. This is precisely what they find.[95] Moreover, as the level of concern about relative position increases, the optimal demogrant and the optimal tax rate also increase.[96] Even a pure (unweighted) utilitarian social welfare function produces substantial redistributive taxation, if concern for relative status is high.[97]

For Bankman and Griffith, who are concerned only with justifying progressive average rates, the Boskin and Sheshinski findings are sufficient. Optimal tax theory supports progressive average rates even without consideration of utility interdependence, and assuming interdependence only strengthens that support.[98] But Boskin and Sheshinksi assume a linear tax, so their study does not indicate whether utility interdependence lends support to progressive *marginal* rates. The only simulation addressing that question is by Tuomala.[99] Tuomala's simulations assume people are only envious (rather than altruistic), and that they determine their utility from relative consumption by comparing their consumption with the average consumption in the economy.[100] He uses a "classical [unweighted] utilitarian sum of individual utilities."[101] He makes the important point that consideration of utility interdependence changes the optimal tax analysis in two ways. Not only does it directly affect individual utility levels, it also has behavioral effects. Concern for relative position can change an individual's marginal rate of substitution between consumption and leisure.[102]

Tuomala investigates three cases of purely redistributive taxation (that is, the government has no nontransfer revenue needs),[103] with varying degrees of "concern for relative position" (yet another nicer term for envy).[104] In all three cases, the optimal income tax rate schedule features slight marginal rate progressivity, except that in two

---

[95] Id. at 594.

[96] Id.

[97] Id. at 599. Andrew J. Oswald also considers the effects of "altruism and jealousy" on optimal taxation, but does not attempt any simulations. His basic finding, however, is consistent with Boskin and Sheshinski: "Optimal marginal tax rates, ceteris paribus, are higher in a predominantly jealous world." Andrew J. Oswald, Altruism, Jealousy and the Theory of Optimal Non-Linear Taxation, 20 J. Pub. Econ. 77, 86 (1983).

[98] Bankman & Griffith, note 5, at 1961-62.

[99] Tuomala, note 1, at 122-35.

[100] Id. at 125-26. He assumes that relative *leisure* is *not* a component of individual utility. Id.

[101] Id. at 131.

[102] Id. at 128-29.

[103] Id. at 106-21.

[104] Id. at 131.

cases (low and moderate concern for relative position), rates decline slightly at the very top of the wage (ability) distribution. In Case 2 (moderate concern), for example, the marginal rate at the 10th percentile of the distribution is 69.5%, at the middle of the distribution the rate is 70.4%, at the 90th percentile the rate is 71.2%, at the 97th percentile the rate is 71.4%, and at the 99th percentile the rate declines to 71.2%.[105] The shape of the rate schedule is quite similar in all three cases; the major effects of increasing concern for relative position are a larger demogrant and higher marginal rates throughout the wage distribution.

Tuomala suggests an intuition behind this marginal rate progressivity: "It turns out that the kind of utility interdependence featured here (envy) seems to make people work harder. In other words, keeping themselves in a high income group, individuals above the median work more in order to retain their relative positions."[106] He considers the shape of these rate schedules "interesting and important, because it is well known that, in the standard optimal income tax model, arguments for a progressive tax structure in the sense of a marginal tax rate have been difficult to find."[107]

B. The Policy Significance of the Results

Although it is unusual to find *any* support for progressive marginal rates in the optimal tax literature, a real-world proponent of graduated rates should not be very encouraged by Tuomala's results, for several reasons.

1. The Rates Are Nearly Flat

In Tuomala's Cases 1, 2, and 3, the lowest and highest rates are (respectively) 55.7% and 57.7%, 69.2% and 71.4%, and 75.8% and 78.2%.[108] In each case, the top rate is between 103% and 104% of the bottom rate. (The top rate does *not* become a higher percentage of the bottom rate as concern for relative position increases.) If the political debate is between the supporters of marginal rate progressivity similar to that under current law (lowest positive rate of 15%, top rate of 39.6%), and the supporters of a flat tax, Tuomala's envy simulations actually offer more support to the flat tax proponents. Under current law, the top rate is 264% of the bottom rate; under a flat tax, the top

[105] Id. at 133, tbl. 8.1.
[106] Id. at 134.
[107] Id.
[108] Id. at 133, tbl. 8.1.

rate is 100% of the bottom rate. The flat tax is a *much* better approximation of the rate schedule shape of the simulations.[109]

2. *Should Envy "Count"?*

To the limited extent envy supports graduated rates, the question arises whether the social welfare function should give any weight to envy, or whether it should be ignored as an anti-social preference. John Harsanyi—in most respects a thorough-going utilitarian—argues that the definition of social utility should "exclude all clearly antisocial preferences, such as sadism, envy, resentment, and malice."[110] According to Harsanyi, the antisocial part of one's personality "has no claim for a hearing when it comes to defining our concept of social utility."[111] In *A Theory of Justice*, John Rawls describes envy as "something to be avoided and feared" and considers it "desirable that . . . the choice of principles [of justice] should not be influenced by this trait."[112]

We are not convinced that "envy" should be excluded from the social welfare function. Relabelled as "concern for relative well-being," or as a "positional externality,"[113] it is not clearly an anti-social preference. Consider Rawls' definition of envy as "the propensity to view with *hostility* the greater good of others even though their being more fortunate than we are does not detract from our advantages."[114] If hostility is at the core of envy, perhaps envy deserves no weight in determining social utility. But there is another way of viewing con-

---

[109] Tuomala acknowledges this, despite his excitement at finding support for *any* degree of marginal rate progressivity: "One way of interpreting these results is to say that they suggest the optimality of constant marginal tax rates for any given degree of envy." Id. at 132.

[110] John C. Harsanyi, Morality and the Theory of Rational Behavior, in Utilitarianism and Beyond 39, 56 (Amartya Sen & Bernard Williams eds., 1982).

[111] Id.

[112] Rawls, note 11, at 530. He makes an exception for the unusual case of "excusable envy": "[S]ometimes the circumstances evoking envy are so compelling that given human beings as they are no one can reasonably be asked to overcome his rancorous feelings." Id. at 534. He concludes, however, that excusable envy would be unlikely in a society governed by his principles of justice. Id. at 537. Rawls arrives at his maximin principle not through reliance on envy, but by assuming extreme risk aversion is appropriate in the original position (behind the veil of ignorance). Id. at 152-53. Nevertheless, Robert Nozick suggests it is not "implausible to claim that envy underlies [Rawls'] conception of justice, forming part of its root notion." Nozick, note 63, at 229.

[113] The latter term is from Robert H. Frank, Progressive Taxation and the Incentive Problem, at 25 (unpublished manuscript on file with the Tax Law Review). Professor Frank notes that economists' questioning of "whether such externalities [are] proper targets for public policy intervention . . . is a curious position for the profession that has always insisted that 'a taste for poetry is no better than a taste for pushpins.'" Id.

[114] Rawls, note 11, at 532 (emphasis added). He notes that this closely follows Kant's definition. Id.

cern for relative well-being, as reflecting disappointed expectations rather than hostility. If one has been led to expect a promotion and a big raise, and then is disappointed, he will suffer disutility from his disappointed expectations. His utility will be lower than if he had neither expected nor received the big raise.[115] This disutility from disappointed expectations has nothing to do with hostility to anyone.[116] The relative income hypothesis can be understood in the same terms. Society creates expectations of affluence levels—for example, through advertising—and then, for many people, disappoints those expectations. Those disappointed expectations sometimes are called envy, but they are not based on hostility, and they are not obviously anti-social. It often has been suggested that the poverty level should be defined partly or entirely in relative terms,[117] but it does not follow that such a definition of poverty implicitly accuses the poor of harboring anti-social feelings. In any event, the argument against giving weight to envy applies only to what Tuomala identifies as the first effect of envy on optimal tax analysis—its direct effect on individual utility levels.[118] If Tuomala's second effect exists—if envy affects the elasticity of substitution between consumption and leisure—we can conceive of no ethical reason for disregarding *that* effect.[119]

3. *The Implications of the U.S. Politics of Taxation for "Counting" Envy*

If we are right in thinking that the practical question for optimal tax analysis in the United States today is the design of the optimal rate schedule in the absence of demogrants, there is an obvious problem with Tuomala's envy simulations—they include demogrants. It would have been possible, of course, for us to build on Tuomala's work by incorporating the effect of envy on individual utility levels into our

---

[115] The disutility from disappointed expectations would be even more dramatic for the person who had his salary unexpectedly reduced.

[116] If the person would feel even worse if the promotion went to someone else than if the position went unfilled, the *added* level of disutility reasonably could be described as based on hostility.

[117] See Measuring Poverty: A New Approach 124-34 (Constance F. Citro & Robert T. Michael eds., 1995) (discussing relative poverty levels); Patricia Ruggles, Drawing the Line: Alternative Poverty Measures and Their Implications for Public Policy 18-20 (1990) (same).

[118] Tuomala, note 1, at 122.

[119] There is another possible effect of envy, which we can see no theoretical reason to exclude from the social welfare function. At extreme levels, envy may generate so much unrest as to threaten social stability. Id. at 124; Rawls, note 11, at 531. The interesting aspect of this is that envy of the rich by the poor creates disutility for the *rich*, by threatening their security. Even if the disutility the poor suffer from their own envy is dismissed as anti-social, the disutility the rich suffer from the poor's envy should figure into the social utility calculus.

simulations. We chose not to, however, because we believe doing so would be inconsistent with the dominant U.S. ethic of taxation. If it is considered illegitimate to take resources from *Richer* to increase *Poorer*'s utility by giving those resources to *Poorer*, it is not likely to be considered legitimate to take resources from *Richer* simply to make *Poorer* feel relatively better off.[120] The general proposition is that taxation of *Richer* in order to increase the utility of *Poorer* cannot be justified;[121] that is true whether the increase operates by transfer of assets or by decreasing *Poorer*'s disutility from envy. Under this analysis, tax policy based on envy is rejected even if envy is *not* considered anti-social. The U.S. ethic of taxation rejects utilitarian redistribution not because it is anti-social, but because it is trumped by rights-based concerns. In the same way, taxation to ameliorate envy violates the rights of those taxed, even assuming envy is not anti-social.

V. Taxation as Insurance

The standard optimal tax analysis assumes people have perfect knowledge of their wage rate at the time they decide how much labor to supply.[122] But suppose people do not have perfect information, and must decide how hard to work without knowing exactly what they will be paid. The uncertainty may relate to lack of knowledge of one's own abilities, or to wage variations due to luck, even if abilities are perfectly known. What happens if wage uncertainty is introduced into the optimal tax model?

One effect of wage uncertainty is to provide a new rationale for redistributive taxation. If all individuals face wage uncertainty, and all are risk-averse, they would favor redistributive taxation as insurance against low wages. In the absence of labor disincentive effects, the resulting tax-and transfer system would look exactly like the utilitarian tax-and transfer system in the absence of disincentive effects—a tax of 100% on all earnings, with revenues distributed equally to all.[123] Despite the identical outcomes, the philosophical foundation for taxation as wage insurance is very different from the utilitarian case for

---

[120] Just as redistribution for the limited purpose of alleviating poverty is acceptable, see text accompanying notes 63-65, so it might be acceptable to "count" envy in the social welfare function for the limited purpose of lessening the relative poverty of those living below the poverty level.

[121] By contrast, it is permissible to avoid decreasing the utility of *Poorer*, by financing the nontransfer costs of government with a tax on *Richer* rather than on *Poorer*. See text accompanying notes 63-68.

[122] Tuomala, note 1, at 44.

[123] Jonathan Eaton & Harvey S. Rosen, Optimal Redistributive Taxation and Uncertainty, 95 Q.J. Econ. 357, 358 (1980); Hal R. Varian, Redistributive Taxation as Social Insurance, 14 J. Pub. Econ. 49, 51 (1980).

redistribution where there is no wage uncertainty. Unlike utilitarian redistribution, wage insurance is not antithetical to rights-based philosophies. The insurance rationale does not justify redistribution from *Richer* to *Poorer* merely because it increases social utility, regardless of its effect on *Richer*'s right to his earnings. Instead, the insurance rationale assumes risk-averse individuals would *agree* to taxation as wage insurance, while their wages were still uncertain. *If* one accepts taxation as insurance as quasi-contractual, the rights-based objection to redistribution does not apply.[124]

A. A Survey of the Literature

Although taxation as insurance against wage uncertainty has labor disincentive effects that must be factored into the optimal tax analysis, the effects are not identical with those of redistributive taxation with wage certainty. High marginal rates on high earners are much more likely to be optimal in the insurance case. The disincentive effect of high rates is dampened because one does not know at the time one decides to supply labor that one will be a high earner. As Varian explains, "[I]f the only way to become a millionaire is to be lucky, there should be very small incentive losses from taxing a million dollar income at a high rate—and there are substantial insurance gains since one can then subsidize [one] million dollar occurrences of bad luck."[125] Thus, Varian demonstrates that one of the best known general results of standard optimal tax analysis—that the marginal rate on the highest income should be zero—does not obtain in the case of wage uncertainty.[126] Similarly, Eaton and Rosen are able to show—in the context of a flat tax model—that wage uncertainty leads to a higher optimal tax rate than certainty.[127]

---

[124] If workers faced with wage uncertainty would really want to contract with one another for wage insurance, why should the insurance be provided *by the government* through taxation? As Eaton and Rosen explain, problems of moral hazard would prevent the development of private wage insurance: "The private insurer, unable to distinguish clearly between external events and the endogenous behavior of the insured party, would provide an incentive for an insured worker to work less hard, spend less time seeking a higher paying job, or otherwise earn an income below potential." Eaton & Rosen, note 123, at 357; see also Varian, note 123, at 50 (citing "well-known arguments concerning moral hazard, adverse selection, transaction costs, and returns to scale . . . .").

[125] Varian, note 123, at 63. Tuomala makes the same point. Tuomala, note 1, at 151 ("While the probability of being the most able taxpayer is so small, the incentive losses from the severe taxing of the *ex post* most able individual is in turn very small.").

[126] Varian, note 123, at 62-63.

[127] Eaton & Rosen, note 123, at 361.

Neither study, however, attempts to calculate optimal nonlinear income tax rates under wage uncertainty.[128] As with envy, the only simulations for the optimal nonlinear rate schedule for taxation as insurance are by Tuomala.[129] He reports the results of two studies. In the first, he assumes that income is a function of work effort and a "random state of nature," so that income "depends randomly on . . . effort."[130] Under realistic assumptions about risk aversion and income distribution, the result is a marginal rate schedule with *significant* progressivity. At the 10th percentile of the wage (ability) distribution, the marginal rate is 12%, at the 50th percentile, the rate is 36%, at the 90th percentile, the rate is 49%, and at the 99th percentile, 58%.[131] This is in striking contrast to the minimal marginal rate progressivity produced by Tuomala's envy simulations. It is also striking for its resemblance to real world income tax rate schedules.[132]

Tuomala's second simulation assumes individuals know something, but not everything, about their ability (wage) levels at the time they make their labor supply decisions. He carries out calculations under two values for the elasticity of substitution between consumption and leisure (1.0, and the probably more realistic 0.5[133]), and for three assumptions of the degree of wage uncertainty. Under one assumption ($\Theta = 1.0$) the individual knows nothing of his own ability, under a second assumption he has a small amount of information ($\Theta = 0.7$), and under a third he has substantial information ($\Theta = 0.4$). As one would expect, the lower elasticity value produces higher optimal rates.[134] More significantly, of the six simulations, five produce substantial marginal rate progressivity.[135] (The sixth—combining the higher elasticity value and complete ignorance of ability—produces a flat tax.[136]) In what is perhaps the most realistic case—with the lower elasticity value and with substantial knowledge of ability—marginal rates

---

[128] Varian does note that uncertainty makes increasing marginal rates potentially optimal, "if risk aversion does not decline too rapidly" with income. Varian, note 123, at 63.

[129] Tuomala, note 1, at 136-59.

[130] Id. at 138.

[131] Id. at 145, tbl. 9.1, Case 2. The simulations use the constant risk aversion utility function, $u = (c^{1-p}/1 - p) - y$, where $p = 1$, $u = \log c - y$. In the equation, consumption is indicated by c, and work effort by y. Different degrees of work aversion are modeled by varying p. In Case 2, $p = 1.5$. Not every degree of risk aversion produces progressive marginal rates. There is mild risk aversion where $p = 1$, yet $p = 1$ produces a flat 26% tax. Id., tbl. 9.1, Case 1.

[132] Economic Recovery Tax Act of 1981, Pub. L. No. 97-34, § 101, 95 Stat. 172, 176-77 (marginal rates ranging from 11% to 50%).

[133] See Bankman & Griffith, note 5, at 1964-65 (criticizing Mirrlees for using 1.0 and explaining the greater plausibility of 0.5).

[134] Tuomala, note 1, at 153-54, tbls. 9.2, 9.3.

[135] Id.

[136] Id. at 154, tbl. 9.3, Case 1.

ranged from 40% at the 15th percentile of the wage distribution to 86% at the 95th percentile.[137]

Tuomala concludes that progressive marginal rates are "quite a plausible outcome of a model where observed income inequalities are due to luck alone [or unknown ability], and of a model where they are due to a combination of luck and [known] ability."[138] Unfortunately, it is impossible to tell from his simulations whether progressive marginal rates would continue to be optimal as the contribution of luck (or unknown ability) to earnings declines from $\Theta = 0.4$ toward zero.[139]

Tuomala's finding that even a modest degree of wage uncertainty can justify graduated rates finds an echo in the study by Eaton and Rosen. While Tuomala considers the situation where *each* individual's wage is somewhat uncertain, Eaton and Rosen consider the situation where some individuals' wages are certain and some are uncertain. Their model assumes a flat tax. They found that when one-half the population faces wage uncertainty, the average rate progressivity of the optimal tax system is only modestly lower than the average rate progressivity if all face wage uncertainty.[140] As a result, "We are led to conjecture that even if a relatively small fraction of the population experiences wage uncertainty, there may be a significant impact on optimal tax rates."[141]

B. Implications of the Literature: Uncertainty About Uncertainty

A first response to the taxation-as-insurance optimal tax studies might be that they are of little practical importance because wage uncertainty is small for most workers. In the end, that may be right, but the insurance analysis cannot be dismissed so quickly. Most self-employed people have significant income uncertainty from year to year, as do employees on commission or with bonuses tied to performance. Moreover, it is easy enough to make a list of occupations where income uncertainty is not merely significant, but massive—real estate broker, farmer, professional golfer, and plaintiffs' personal injury lawyer, to name a few. No doubt it remains true that there is little short-

---

137 Id. at 153, tbl. 9.2, Case 3. A surprising result is that the optimal marginal tax rates on higher income individuals increase as the degree of uncertainty decreases. For example, in the cases with the lower elasticity of substitution, the marginal rate at the 98th percentile is 70% in the case of total ignorance ($\Theta = 1.0$), the marginal rate at the 97th percentile is 73% in the case of low information ($\Theta = 0.7$), and the marginal rate at the 95th percentile is 86% in the case of high information ($\Theta = 0.4$). Id. at 153, tbl. 9.2.

138 Id. at 156.

139 Tuomala reports that "it is difficult to obtain converged solutions when [ϵ] is less than 0.4 . . . ." Id.

140 Eaton & Rosen, note 123, at 363.

141 Id.

term wage uncertainty for most workers, but recall the indication (from Tuomala) that even a modest uncertainty component in all wages may be enough to justify graduated rates,[142] and the suggestion (from Eaton and Rosen) that the level of optimal progression (at least of average rates) may be greatly heightened by wage uncertainty among only a few workers.[143]

The analysis also changes if the focus is not solely on wage uncertainty in the short term. In order for tax as insurance to make sense, it is *not* necessary that there be wage uncertainty at the time the labor is performed; it is sufficient that there be wage uncertainty *at the time the labor supply decision is made.*[144] In some cases, that may be long before the labor is performed. One may decide to become a lawyer, for example, on the basis of very limited knowledge—both of one's own ability, and of the market for legal services years or decades hence (and with even less knowledge, perhaps, of future wage rates in potential alternative careers). If entering law school committed one to working as a lawyer for 2,000 hours a year for 40 years, there would be only one labor supply decision for a lawyer, and it would be made in the face of massive uncertainty. Year by year, during her professional career, the lawyer might know her wage with precision, but at those times, there would be no labor supply decision to be made. This story is most persuasive with respect to careers requiring heavy early investments in education, and even for such careers, the story is an overstatement. Nevertheless, it contains a kernel of truth. Important long-term labor supply decisions are made at the education stage, when wage uncertainty is high. Taking that into account increases the plausibility that there is significant wage uncertainty in the economy. In a recent book, Robert H. Frank and Philip J. Cook argue that winner-take-all competitions, featuring significant wage uncertainty at the time the career decision is made, have become a major feature of the U.S. labor market.[145] Although such competitions are probably not as common as Frank and Cook claim,[146] the (largely anecdotal) evidence they present suggests the extent of wage uncertainty is far from trivial.

At this point, the case for graduated rates based on an insurance rationale is certainly not proven. We have insufficient information

---

[142] Tuomala, note 1, at 139, tbl. 9.2.

[143] Eaton & Rosen, note 123, at 363.

[144] Eaton & Rosen, note 123, at 357; see Tuomala, note 1, at 157.

[145] See generally Robert H. Frank & Philip J. Cook, The Winner-Take-All Society (1995). The optimal tax implications of the book are discussed in more detail, in the text accompanying notes 196-206.

[146] See text accompanying notes 200-02.

both on the actual extent of wage uncertainty,[147] and on the impact of small amounts of uncertainty on optimal tax analysis. We do not know, for example, how marginal rates would be affected if Θ equalled 0.1 for everyone, or if 10% of the population faced massive wage uncertainty.[148] Still, based on what we do know, it is fair to say that consideration of wage uncertainty makes the optimality of graduated rates much more plausible than usually is supposed.

C. *The Wage Insurance Analysis and the Rejection of Demogrants*

The existing studies of tax as insurance all assume the availability of demogrants; thus, they do not ask how the insurance analysis would affect optimal marginal rates if demogrants are not permitted. Our study could be modified to incorporate wage uncertainty and insurance. The likely result would be greater progressivity; the same dampening of the disincentive effect that leads to higher marginal rates on high earners in the analysis with demogrants should apply in the case without demogrants.[149]

We think the modification is not worth doing, however, for political-philosophical reasons. Suppose the optimal tax case for tax as insurance could be made convincingly to the public. (This would require both a technically solid case and a lucid explanation to the public; both tasks are daunting.) In that case, utilitarianism would not be the foundation for redistributive taxation. Redistribution would be based, instead, on a social insurance contract. *If* it is reasonable to view the lucky high earner as having contracted to subsidize the unlucky low earner in exchange for the reciprocal promise of the unlucky earner (had the distribution of luck been reversed), the rights-based objection to redistribution vanishes.[150] We doubt that the U.S. public will ever be convinced of the case for income tax as wage insur-

---

147 Tuomala's claim for the realism of his first simulation is limited to its assumptions concerning risk aversion and income distribution. Tuomala, note 1, at 144. He does not claim its assumption concerning wage uncertainty is realistic.

148 As Tuomala has noted, it also would be useful to have optimal tax calculations for a model where some labor supply decisions are made early based on minimal information, and other decisions are made later using more complete information. Id. at 157.

149 Without demogrants, of course, the extent of possible insurance is limited. But a steeply progressive tax structure can serve as insurance *against tax liability*, in the event of low wages. With demogrants, the tax-and-transfer system could serve as insurance against the low wages themselves, rather than merely against tax.

150 A similar quasi-contractual interpretation is the key to the political success of Social Security. Social Security may seem to contradict our claim that U.S. society rejects redistribution to those above poverty. But our claim is narrower—that society rejects the *utilitarian* case for redistribution. Society is willing to consider an *insurance* case for redistribution, and the advocates of Social Security have persuaded Americans to view it as insurance.

ance. But if it ever is convinced, it then would be willing to accept a *tax-and-transfer* system, and there would be no reason to exclude demogrants from the analysis.

VI. If the Elasticity of Substitution Between Consumption and Leisure Declines as Income Increases

Optimal tax studies almost invariably assume the elasticity of substitution between consumption and leisure is the same for everyone.[151] There is, of course, no reason to think that every person, or every demographic group, really views the trade-off between consumption and leisure in the same way. In fact, it is well-established that the elasticity of substitution for married women is significantly higher than for other groups.[152]

Similarly, elasticities *might* vary systematically across the population by wage rates. If it could be established that low-wage individuals have high elasticities, and high-wage individuals have low elasticities, progressive marginal rates might well be optimal, even in a standard tax-and-transfer (demogrant) analysis.[153] Low rates on low-wage individuals then would be attractive on both efficiency and distributional grounds. High marginal rates on high earners would be attractive—as always—on distributional grounds, and the usual efficiency objection would be muted if high earners responded little to high tax rates. In the extreme case, if the highest wage group were totally inelastic, the optimal marginal rate at the top of the income distribution would be 100%. The social welfare gain from redistribution could be had without any efficiency cost.[154]

Atkinson briefly discusses this issue in his survey of optimal income tax analysis.[155] He explains that "empirically we need estimates not

---

[151] See, e.g., Tuomala, note 1, at 38-43 (describing various tax studies that have implemented this assumption).

[152] The literature is surveyed in McCaffery, Taxing Women, note 46, at 179-84. These results usually are expressed in terms of compensated elasticities of labor supply, rather than elasticities of substitution, but a high elasticity of one sort implies a high elasticity of the other. The technical distinction is that elasticity of substitution concerns how an individual will "alter his mix of consumption and leisure in response to a change in the relative prices of those commodities, while [elasticity of the labor supply] measures the amount an individual will adjust his work hours to changes in the wage rate." Bankman & Griffith, note 5, at 1963, n.231.

[153] Tuomala, note 1, at 14 ("Of course, it is possible to argue against the taxation structure derived from numerical simulations if it can be claimed that people in higher income groups are not in fact very responsive to tax rates . . . .").

[154] In that case, a 100% rate at the top of the income distribution also would be called for in a system without demogrants. The 100% rate at the top would be optimal absent efficiency costs, see text following note 61, and if the highest earners are completely inelastic, there is no efficiency cost.

[155] Atkinson, note 3.

just of the elasticity but also as to how it varies with the wage rate."[156] Despite his recognition of the importance of the question, he cites no empirical elasticity research on point.[157] In a survey of the literature on the work disincentive effect of taxation on high income groups, Jerry Hausman notes that there is little empirical information available, and what little is known comes almost entirely from interview surveys.[158] These surveys ask high earners how existing taxes affect their work effort, or how they would change their work effort in response to tax changes.[159] The technique is not very satisfactory, both because the respondents may not fully understand their own responses to taxation, and because it is difficult to separate the income effect from the substitution effect.[160] (Only the latter is relevant in determining the efficiency cost of taxation.[161]) Hausman's conclusion is that "in terms of work response it does not appear that the rich are different than everyone else."[162] This is not enough to make the case for progressive marginal rates. That would require that the rich be *less* responsive to taxation than everyone else. There is, however, one study that finds that elasticity systematically declines as income increases, and that study has been incorporated into an optimal tax simulation. Analyzing data from an earlier labor supply study,[163] Efraim Sadka, Irwin Garfinkel, and Kemper Moreland compute the compensated wage elasticity and the elasticity of substitution for each quintile

---

156 Id. at 53.

157 Atkinson claims that "[i]n some empirical research, the elasticity does indeed vary systematically across the population." Id. But he cites only one study in support of that claim, and in fact the study cited is not on point. The cited study is Edgar K. Browning & William R. Johnson, The Trade-Off Between Equality and Efficiency, 92 J. Pol. Econ. 175 (1984) [hereinafter Trade-Off]. Browning and Johnson are interested in the equality-efficiency trade-off involved in making marginal changes in existing federal tax laws. For that specialized purpose, they assume that "labor supply elasticities depend on the level of average and marginal tax rates [under existing law] and will therefore differ across households" by income levels. Id. at 187. This approach results in a compensated labor supply elasticity of .513 for the lowest income quintile, .364 for the second quintile, .283 for the third, .255 for the fourth, and .318 for the highest. Id. at 188 tbl. 4, Case A-Compensated. The fact that elasticity generally declines with increasing income is a function of the tax rates faced by households in different income quintiles under then-existing law. Id. at 187. Their analysis does *not* imply that elasticity *inherently* differs by wage level (that is, apart from the effect of marginal tax rates under existing law). Thus, it does not support an assumption of declining elasticity in the standard form of optimal tax analysis, which designs a tax system "from scratch," rather than investigating marginal changes in existing law.

158 Jerry A. Hausman, Taxes and Labor Supply, in Handbook of Public Economics 213, 250 (Alan J. Auerbach & Martin Feldstein eds., 1985).

159 Id. at 250-52.

160 Id. at 251.

161 See note 5.

162 Hausman, note 158, at 252.

163 Stanley Masters & Irwin Garfinkel, Estimating the Labor Supply Effects of Income-Maintenance Alternatives (1977).

of the income distribution, and find that both elasticities generally decline as income increases.[164] They then use these declining elasticities in determining the optimal two-bracket income tax system with demogrant.[165] They consider 14 cases, involving seven social welfare functions (ranging from unweighted utilitarian to Rawlsian) and two levels of nontransfer revenue needs.[166]

In nine of the fourteen cases, progressive marginal rates (that is, the second bracket higher than the first) are optimal.[167] The two least egalitarian social welfare functions fail to produce marginal rate progression, and the third least egalitarian produces marginal rate progression under one level of revenue need, but not under the other.[168] The remaining four social welfare functions produce progressive marginal rates under both revenue need levels.[169]

The lesson is that *if* the elasticity of substitution declines as the wage rate increases, graduated rates *may* be optimal.[170] Whether rate graduation is optimal depends on how dramatically the elasticity declines, on the level of government revenue need, and on the strength of social aversion to inequality. A fairly strong social preference for equality seems to be necessary to support progressive marginal rates. Even when the simulation does generate progressive rates, the rates do not much resemble a politically realistic tax system. Of the nine simulations with progressive rates, the one with the *lowest* marginal rates has a first bracket of 35% and a second bracket of 61%.[171] On the other hand, incorporating declining elasticity into an optimal tax simulation without a demogrant should increase the marginal rate

---

[164] They found an elasticity of substitution of .4653 for the bottom quintile, .4976 for the second quintile, .4092 for the third, .3108 for the fourth, and .2589 for the top. Efraim Sadka, Irwin Garfinkel & Kemper Moreland, Income Testing and Social Welfare: An Optimal Tax-Transfer Model in Income-Tested Transfer Programs: The Case For and Against 291, 301 tbl. 8.2, Case I, (Irwin Garfinkel ed., 1982).

[165] Id. at 302.

[166] Id. at 305.

[167] Id. at 303 tbl. 8.3.

[168] Id.

[169] Id.

[170] The authors frame their results in an unusual way. They note that a tax-and-transfer system may have marginal rate *regressivity*, not because the income tax rates are explicitly regressive, but because of the phaseout of the benefit of income-tested anti-poverty programs as income rises above the poverty level. Id. at 292. Thus, they describe a two-bracket tax system as income-tested if the marginal rates are regressive, and as non-income-tested if the marginal rates are flat or progressive. Id. Of the 14 simulation results, only three are income-tested, in their sense of the term. Id. at 293-98. (Of the other 11, nine are progressive and two are flat. Id.) They argue that these results "are sufficient to call into question the consensus among economic experts that transfer programs which provide benefits only to those with low incomes are more efficient than those which provide benefits to all regardless of income." Id. at 311.

[171] Id. at 303 tbl. 8.3, col. 6.

progressivity of the system, without calling for such high marginal rates (because revenue is not needed to finance a demogrant).

The problem with the declining elasticity case for graduated rates is empirical. There is simply not enough evidence that elasticity decreases as the wage rate increases, to serve as a foundation for tax policy. Until that evidence appears, this case for progression resembles the case based on insurance for wage uncertainty—theoretically interesting, but insufficiently based on established fact.

VII. If Ability Is Distributed Differently Than Is Usually Assumed

In performing an optimal tax simulation, it is necessary to specify how abilities (in the sense of wage rates) are distributed within the population. The "industry standard" assumption, following Mirrlees,[172] has been of a log-normal distribution of abilities, with a standard deviation of logs of 0.39.[173] Two recent studies indicate that results can change significantly if either a larger standard deviation is assumed, or if the distribution of skills is Pareto rather than log-normal.

A. A More Unequal Distribution of Abilities

In their study, Kanbur and Tuomala maintain the assumption of a log-normal distribution, but consider cases in which the standard deviation of logs is greater than 0.39—in other words, where inherent inequality in abilities is greater than usually assumed.[174] They determine optimal tax rates under three assumptions about ability distribution, and under three social welfare functions.[175]

Using an unweighted utilitarian social welfare function and a standard deviation of 0.39, they produce the typical result that declining marginal rates are optimal.[176] Changing the standard deviation to 0.7, however, has a surprising effect on the shape of the rate schedule—the schedule becomes mildly progressive through most of its range.[177] At the bottom of the wage distribution, the marginal rate is 57%.[178]

---

172 Mirrlees, note 2.

173 Kanbur & Tuomala, note 18, at 275.

174 Id. at 278.

175 The three standard deviations of logs are 0.39, 0.7, and 1.0. Id. at 278. The three social welfare functions are unweighted utilitarian, weighted utilitarian, and Rawlsian (maximin). Id. at 279-80. In all cases, they assume an elasticity of substitution between consumption and leisure of 0.5. Id.

176 Id. at 279 tbl. 1.

177 Id.

178 Id. at 279 tbl. 1, col. 2.

The marginal rate rises to 63% by the middle of the distribution, and stays there until almost the 90th percentile of the distribution.[179] For the top 10% of the distribution, however, the marginal rate declines; at the 99th percentile, it is 37%.[180] With even greater inherent inequality—a standard deviation of 1.0—the shape of the marginal rate curve remains an inverted U, with the peak occurring near the 90th percentile of the wage distribution, but the progression becomes more pronounced.[181] Marginal rates range from 47% at the bottom to a high of 74% at the 84th percentile.[182]

With a weighted utilitarian social welfare function, optimal rates increase, but the basic shapes of the rate schedules remain the same.[183] A standard deviation of 0.39 yields steadily declining marginal rates, and the two larger standard deviations yield inverted U curves, with declining marginal rates only near the top of the wage distribution.[184] Interestingly, however, a greater social aversion to inequality tends to flatten the inverted U curves. With a standard deviation of 0.7, the lowest rate is 72% and the highest is only 75% (compared with rates of 57 and 63% in the corresponding utilitarian case).[185] With a standard deviation of 1.0, the lowest rate is 69% and the highest is 80% (compared with rates of 47% and 74% in the corresponding utilitarian case).[186]

The most surprising result is that the maximin social welfare function produces declining marginal rates throughout the entire schedule, regardless of the distribution of abilities.[187] Kanbur and Tuomala summarize their results: "When inherent inequality is sufficiently high [and inequality aversion is not extreme], we find that over a significant range, marginal tax rates *rise* with income."[188]

The significance of these findings depends, of course, on the actual distribution of abilities. Although Kanbur and Tuomala discuss this issue only briefly, they say enough to suggest that the assumption of greater inherent inequality is reasonable.[189] They cite a recent study by Joel Slemrod,[190] which found a distribution of wage rates in the

179 Id.
180 Id.
181 Id. at col. 3.
182 Id.
183 Id. at 280 tbl. 2.
184 Id. at 280 tbl. 2, col. 1.
185 Id. at col. 2.
186 Id. at col. 3.
187 Id. at 280 tbl. 3.
188 Id. at 280.
189 Id. at 281.
190 Id. at 280.

United States roughly consistent with a standard deviation of 1.0.[191]

Although it is unusual and interesting to find any support in the optimal tax literature for progressive marginal rates, this study offers little solace to defenders of graduated rates. Compared to actual tax systems, the marginal rates at the bottom are very high, and the differences between the lowest and the highest rates are small. Especially unhelpful are the declining marginal rates over a significant range of high incomes, and the finding that a strong aversion to inequality can work *against* progressive marginal rates. In short, although the study provides important evidence against the optimality of steadily declining marginal rates, it does not suggest real world graduated rate schedules are anywhere near optimal.

In our simulations of the optimal two-bracket system without demogrants, we have not considered the effect of assuming different distributions of abilities. In light of the finding that optimal rate schedules are sensitive to the degree of inherent inequality, that would be a worthwhile topic for future research.

B. A Pareto Distribution of Abilities

Peter A. Diamond presents further evidence that the skill distribution assumed can affect the shape of the optimal tax rate schedule.[192] Diamond assumes a Pareto distribution of skills rather than the log-normal distribution that Mirrlees and others have assumed. Diamond finds rising marginal tax rates on those above the modal skill level to be optimal.[193] Interestingly, Diamond also finds that the marginal tax rate may be declining at the modal skill. He uses Current Population Survey data to construct a wage distribution for the United States to see if a Pareto distribution would be a reasonable assumption. Using these data, he recalculates a wage distribution by estimating a wage equation with regression techniques. These manipulations lead to a constructed wage distribution with properties "consistent with a Pareto distribution over this range of values."[194] Although we cannot determine whether the Pareto or the log-normal distribution better

---

[191] Joel Slemrod, Taxation and Inequality: A Time-Exposure Perspective (NBER Working Paper No. 3999, 1992). They also criticize Mirrlees for basing his assumption of a standard deviation of 0.39 on evidence of the distribution of *incomes* (that is, wage rate times hours worked), rather than of wage rates. Kanbur & Tuomala, note 18, at 280, criticizing Mirrlees, note 2, at 201.

[192] Peter A. Diamond, Optimal Income Taxation: An Example With a U-Shaped Pattern of Optimal Marginal Tax Rates, 88 Am. Econ. Rev. 83 (1998).

[193] Id. at 87-88.

[194] Id. at 92.

approximates reality, Diamond has pointed out the importance for further study of the actual distribution of skills.

As noted earlier, efficiency considerations will push in the direction of regressive marginal rates if the ratio of submarginal to marginal earners declines as income increases.[195] Although that ratio does decline as income increases under a log-normal distribution of skills, it *rises* with income under a Pareto distribution—thus increasing the likelihood that progressive marginal rates for the highly skilled will be optimal. The final pattern of optimal marginal tax rates will depend on the utility functions and social welfare functions assumed, as well as on the distribution of skills.

VIII. Progressive Taxation in a Winner-Take-All Society

As noted previously, Frank and Cook offer an unorthodox description of the modern American labor market as consisting largely of winner-take-all competitions, in which a few entrants win huge rewards, while most win little or nothing.[196] These competitions attract an inefficiently large number of entrants because each person decides whether to enter based solely on the expected payoff to herself, without taking into account the negative externality her entrance imposes on all other entrants (by reducing their chances of winning).[197] A progressive income tax could help correct this misallocation of effort. If winners in the winner-take-all competitions were taxed at higher average rates than those who work in other fields, relative expected payoffs would decrease, and the number of entrants would decline to a more efficient level.[198] (This is analytically distinct from the argument, discussed earlier, that the wage uncertainty characteristic of a winner-take-all society would support redistributive taxation under an

---

[195] See text accompanying note 18.

[196] Frank & Cook, note 145.

[197] Id. at 106-09. Frank and Cook note that this is a variation on the "tragedy of the commons." Id. at 108. As a highly stylized example, they describe a society in which there are only two career choices: being a potter for a certain income of $10,000, or entering a one-winner singing contest, in which the winner's reward increases with the number of entrants. Id. at 106-08. With 99 entrants, the winner's payoff is $1,999,000, and the addition of a 100th entrant would raise the payoff by $1,000, to $2 million. Id. at 108. A 100th person will enter (if she is risk-neutral) since her expected payoff of $20,000 (1/100 × $2 million) is twice a potter's wage, but that entry is inefficient. Id. It increases societal income by only $1,000, compared with the $10,000 she would have produced as a potter. Id.

[198] Id. at 121-22. Consider the example described in note 197. A flat tax would not change the decision of the 100th entrant. If the tax rate was 20%, the expected after-tax reward to a singer ($16,000) still would be twice a potter's after-tax wages ($8,000). But if the potter was taxed at an average rate of 10%, while the winning singer was taxed at an average rate of 60%, the potter's $9,000 would exceed the singer's expected $8,000.

insurance rationale.[199]) Frank and Cook do not attempt—or even suggest—the incorporation of their model of the labor market into an optimal tax simulation, and it is not clear whether a simulation based on their model would support the optimality of progressive marginal rates. Their model obviously calls for progressive average rates, but optimal tax simulations routinely produce progressive average rates even without their model. Whether the added impetus for progressivity under their model would lead to progressive marginal rates can be determined only by simulations.

Although we have not attempted a simulation using a winnner-take-all model, that would be a worthwhile project. Even if such a simulation did produce progressive marginal rates, the significance of the results would depend on the realism of the model. On that question, two points are worth noting.

First, it is not clear how large a role winner-take-all competitions play in the overall U.S. labor market. Frank and Cook are convincing when they claim that winner-take-all accurately describes a few fields, such as sports and entertainment.[200] They also make a strong case that in recent years, the markets for professional services, such as law and medicine, have developed more winner-take-all features.[201] They do not prove, however, that the winner-take-all phenomenon is as pervasive as they claim.[202] On the other hand, the entire economy need not be based on the winner-take-all model for the Frank and Cook analysis to lend support for progressive marginal rates near the top of the income distribution. Even if few earners are in winner-take-all fields, it may be that most *extremely high* earned incomes are in such fields. If so, high marginal rates on seven-figure incomes might prevent an inefficiently large number of entrants into winner-take-all competitions.

Second, their illustration of the inefficiency of winner-take-all markets depends on the unrealistic assumption that people are risk-neutral—that people are indifferent, for example, between a sure income

---

199 See Section V.B. To see the difference, consider a society in which people have no choice between entering a traditional job market and a winner-take-all market; the only labor opportunity is in a single winner-take-all field. The rationale for progressive taxation as insurance against wage uncertainty would apply, but the Frank and Cook argument would not (because it is based on inefficient allocation of labor between winner-take-all fields and other fields).

200 Id. at 61-84.

201 Id. at 85-99.

202 This is the major theme of John Kenneth Galbraith's review of Frank and Cook: "This is not a winner-take-all society; rather, it is an economic world in which the case the authors describe plays an interesting but far from dominant role. No wheat grower, no dentist, no housepainter has a dominant position in his or her industry." John Kenneth Galbraith, The Winner Takes All . . . Sometimes, Harv. Bus. Rev., Nov.-Dec. 1995, at 44.

of $20,000 and a 1% chance of $2 million.[203] They concede that "because of a general aversion to risk, *too few* people [might] compete in a particular winner-take-all market."[204] They immediately say this does not matter, however: "Someone could organize a cooperative in which all contestants shared the payment generated by the winning contestant, thus converting the gamble into a certain payoff. We would then, as before, be left with too many contestants, despite each person's aversion to risk."[205] Their implicit dismissal of the problem of transaction costs is not convincing, especially considering they are able to cite only one situation in which anything resembling such a cooperative actually exists.[206]

IX. Conclusion

Regardless of the results of any simulation, optimal tax analysis can never prove that the income tax should have progressive marginal rates. Even if a simulation indicated graduated rates were optimal, and even if the simulation's factual assumptions were unassailable, an opponent of progression could still dismiss the results by rejecting the philosophical basis of the simulation. If the premises of the simulation are utilitarian or Rawlsian, no amount of sophisticated mathematics will convince someone who objects to those premises.

The nature of optimal tax analysis, however, gives it the potential to prove the income tax should *not* have progressive marginal rates, by demonstrating that graduated rates do not maximize social welfare even under a philosophy open to redistributive taxation. In the standard version of the story, optimal tax analysis has demolished the case for graduated rates in exactly that way. This Article has shown that the implications of optimal tax theory for graduated rates are not so dire, after all. The standard version is based on several unrealistic assumptions—most importantly, that the political system is open to demogrants, that people do not care about relative levels of consumption, and that there is no wage uncertainty. Once those assumptions are corrected, the optimal income tax probably does have progressive marginal rates. The reports of the intellectual death of the graduated income tax are indeed exaggerated.

---

[203] Frank & Cook, note 145, at 106-08, described in note 197.

[204] Id. at 117-18 (emphasis added).

[205] Id. at 118.

[206] Id. (citing as an example scientific researchers who trade the right to their future discoveries for guaranteed salaries).

APPENDIX

These simulations find the optimal piece-wise linear income tax with the following restrictions. We assume, due to political constraints, that an income guarantee (demogrant) is not an option, but that certain income can be exempted. We assume that everyone qualifies for the current exemption (designated here as E). Two marginal tax rates for those above this exemption become our policy parameters. In picking these two rates, we also find that level of gross income (called here *ZBAR*), where the individual would pass from the tax rate on the middle group, t_M, to the tax rate on the higher income group, t_H. The marginal tax rate for those below E will of course be zero, the marginal tax rate will be t_M for those just above E but below *ZBAR*, and t_H applies to those with gross incomes above *ZBAR*.

Individuals

The model society will be described by five representative individuals who are assumed to have identical utility functions $u(x,y)$, where x equals consumption, and y equals labor services.[207] Every individual is endowed with y_O hours to be divided between work and leisure. Individuals differ only in their wage rates, and are ordered so that $w_1 < w_2 < w_3 < w_4 < w_5$.

A CES utility function was used to describe individual preferences for consumption and leisure. In the following, $\sigma = 1 / (1 - D)$ equals the elasticity of substitution between consumption and leisure.

$$U(x,y) = [\beta x^D + (1 - \beta)(y_O - y)^D]^{1/D}$$

y_O represents the individual's endowment of hours to be divided between work and leisure, here taken to be 3120 hours. Following Stern,[208] the values used in the simulations for β and σ were 0.995 and 0.40 respectively.

GOVERNMENT BUDGET CONSTRAINT AND TAX SYSTEM

The government budget constraint requires the tax system to collect a fixed sum of nontransfer expenditures. This fixed sum will be financed by a piece-wise linear income tax that allows an exemption but no positive transfers. To describe this tax, one must specify the exemption E, the marginal tax rate t_M for those with gross incomes

[207] Utility declines as hours devoted to labor services increase. Alternatively, utility could be expressed as a function of consumption and leisure, with utility increasing as the number of leisure hours increases.

[208] N.H. Stern, On the Specification of Models of Optimum Income Taxation, 6 J. Pub. Econ. 123, 136 (1976).

above E but below $ZBAR$, and a marginal tax rate equal to t_H for those with gross incomes above $ZBAR$.

The Tax System and the Consumer's Budget Constraint

An individual maximizes his utility function by choosing a consumption level and labor services subject to a personal budget constraint that is shaped by the nature of the tax function. An individual may earn a gross income, $z = wy$, but what one can keep for consumption, x, depends on the tax function. Under the tax system here, the individual's budget constraint becomes:

$x \leq wy$ for $z \leq E$

$x \leq (1 - t_M)wy + t_M E$ for $E < z \leq ZBAR$

$x \leq (1 - t_H)z + t_M E + (t_H - t_M)ZBAR$ for $z > ZBAR$.

The Social Welfare Function

The social welfare function is an individualistic welfare function adapted from Atkinson.[209] It contains a parameter g, which serves as an index of inequality aversion. For $g = 0$, we have the simple sum of utilities welfare function. As g moves toward infinity, the social welfare function approaches the Rawlsian maxi-min criterion.

$W(u_1,u_2, \ldots u_N) = [1 / (1 - g)]E[u(x_i,y_i)]^{(1-g)}$

The Data

To approximate the U.S. skill distribution, an estimate of the 1994 wage distribution was created from the March 1995 Current Population Survey.[210] Only householders who worked are included. In addition, those who limited their work due to retirement, illness, or disability were excluded. After arranging these householders in ascending order, the first 20% became group 1, the next 20% became group 2, and so on. The average hourly wage rate for group 1 became our w_1 = \$4.16. Following group 1, we have: w_2 = \$8.39, w_3 = \$12.16, w_4= \$17.08, and w_5 = \$32.83.

The government budget constraint must collect a fixed sum of nontransfer expenditures. The true tax on income in 1994 will represent this sum (adjusted for the householder's share of total income). A value of \$5,000 was used to approximate this fixed sum per person.

---

[209] Anthony B. Atkinson, On the Measurement of Inequality, 2 J. Econ. Theory 244, 257 (1970).

[210] Bureau of the Census, U.S. Dep't of Commerce [producer], Current Population Survey [computer file] (Mar. 1995); Inter-university Consortium for Political and Social Research [distributor] (1997).

TABLE

Optimal Tax Rates t_M and t_H

CES Utility Function With $\beta = 0.995$ *and* $\sigma = 0.40$

	$\varepsilon = 0$	$\varepsilon = 0.1$	$\varepsilon = 0.2$	$\varepsilon = 0.4$	$\varepsilon = .08$	$\varepsilon = 2.0$	*Maxi-Min*
t_M	0.118	0.072	0.021	0.0	0.0	0.0	0.0
t_H	0.390	0.412	0.435	0.446	0.451	0.520	0.736
ZBAR	18,240	18,190	18,052	18,048	18,209	19,982	22,424
E^*	12,000	12,000	12,000	12,000	12,000	12,000	12,000
Mean Income	27,934	27,837	27,719	27,672	27,667	27,285	25,929
y_1	2,432	2,432	2,432	2,432	2,432	2,432	2,432
y_2	2,174	2,168	2,152	2,151	2,170	2,180	2,180
y_3	1,982	1,964	1,946	1,936	1,931	1,858	1,844
y_4	1,891	1,880	1,868	1,862	1,859	1,811	1,567
y_5	1,673	1,672	1,671	1,670	1,670	1,660	1,585
Inc < *E*	20%	20%	20%	20%	20%	20%	20%
Inc = *E*	0	0	0	0	0	0	0
E<Inc<*ZBAR*	0	0	0	0	0	20%	20%
Inc = *ZBAR*	20%	20%	20%	20%	20%	0	20%
Inc > *ZBAR*	60%	60%	60%	60%	60%	60%	40%

* The exemption applied to all income is held constant to reflect current tax policy.