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EVIDENCE ON THE HIGH-INCOME LAFFER CURVE FROM SIX DECADES OF TAX REFORM

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Abstract

A burgeoning literature in public finance seeks to estimate the impact of marginal tax rates on the behavior of the rich. This literature argues that by leading people to shift income out of taxable form when rates rise, high marginal rates and progressivitiy in the tax code can create a substantial deadweight loss while raising little revenue, even if the elasticity of labor supply is zero. The literature has used natural experiment methods on data from the tax cuts of the 1980s and estimated a large behavioral response of high-income taxpayers. In this paper, I use the same methods as this literature but examine tax changes from previous decades that generated the same type of tax variation as the tax cuts of the 1980s but with potentially fewer, or at least different, problems of spurious correlation. The evidence from both aggregate cross-sectional data on tax returns and panel data on executive compensation indicates that the responsiveness of high-income people seems to be relatively modest in almost all time periods except the 1980s. The lowest estimates of the elasticity based on the 1980s data exceed even the highest estimates from data on any previous tax change.

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I. Intro

In the 1980s, federal income tax policy took center stage in the political arena as an influential group of "supply-side" economists argued that high marginal tax rates were severely reducing the incentives of people to work and that cutting tax rates, by stimulating people to work harder and earn more income, could actually raise revenue. This idea is known in the popular parlance as the Laffer curve, after Arthur Laffer who (according to rumor) wrote out the idea on a napkin at a cocktail party. In actuality, political debate in the United States over whether cutting rates can raise revenue dates back many years.[1]

Even if they do not pay for themselves, if taxes lead to large behavioral responses by individuals, the implications are quite important for the making of tax policy. High marginal rates cause inefficiency that rises with the square of the tax rate. If the Laffer curve is correct and high rates fail to raise revenue, they are, quite literally, less than worthless.

As a testable hypothesis, however, the original Laffer curve has not fared well. Somewhat unfairly, the public has taken the explosion of budget deficits following the rate cuts of the 1980s and the elimination of deficits following the rate increases of the 1990s as a refutation of the idea. More careful econometric analysis has not been any more supportive. An extensive literature in labor economics has shown that there is very little impact of taxes on labor supply for most people, particularly for prime age working men.[2] This would seem to indicate that the central tenet of the Laffer curve is demonstrably false.

The last decade or so in public finance, however, has seen the birth of a new and important literature very much in the spirit of the Laffer curve but more sophisticated and, potentially, much more persuasive. I call it the New Tax Responsiveness literature. Perhaps most associated with the work of

Lawrence Lindsey and Martin Feldstein but including many others, the New Tax Responsiveness (NTR) literature's main hypothesis is that high marginal rates have major efficiency costs and fail to raise revenue at the top of the income distribution.[3] High tax rates do not necessarily get people to work less. Instead, they lead people to shift their income out of taxable form. Their work has shown that if people do shift their income, this can imply the same revenue and deadweight loss problems as in the original Laffer curve *even if the elasticity of labor supply is zero*. The NTR literature has tried to estimate the impact with data on high income people and claims to find large effects. If true, this work means that the marginal deadweight cost of the income tax is quite high and it calls the progressivity of the tax code into serious question.

The central goal of the NTR literature is to estimate the elasticity of taxable income with respect to the marginal tax rate (actually, to one minus the tax rate). This parameter can be used to determine the deadweight loss of the income tax, the revenue implications of tax changes, even the optimal size of government.[4] As Joel Slemrod has put it "recently…much attention has been focused on an elasticity that arguably is more important than all others, because it summarizes all of what needs to be known for many of the central normative questions of taxation. This is the elasticity of taxable income with respect to the tax rate."[5]

As one might expect of something so influential, there is considerable controversy over the magnitude of this elasticity. Indeed, estimating it has been one of the most active areas of research in public finance of the last decade. The basic methodology of the NTR work has been the natural experiment—relating changes to the relative incomes of groups around a tax change to the changes in their relative tax rates in the tax change. Commonly referred to as difference-in-differences estimates,

this method has tended to find large taxable income elasticities when applied to the tax cuts of the 1980s.

The methodology is not without its critics. Some have questioned their validity when comparing high income people to others.[6] Others have been more generally critical.[7] The potential biases have lead many to wonder if results from the 1980s are significantly biased upward.

While there are potentially serious difficulties associated with the use of natural experiments to estimate the behavior of very rich people, in this paper, I will not seek to criticize the methods of the NTR. Instead, my goal will be to use those same methods of the NTR but apply them to different time periods than the familiar tax changes of the 1980s and 1990s to see how robust the case is for a large taxable income elasticity. The results from tax based natural experiments from seven different tax reforms between 1920 and 1975 suggest that perhaps the case is not very robust.

The advantage of using the historical data to examine this question is that there have been numerous major tax changes throughout the six decades, both cuts and increases, to give perspective. The trends in income inequality and other factors potentially biasing work on the 1980s have been much different in other periods. The drawback of looking at the historical experience is that the data are substantially worse than currently available with individual level and panel data sources. In most cases only cross-sectional data are available, requiring some statistical interpolation to calculate incomes and tax rates. Where panel data do exist, they lack the detail of tax return data.

This paper proceeds in VIII parts. Section II gives an overview of the New Tax Responsiveness approach including the basic theory and the natural experiment methodology. Section III examines the empirical findings of the NTR literature. examines the empirical approach of the NTR literature and the existing estimates from the 1980s and 1990s. Section IV describes outlines a

procedure to use cross-sectional tax return aggregates to estimate the tax elasticity and checks it with data on the Tax Reform Act of 1986. Section V presents results from explicit natural experiments using cross-sectional data on five major tax reforms since 1920. Section VI turns to panel data on the compensation of high-income corporate executives in the 1930s and the 1970s to examine the impact of taxes. Section VII concludes.

II. THE NEW TAX RESPONSIVENESS APPROACH

A. Theory

One of the basic premises of the New Tax Responsiveness Literature is that what matters for calculating the marginal deadweight loss from taxation or the revenue impact of taxation is *not* the elasticity of labor supply with respect to the tax rate. Even if that is literally zero, there can still be major impacts of tax policy on the economy. What matters is the elasticity of taxable income.

If the individual has forms of income or consumption that are not taxable (including fringe benefits, non-taxes perquisites, tax deductions, etc.), the individual maximizing utility subject to a budget constraint will make choices between labor and leisure, as in the standard model, but will also make choices about shifting income and consumption out of taxable forms. Even if shifting into leisure is very small, so long as tax changes lead people to do a lot of shifting into tax free income, many of the implications of the Laffer curve analysis remain. This argument set forward most clearly in the work of Martin Feldstein.[8]

Feldstein takes a standard model with consumption, C, and leisure, L and adds nontaxable income (e.g., fringe benefits), E, and nontaxable consumption (e.g., deductions), D. The individual maximizes utility over all of these arguments, U(C,L,E,D), subject to the budget constraint that C = (1-

t)[w(1-L) - E - D] where w is the wage rate. The term in brackets on the right hand side is defined as taxable income. It is the amount of compensation minus the deductions and tax-exempt income. Rearranging the budget constraint, the intuition as to why deadweight loss depends on more than labor supply becomes obvious. Defining 1+z to be 1/(1-t), the budget constraint can be written as

$$C(1+z) = w(1-L) - E - D.$$

In this model the standard income tax raises the price of taxable consumption but it does not change the relative price of L, E, or D. In other words, all of the non-taxed factors make up a composite outside good. The deadweight loss of the income tax is, then, equivalent to the deadweight loss from a sales tax at rate z on taxable consumption. Such a deadweight loss depends on how much taxable consumption falls. It does not matter if the lower C increases L, E or D. So long as the individual is not at a corner, it is not necessary to know the elasticity of substitution between the types of untaxed goods in the utility function, only the extent to which they shift away from taxable consumption when rates change.

Feldstein shows that the DWL will be

$$= \frac{1}{2}\left(\frac{z}{1+z}\right)e_C zC$$

where ε_C is the elasticity of taxable consumption with respect to 1+z. Feldstein goes on to show that, for compensated changes, this is equivalent to

$$= \frac{1}{2}t^2\left(\frac{1}{1-t}\right)e_{TI}TI$$

where TI is taxable income and ε_{TI} is the elasticity of taxable income with respect to the net-of-tax share, (1-t). In principle, all of the elements in this equation can be directly estimated.

The issue of the corner solution is critical. If two types of compensation are perfect substitutes, a tax change will lead to a large amount of shifting, making the elasticity of taxable income very large but there will be no deadweight loss. If they are perfect substitutes, however, it should lead to a corner solution. They should switch completely out of the more costly type of income. The fact that wage income is tax disadvantaged yet people continue to take means that it cannot be a perfect substitute for non-taxed compensation. There must be some additional negative associated with taking non-taxed compensation that keeps people on the margin from shifting all of their income into the advantaged form and that additional negative is what creates a deadweight loss.

Indeed, in this simple setup, the marginal welfare cost of a tax change is the same whether it shifts the individual out of taxable income into untaxed leisure or into other untaxed forms of compensation or consumption. [9] It is leading them to take more of something they would not want if it were not for taxes. This result is quite important and should be better known.

Motivated by this observation, the NTR has set out to estimate the elasticity of taxable income and determine if it is significantly larger than the elasticity of labor supply (thus implying a larger DWL from taxation). The standard approach to identify the elasticity has been to use natural experiments generated by changes to the progressivity of the income tax.

B. Natural Experiment Approach

The idea of the natural experiment is to start with at least two different groups that experience tax changes of different magnitudes. In order to control for various unobservables, the "experiment"

derives from the assumption that the two groups' reported taxable income would grow at identical rates were it not for the changes to their relative taxation. In this literature the groups are usually the very rich and the somewhat rich.

Suppose that the reported taxable income, Y, for an individual or group of identical individuals A (indexed by time, t) is a function of the net-of-tax share according to the following simple, constant elasticity specification.

$$\ln(Y_t^A) = a_A + b \ln(1 - t_t^A) + d_t + h_t^A$$

where α is a fixed effect for the group, β is the elasticity of taxable income, τ is the marginal tax rate facing the group indexed by time, δ is a year effect indexed by time, and η is a random term that is distributed normally. Time series data on the group before and after a tax change will not be sufficient to identify the elasticity term. Differencing this equation across years with a tax change yields

$$\ln(Y_t^A) - \ln(Y_{t-1}^A) = b[\ln(1 - t_t^A) - \ln(1 - t_{t-1}^A)] + d_t - d_{t-1} + e^A.$$

Although this eliminates the group effect α, it cannot eliminate the impact of the time effects. This just says that observing a group's taxable income before and after a tax change will not yield the true taxable income elasticity unless there are no other changes (the business cycle for example) that influence income at the same time.

The way around this problem in the natural experiment literature is to use as a control another group of individuals, B, who are thought to be the same as the individuals in group A except that they face a different tax change. In other words, they have the same year effects as A group and the same elasticity of taxable income. In this case, the differenced equation for group B is

$$\ln(Y_t^B) - \ln(Y_{t-1}^B) = b[\ln(1 - t_t^B) - \ln(1 - t_{t-1}^B)] + d_t - d_{t-1} + e^B$$

and taking the difference of the two differenced equations yields

$$\Delta \ln(Y_t^A) - \Delta \ln(Y_t^B) = b[\Delta \ln(1-t_t^A) - \Delta \ln(1-t_t^B)] + \tilde{e} .$$

If group B is a valid control, the year effects will cancel in the second difference. Given data on reported incomes and tax rates, a difference-in-differences will provide a consistent estimate of the true elasticity of taxable income:

$$\hat{b} = \frac{\Delta \ln(Y_t^A) - \Delta \ln(Y_t^B)}{\Delta \ln(1-t_t^A) - \Delta \ln(1-t_t^B)} .$$

This is exactly the type of estimate used by Feldstein and others to get the taxable elasticity.[10] A regression counterpart when there are more than two groups is straightforward.

As summarized in the discussion of James Heckman, the troubling part about such an estimate is that if the control group is not perfect (i.e., the year effects are not the same), say because of secular trends in income inequality between groups, then the difference-in-differences estimator will not be consistent.[11] The direction of the bias will depend on how the different growth rates are correlated with the relative tax changes since

$$E[\hat{b}] = b + \frac{\Delta d^A - \Delta d^B}{\Delta \ln(1-t_t^A) - \Delta \ln(1-t_t^B)} .$$

To illustrate, consider the tax cut of 1986. The rich are group A and the almost-rich are group B. Since the rich received the largest relative tax cut and also had the largest relative income gains, the natural experiment suggests that taxes matter. Indeed, Feldstein calculates that the elasticity exceeds one.[12] If there were non-tax related trends in income inequality, however, driving up the income of the rich relative to other groups over this time period, there will be clear bias upward in the estimates. Note

that this direction of bias is only because, in this case, the tax change and the unobserved trend moved in the same direction. If TRA86 had been a tax increase on the rich while the rich's relative incomes rose, the second term would be negative and the elasticity would be biased downward. That is one of the primary motivations of looking at natural experiments in several other periods.

Three caveats regarding the standard approach are in order at the outset. One, the theory largely relates to compensated elasticities while the natural experiments provide information primarily on the uncompensated effects. Two, there are numerous types of shifting such as temporary shifts to the timing of compensation or shifts from the corporate to the individual tax base that may appear as large behavioral responses in the natural experiment approach but may not have the same implications for deadweight loss and revenue. Three, there are many potentially important long-run impacts of taxes such as their effect on occupational choice, retirement, and the like, that are completely neglected in the literature. This is strictly an analysis of the relatively short-run responses to taxation. It is almost impossible to identify the magnitude of these effects given standard data sources but this is not meant to imply that they are unimportant.

C. Revenue Implications

The discussion above and the results in this paper are a bit afield of the popular notion of the issue. The academic debate is predominantly about estimating the behavioral response to taxation, the elasticity of reported income with respect to the net-of-tax share. The popular conception concerns where the top of the Laffer curve is; in some sense, the elasticity of tax revenue with respect to tax rates. Obviously, these are not the same.

One reason economists have not spent as much time examining the Laffer curve proper is that since the tax system has a schedule of marginal rates, the conventional Laffer curve does not exist. The impact of a marginal rate change depends on average rates, too. I will follow the public finance literature and examine the theoretically-well-defined behavioral response of individuals to the marginal net-of-tax share and spend little time on revenue implications. A convenient way to get a suggestive sense of the revenue effects of taxes given an estimated elasticity with respect to the net-of-tax share is to note that if there were only a single tax rate in the economy and the elasticity of taxable income with respect to the net of tax share were e, the revenue maximizing tax rate (i.e., the top of the Laffer curve) would be 1/(1+e). In other words, taxes would raise revenue so long as the elasticity did not exceed (1+t)/t. Though the tax code does not conform to this assumption, at least it provides a benchmark.

III FINDINGS OF THE NEW TAX RESPONSIVENESS LITERATURE

A. TAX RESPONSIVENESS IN THE 1980S

By now, the NTR literature has grown quite voluminous so I will selectively choose among the work in order to set the stage for why looking at tax reforms in previous decades might be useful.[13] I will focus exclusively on work that directly estimates the elasticity of taxable income. There are related literatures on the impact of marginal tax rates on fringe benefits, on capital gains distributions, charitable giving, and so on that are important but beyond the scope of this paper.[14]

NTR estimation of the elasticity of taxable income and the behavioral responses to taxation really begins with the work of Lawrence Lindsey.[15] He uses cross-sectional data from the early 1980s on the reported income of various income groups to show that the reported incomes of taxpayers at the top of the income distribution rose dramatically at the same time as marginal tax rates were falling for

those same people. He argues that if the people at the top of the income distribution are the same people over time, the repeated cross-sections are similar to panel data. Given this assumption, his reasoning is explicitly natural experiment based. He compares the rich to other groups and argues that the marked difference in relative income growth rates can be accounted for by differences in tax treatment. He estimated that the elasticity of taxable income was well in excess of one.

Daniel Feenberg and James Poterba use cross-sectional data from aggregate tax return data from the 1950 to 1990 and cross-sectional micro data from 1979 to 1991 in order to calculate the share of total income accruing to the highest (top one half of one percent) of the income distribution.[16] Their primary area of interest is the significant increase in the share of income going to the wealthy in the 1980s. The find that most of this was due to a significant rise in 1987 and 1988 of the extreme tail of high income people and that this is consistent with people responding to tax incentives in the Tax Reform Act of 1986 (TRA86). Though they do not put this in an elasticity context, it was certainly consistent with a natural experiment approach. Incomes rose dramatically for the group that had the largest relative cut in its marginal tax rates.

Because only cross-sectional data is available for most of the historical tax changes discussed in this paper, it is important to note at the outset the criticisms raised against this type of analysis. First, in any analysis of the impact of tax changes on reported income, the tax code may change the definition of income as well as the rate. It is basically impossible to maintain constant definitions of income with aggregate data. In existing work that corrects for this problem in the micro data of Feenberg and Poterba, however, the results do not change much.[17]

Second, and more importantly, several analysts have questioned whether people remain in the same income categories across time, as assumed in the natural experiment approach. Slemrod

discusses the potential importance of temporary income and rank reversals for making conclusions about relative income changes.[18] Capital gains income, for example, is often realized in spikes. He finds that the composition of high income groups does have some significant turnover from years to year. Because of this problem, the work of the NTR literature turned to panel data to check whether the elasticities calculated with cross-sectional data would be affected.

Feldstein explores the tax cuts of TRA86 with panel data.[19] TRA86 was another major cut whose largest effect was at the top of the income distribution. Feldstein compares income growth for people in the 49-50 percent brackets, 42-45 percent brackets, and 22-38 percent brackets before TRA86 and found that the incomes of the very rich rose the most and that they were also the group with the biggest tax cut. The resulting elasticities of taxable income averaged between one and 1.5 with some as high as 3.

Feldstein's results were criticized for having only a small number of observations of the highest income people and for not using a statistical method that could indicate the precision of the estimates.[20] Gerald Auten and Robert Carroll, however, using an internal Treasury sample of thousands of high-income tax returns and a regression methodology, were again able to find significant elasticities, though smaller than those in Feldstein.[21] With this non-publicly-available data, they also had information on occupation and other nontax factors as reported on the tax returns and they found that the controls for other factors and the weighting of the sample did make some difference to the results. Their preferred estimates of the elasticity of taxable income was around 2/3.

B. TAX RESPONSIVENESS IN THE 1990S

The work from the 1980s consistently shows large elasticities in a natural experiment context. One lingering concern from such work, however, is the possibility that other factors that are coincidentally correlated with tax changes are, in reality, driving the relative income changes. TRA86 in particular embodied many tax changes, not just marginal rate cuts.[22] Although clearly there need not be a unique elasticity across time, having results from other tax changes that agree with the elasticities from TRA86 would be more persuasive since so much else happened at that time.

Second, a major literature in labor economics, for example, has noted that for reasons unrelated to taxation, income inequality was rising throughout the 1980s.[23] If this pattern extended to the top of the income distribution, this would mean that the NTR experiments examining tax cuts at the top of the distribution suffer from potentially serious upward bias since taxes decreased for the same people whose relative incomes were trending upward.[24]

These facts have made results from the 1990s quite important for evaluating individuals' responses to marginal tax rates. In the 1990s, secular trends in inequality continued but President Bush and later President Clinton *raised* marginal tax rates on high-income taxpayers. Feldstein and Feenberg present a preliminary analysis of the 1993 tax increase on the rich using aggregate cross-sectional tax return data and found that incomes of approximately one million richest taxpayers fell significantly from 1992 to 1993 while incomes of lower income groups rose, indicating a large elasticity.[25] Their work, however, cannot distinguish temporary from permanent shifts, however, a potentially important issue since the 1993 tax increase was announced by Clinton in late 1992, giving people a chance to retime their income.[26]

In my own work, I have turned to executive compensation data from several thousand corporate executives, and showed that as much as 20 percent of the total wage and salary decline of the

top 1,000,000 taxpayers in 1993 came about from a change in the reported incomes of just 10,000 corporate executives (with more than 2 percent from a single individual), and that these changes were driven almost exclusively through a one-time cash out of stock options in late 1992 in anticipation of the higher rates.[27] In these data, the short-run elasticity of income exceeded one, as in other NTR studies, but the elasticity after one year was more like one third or less. The results also indicate that not correcting for secular time trends in inequality creates a substantial bias in the data. Other work using tax return data has tended to bear out the significantly smaller elasticities than those found in the 1980s.[28]

As Slemrod has observed, the implications for government policy if the elasticity is .4 versus 1.4 are tremendous.[29] The marginal deadweight loss will be more than three times higher in the second case, and progressive tax increases are unlikely to raise any revenue. The evidence on the question is conflicting. Results based on the 1980s suggest the elasticity is close to one, or even above. The literature based on the 1990s suggests it is significantly smaller than one. But that is, essentially, all the evidence there is. There is almost no econometric work based on any other time period that can provide perspective on the debate, despite numerous tax changes through time.[30]

V. ESTIMATING ELASTICITIES WITH ONLY AGGREGATE DATA

A. METHOD

I will first try to estimate the elasticity of taxable income using cross-sectional data from tax returns. Of course, natural experiments with these data will suffer from all the standard problems facing cross-sectional data as mentioned above. To get results, I must assume there are no rank reversals. Furthermore, I will be unable to control for changes in temporary income and I will not separate out

different types of income such as capital gains. Later in the paper I will present results from panel data that address and hopefully help resolve some of these problems.

In examining older periods, one must immediately confront the fact that there is no individual level tax return data available that can be used to estimate the elasticity of taxable income. The only data are given by the annual income histograms of the *Statistics of Income.* These data give the number of returns and the total income reported for several income classes such as $50 thousand to $100 thousand, $100 thousand to $200 thousand, and so on.

Unfortunately, the income brackets are fixed in nominal dollars over time. Even if there are no rank reversals, the number of people in each reporting group changes. The data may report that in the starting year there are 1000 people with income over $1 million. Four years later, there may be 1500 people with income over $1 million. It would clearly be wrong to take the mean income in the later year for the same nominal bracket since the composition of the group has changed dramatically. Here, 500 people (assuming no rank reversals) have moved up from a lower income group and will tend to pull down the mean. To calculate an accurate income change for the original 1000 people requires somehow observing the mean income is of the highest 1000 of the 1500 people in the later sample.

Though direct observation is not possible, if the incomes were distributed according to a known distribution, it would be possible to compute the mean incomes of the top 1000 people of the 1500. To make such a calculation, I will extend a common interpolation approach from the literature and assume that income in the later year is distributed according to a Pareto distribution.[31] This means that the probability that an individual's income exceeds I is

$$P(Y > I) = \left(\frac{k}{I}\right)^q,$$

where k and θ are the parameters of the distribution. This distribution has been shown to fit the top of the income distribution quite well in a significant amount of empirical work.[32] As described in the appendix, this distribution can be easily estimated with the I.R.S. histograms and seems to approximate the data well. The key parameter is θ, the shape parameter.

The essence of the approach is straightforward. Say in the starting year there were three brackets: $100,000 to $500,000, $500,000 to $1 million, and over $1 million and in these brackets there were 1000, 5000, and 10,000 people. In the base year one observes the mean income for each of these groups and would like to know what happens to the mean income of these same groups over time. In a later year, say the number of people in the three brackets is 2000, 8000, and 12,000 people and the mean income is observed only for the new, larger groups so it can't be used to calculate the income change. If the incomes making up the later year's histogram are distributed Pareto with known parameters, the formulae derived in the appendix can be used to solve for the new cutoff income levels to be in the top 1000, the next 5000, the next 10,000, and so on, as well as to calculate the mean income of those groups. Assuming no rank reversals, comparing these means to the means in the base year gives a measure of income change and becomes the dependent variable for the regressions relating relative income changes to relative tax changes.

To get the independent variable in the regression, the net-of-tax share for each group in the base year and the later year requires one to deal with the potential endogeneity problem. It is valid to calculate the marginal tax rate based on observed income in the base year since this is before the tax change. However, it is not valid to take the observed marginal tax rate from reported income in the

later year because this is endogenous. Reported income directly affects the observed marginal rate.[33] To get a tax rate that is not endogenous, I take the mean taxable income in the base year and inflate it at the rate of nominal GDP growth to the later year and calculate the marginal tax rate faced by an individual with income as the tax rate facing the group.

In the pre-World War Two samples, the histograms are divided by taxable income so the results account for changes in deductions and the like. For the two experiments after the war, however, the histograms are listed in gross income categories so I have to estimate the Pareto using gross income. To convert gross income to taxable income I assume the ratio of taxable to gross income is constant. Although this rules out tax induced changes to deductions, in the two samples considered, this makes little difference to the results because the ratio remained fairly constant across the experiments. From 1948 to 1952, when the net-of-tax-share for people earning more than $500,000 per year fell by 57 percent, the ratio of taxable to gross income for people in the same nominal bracket only fell from .86 to .83 (these data include only itemizers). From 1962 to 1966, when the net-of-tax share for people earning more than $500,000 per year rose by more than 200 percent, the ratio of taxable to gross income only rose from .78 to .80. This is similar to the findings of Carroll, using an extensive panel data set, that the elasticities estimated with AGI differ by about .1 or less from those using full taxable income.[34]

B.CHECKING THE METHOD: THE TAX REFORM ACT OF 1986

I use the TRA86 as a means of checking whether this approach gives plausible answers and to demonstrate how the method works. Since we have panel data results from TRA86, we have a good idea of what the results should be ahead of time.[35]

Table 1A lists the aggregate data given by the IRS for 1985 and 1989 for all categories above $30,000 of income. The number of returns in each category rises over the sample. There were 17,000 taxpayers with more than $1 million of gross income in 1985 and their average income was almost $2.4 million. By 1989, though, there were 58,000 people with over $1 million. I need to calculate, assuming the same 17,000 people were at the top of the income distribution in 1989, the average income of the top 17,000 of the 58,000 people in 1989.

To do this, I estimate the Pareto on the 1989 data and get a shape parameter of 1.887 (all the Pareto estimates are listed in the appendix table). The standard error was .056, so this parameter is estimated somewhat precisely; the R^2 for the regression was .99, despite only 8 observations.

With this shape parameter, I solve for the new cutoff levels in 1989 for the same grouping as existed in 1985 as derived in the appendix. I list this information in table 1B. To be in the top 17,000 people in 1989 required an income of at least $1.9 million and this group had a mean income of more than $4 million, up from $2.4 million in 1985. The 1989 incomes of people with the same relative rankings as the $100 thousand to $200 thousand group in 1985 had, by 1989, increased to between $159 thousand and $354 thousand and the mean had increased, as well. The 1985 net-of-tax share is calculated from the observed income data before the tax change. The 1989 net-of-tax share comes from growing the 1985 mean income at the rate of nominal GDP growth (30.1 percent over the period) and using that to calculate the 1989 tax rate.

The essence of the NTR approach is to compare the percent change in income for each group to the percent change in the net-of-tax share for the group. The table shows that incomes generally rose most at the top of the distribution where the tax cuts were largest.

I will calculate the elasticities in two ways. The first is a suggestive but less preferable calculation than the second method, as described below. This approach breaks the income distribution into three groups and calculates a relative elasticity rather than estimating a regression. I do this first to parallel the some of the existing work such as Lindsey and Feldstein.

For TRA86, I use people with $30 thousand to $100 thousand, $100 thousand to $500 thousand, and $500 thousand plus (obviously, these are aggregated from the finer histogram data). I compute these elasticities in table 2A.

As described above, the estimate of the elasticity is the difference in changes in log income for the two groups divided by the difference in change in the log net-of-tax shares for the two groups. Comparing the highest to the medium group, for example, the difference-in-differences elasticity is equal to (.487 - .265)/(.365 - .072), or 0.76. Comparing high group to the medium group, the elasticity is 2.07. Comparing the highest to the high group, however, accentuates the weaknesses of the discretely computed approach. The elasticities are often rather sensitive to the income groups chosen and there is no standard error to make statistical tests.[36] Here, comparing the highest to the high group, the tax change goes the wrong way compared to the income change and the elasticity is negative.

To get around these problems and to use all of the information that is available in the histogram data, regression estimates are preferable. In table 2B, I take all of the income categories listed in table 1 and run a regression of the change in log income on the change in log net-of-tax share (i.e., the last two columns of table 1B). Since this in log form, the coefficient on the tax term is a direct estimate of the elasticity of taxable income. Note that this is still the same natural experiment as above but is now using all of the data together to estimate a single elasticity.

The results are listed in column 1. The estimated elasticity is approximately 1 with a standard error of .15. The standard error here is biased downward since the taxable income is calculated using the estimated Pareto distribution as if it were known with certainty. Since the calculation of the log income given θ is a somewhat complex calculation, it is not straightforward to correct the standards errors in the second stage. Instead, to check the robustness of the results to the value of θ, columns 2 and 3 reestimate the regression but using the change in log income based on a θ two standard errors above and two standard errors below the point estimate (the standard errors are listed in the appendix table). The results range from .88 to 1.15 but still show the large elasticity of taxable income.[37] In general, although they are based on data that is much more sparse, these Pareto results give elasticity estimates at least in the ballpark of the existing NTR literature that finds elasticities at or above one.

V. CROSS-SECTIONAL EVIDENCE FROM SIX DECADES OF TAX REFORM

I now apply the Pareto/histogram methodology to examine five major tax reforms from 1920 to 1966. I will purposely avoid using the tax increases during World War I and World War II, although they were sizable, simply because so much else was taking place simultaneously that it would be hard to conclude much about taxable income or labor supply in such periods, particularly during World War II.

In addition to the caveats about using aggregate cross-sectional data mentioned previously, it is also important to note that although most papers seek to estimate "the" elasticity of taxable income, there is no reason to expect that the elasticity should be equal across years or across different types of people.[38] I have tried to choose years sufficiently separated so as to avoid temporary shifting but clearly the existence and ease of use of tax shelters and other avoidance schemes has varied greatly over time. In addition, the natural experiments are not on the same types of taxpayers in each

tax change. In early years of the income tax, only very rich people paid any income tax at all. In later years it was very broad-based. Finally, the tax avoidance technologies of different income groups may be quite different and the sensitivity of high income people to economic fluctuations may be greater, as well, implying that relative elasticities may differ depending on the state of the business cycle or other factors.[39]

Note, too, that any biases arising from changes in income inequality being spuriously correlated with tax changes will lead to bias in these experiments, as well. Trends in income inequality have varied greatly since 1910, however, and my hope is that looking at different decades will help indicate how important this factor is.[40]

The goal of the elasticity calculations here is not to isolate the "true" elasticity. Such a number probably does not even exist. It is, instead, to repeat standard methods on other time periods to get a sense of whether the NTR results from the 1980s are robust or are, instead, outliers.

PERIOD A: 1922 to 1926—TAX CUT

The first income tax was enacted in 1913 amid rancorous debate and only after a constitutional amendment specifically allowed it. A few years later the government relied on the progressive income tax rather heavily to finance its involvement in World War One. Technically, in the years before World War Two, the "income" or "normal" tax referred to the low and generally rather flat rate above some exemption. The progressive portion of the income tax was known as the surtax. It was, however, just an addition to the basic rate and it varied by income level. The marginal rate was the sum of the two.

In the early years of the income tax, the marginal tax rates could get very high at the top of the income distribution. Table 3 lists the maximum marginal tax rate for the decade from 1913 to 1923.[41]

During World War One the top bracket rose as high as 77 percent. Note, however, that at this time the tax code as a whole applied to only a small part of the population and the highest rates applied to a select group indeed. The rate of 77 percent, for example, applied only to income in excess of $1 million (in 1918 dollars!) and only 67 people were in the top bracket.[42] When the war ended, rates did not return to their pre-war levels. Wilson discussed lowering tax rates in his final message to Congress in 1920, but rural opposition among Democrats prevented tax reform in the latter part of his administration.

In 1921, Republican Warren Harding swept into office and Republicans also took control of Congress. The Republicans were traditionally opposed to the income tax and tax reform was viewed as one of the most pressing issues facing the country. Business leaders were somewhat doubtful of Harding's commitment to cutting tax rates but when he appointed Andrew Mellon to be the Secretary of the Treasury, they were ecstatic.[43] Mellon was an inveterate proponent of reducing tax rates. His 1924 book, *Taxation: The People's Business* bears striking resemblance to the arguments of the 1980s. In it he advocated lower surtaxes to encourage high-income people to stop wasting effort avoiding taxes through shelters, municipal bonds, and so on and, instead, start investing productively. He argued that high tax rates and serious progressivity outside of war-time were both inefficient and anti-American. At one point he summarizes by saying, "if the price is too high, the tax payer, through the many means available, avoids a taxable income and the Government gets less out of a high tax than it would out of a lower one."[44]

Republicans would succeed in reducing taxes in the Revenue Act of 1921 but the biggest cuts would take place in 1924 and 1925 under the leadership of Calvin Coolidge (Harding had died of an embolism while in office). Coolidge was an anti-tax Republican who wanted rates reduced.[45] From

1922 to 1926, the top marginal tax rate fell from 58 percent to 25 percent. Because these tax changes flattened the rate structure, they created a natural experiment not unlike the one in 1986. They gave a general tax cut but the cut was largest for the top of the income distribution. Table 4A summarizes the actual taxes for a variety of incomes points in 1922 and 1926.

The 1920s may have been similar to the 1980s in the potential bias arising from rising income inequality, as well. It has been the claim of several analysts that the 1920s were a period of rising income and wealth inequality.[46] Unfortunately, most of the data on the subject seems to come from tax records, so it does not give an independent source of information. The data of Goldin and Katz suggests that inequality may not have risen much in the 1910s and 1920s, but if there were a secular trend in inequality in this sample, it would likely lead to an upward bias in the estimated elasticity for the same reasons as in the 1980s—tax cuts and non-tax-related income trends moving in the same direction.[47]

For the difference-in-difference computations, I choose the two years before and after the marginal rate changes of 1924. I divide the tax payers into three groups. The very high group will be those with more than $100,000 of income per year in 1922, the high group will be those with $50,000 to $100,000, and the medium group will be those with $25,000 to $50,000. Adjusted using GDP deflators, even the lowest income group would be greater than $250,000 per year in 1996 dollars.[48] The tax rate is calculated by increasing initial incomes by the 33.6 percent growth rate of nominal GDP over the period. As Table 4B outlines, the net-of-tax share rose most for the highest in the income distribution and so did reported incomes. Using the shape parameter for 1926 from the appendix, the difference-in-differences elasticities listed at the bottom of the table illustrate somewhat large estimates. Two of the implied elasticities are around .6 to .7 and one is about 1.2.

Switching to the more preferred regression method to directly estimate the elasticity using the entire histogram of income categories with at least $5,000 per year, the results are shown in column 1 of table 4C.[49] The coefficient is the estimate of the elasticity and it is .58 in this period. In column 2, I examine only income categories of at least $25,000 per year and the elasticity is almost the same at 0.53. Columns 3 and 4 demonstrate that the elasticity estimates are quite robust to choices of the shape parameter. Changes in log income calculated using shape parameters two standard errors high (in column 3) or lower (in column 4) yield elasticities in the range of .52 to .64. While these elasticities are not as large as those in the NTR literature, they a significantly greater than zero.

PERIOD B: 1931 TO 1935—TAX INCREASE

In 1929, the United States economy began to collapse as the great depression began. Quickly, the government began to run budget deficits as incomes around the country fell rapidly. While some argue that President Hoover privately believed that getting out of the depression would require some deficit spending, Congressional leaders and influential members of the popular press such as Walter Lippmann continuously denounced the unbalanced budgets.[50] When the Federal Reserve produced a monetary contraction in 1931, Hoover feared that deficit spending would increase the competition between the government and private borrowers and worsen the credit crunch and that the deficits were the source of market fears about the U.S. dollar (Brownlee, 1996). In 1932, Hoover raised taxes to try to reduce the deficit. The rate increases were very progressive. Table 5A gives a summary of the tax code for selected income categories in 1931 and 1935. Here again, there is a natural experiment, if one is willing to argue that different groups are valid controls for one another.

I look at the change from 1931 to 1935. Over this period, nominal GDP fell by about 5% and the number of high income tax returns fell, too. I purposely avoid using the base year as 1929 or 1930 because the output drops were much more dramatic in those years. As a result, there are also some of the tax increases of the Roosevelt administration in the experiment (as described in the next experiment).

Since nominal GDP growth was negative and the number of taxable returns fell, the Pareto/histogram method here is a bit different from the others. The normal method needs to be, in some sense, run in reverse. Rather than calculating what share of people from a lower group moved up into the higher group, now I must calculate what share of the higher group fell into the lower group in order to calculate the new mean. The interpolation procedure is the same, however.

For the difference-in-differences computation approach, I divide the groups into the $25,000 to $50,000, $50,000 to $100,000, and $100,000 plus. The tax rate change is only large for the highest group. Among the other two, the tax change was very similar so the elasticity is quite unstable (the denominator is close to zero) so I do not report an elasticity between the two. The results, reported in table 5B, show that incomes did fall most for the highest income people, the people with the greatest fall in net-of-tax share. The magnitude, however, is relatively modest. The implied difference-in-differences elasticities of taxable income are between a quarter and a third.

The regression results using all the data are reported in table 5C. They also show modest responses. The elasticity for people with at least $5,000 of income is listed in column 1, for people with at least $25,000 in column 2. They put the elasticity at .21 and .27, respectively. Even allowing for the two standard error change in the shape parameter when calculating the change in log income (results reported in columns 3 and 4) the elasticities are between .15 and .3. All of these are quite modest compared with results from the 1980s.

Further, they may be biased upward by the narrowing inequality of the 1930s since the relative tax increases were largest for the rich.[51] On the other hand, it is possible that high income people are more responsive to demand conditions and that this is contributing to a lower elasticity.

PERIOD C: 1934 TO 1938—TAX INCREASE

In 1933, Franklin Roosevelt took office and the Democrats took control of congress. Over the 1934 to 1938 period, national output did rise at somewhat normal rates but, clearly, from a much reduced base. Roosevelt needed money to fund many government programs. Further, there was considerable public pressure for redistribution from the wealthy. Roosevelt proposed a sharp increase in progressive taxation along with a steep inheritance tax, gift taxes, and an increase in corporate income taxes. Opponents reacted vociferously. William Randolph Hearst instructed the editors of the newspapers he owned to, from that point forward, refer the New Deal as the Raw Deal, and to reference the tax plan as Roosevelt's attempt to "soak the successful."[52] The Revenue Act of 1935 passed, however, by a comfortable majority and the top rates rose substantially as illustrated in the summary in table 6A. The top surtax rate rose from .59 to .75.

Part of the Roosevelt tax program was also to be more aggressive about tax enforcement. Indeed, the Treasury even prosecuted the former Secretary of the Treasury Andrew Mellon for tax evasion! He was found innocent of evasion, but was forced to pay $400,000 for "mistakes" he had made in his favor.[53] Since this occurred simultaneously with the rate increase, this might tend to bias elasticities downward.

I choose the two years before and the two years after the increase in rates of 1936.

In the natural experiment computation, I again divide the sample into the three high-income groups. Unlike the 1931 to 1935 period, there were increasing numbers of returns in this period so the method described in the appendix works fine. As table 6B indicates, the decrease in log net-of-tax share was virtually identical for the $50,000 to $100,000 group and the $100,000 plus group so I do not calculate the difference-in-differences elasticity between the high and the very-high groups. That said, it is apparent from looking at the income numbers that the experiment here is not consistent with a positive elasticity. The tax increase is biggest for the rich but their reported incomes grew the fastest. According to the natural experiment methodology, this yields a *negative* elasticity of taxable income. At the least, there is no evidence from this tax increase of a sizable positive elasticity of taxable income.

The regression estimates, reported in table 6C, confirm this negative elasticity with the full histogram data for people with at least $5,000 in column 1 and at least $25,000 in column 2. Either way, the elasticities are fairly negative at -.55 and -.83. Varying the shape parameter when calculating the change in log income, as reported in columns 3 and 4, does not change the estimated elasticity much at all. It ranges from -.5 to -.6. Recall, too, the evidence of Goldin and Katz that inequality was falling in this period. If anything, this should have been contributing an *upward* bias to the estimates here because relative income changes were moving in the same direction as the relative tax changes. Perhaps the increase in enforcement can explain the perverse results. It was also the case that corporate rates rose from .1375 to .19 so some of the shift might be people trying to shift income out of corporate form.[54]

PERIOD C: 1948 TO 1952—TAX INCREASE

In World War II, the income tax became much broader and by 1945 applied to a large majority of people. Marginal tax rates had risen dramatically to help fund the war. After the war, Republicans controlled Congress while Democrat Harry Truman occupied the White House. The fought acrimoniously over many things, including tax policy. The President wanted to retire war debt while Republicans wanted to cut taxes. In 1947, Truman vetoed the Republicans' tax reduction bill. According to some, this made him the first President in modern history to openly oppose a tax-relief measure.[55] Eventually, the Revenue Act of 1948 did reduce marginal rates but the top rate was still over 82 percent in 1948, as outlined in table 7A. In 1950 and in 1951, to help pay for the Korean War, marginal rates rose and in a progressive way. While increasing rates from 82 percent to 92 percent may not seem drastic, the impact on net-of-tax share is quite high. For someone earning over $400,000 per year, the after tax share was cut more than in half between 1948 and 1951, falling from about .18 to .08. This should cause a noticeable change in the relative incomes of high income people. The estimated elasticity may even be biased upward by income inequality trends.[56] At the same time, though, there was a sizable increase in the corporate tax rate (.38 to .52) that might have lead people to shift income out of the corporate sector.

For the difference-in-differences computations, I choose two years before (1948) and one full year after (1952) the two year tax increase of 1950-1951 as the points of reference. For the three income groups I use $50,000 to $100,000, $100,000 to $500,000, and $500,000 plus. The results are presented in table 7B. The net-of-tax share fell most for those with highest income. Consistent with the NTR theory, the highest group also had the smallest increase in income. The magnitudes, however, are again quite modest in elasticity terms. The implied elasticities of taxable income range from .03 to .4. The full regression results presented in table 7C the complete histogram for incomes at least

$15,000 in column 1 and at least $30,000 in column 2 confirm these magnitudes. The estimated elasticities are less than .16 in both cases and not significantly different from zero in the second column. Checking the robustness to varying the shape parameter in columns 3 and 4 gives almost identical estimates around .15. Here again there seems to be a rather modest effect of tax policy.

PERIOD D: 1962 TO 1966—TAX CUT

In 1964-5, President Kennedy's economic advisors wanted a Keynesian stimulus for the economy. There had been a mild recovery after the 1960-61 recession but economic growth seemed to slow. Kennedy's CEA Chairman Walter Heller supported lowering the high marginal tax rates but the Secretary of the Treasury Douglas Dillon favored a balanced budget.[57] The President was not sure about the timing of the cut, so the elimination of the high marginal rates was postponed into the Revenue Act of 1964. Given the prevailing rate structure, this flattening of the income tax caused a rather substantial change to the progressivity of the tax code and served as another major natural experiment, as described in the tax code summary table tables 8A. The net-of-tax share for the highest income taxpayers rose from .09 in 1963 to .23 in 1964 and .30 in 1965 as a result of the Revenue Act of 1964. In log terms, this was a very dramatic tax cut.

In the difference-in-differences computation, reported in table 8B, I again use the categories $50,000 to $100,000, $100,000 to $500,000, and $500,000 plus. Note that despite the major cut in the income tax at the top of the income distribution, there is not a noticeably larger increase in the reported taxable income for that group. The second highest income group has a larger increase, despite a smaller increase in net-of-tax share. In any of the combinations, the elasticities are very close to zero and two are actually negative. The regression results using the full data, reported in table 8C, confirm

the idea that the elasticity is small when looking all groups of at least $20,000 in column 1 and at least $50,000 in column 2 (the IRS changed the number of reported brackets in this period, hence the smaller number of observations). The elasticity is almost exactly zero in both cases and the standard errors are not large. Allowing for variation in the shape parameter, as reported in columns 3 and 4, again yields elasticities very close to zero. One factor that may contribute to a downward bias in this case is the fact that income inequality was falling in this period.[58]

SUMMARY AND DISCUSSION

Taken as a whole, these five natural experiments using cross-sectional data suggest that the elasticity of taxable income in response to most of the major tax changes in U.S. history were not nearly as large as those estimated from the 1980s. In the regression analyses, the largest elasticity was less than .6 with the average being much smaller. The sizable behavioral responses estimated in the literature based on the tax changes of the 1980s, where an elasticity of .7 is something of a lower bound, are quite atypical in the historical context. This may reflect a true elasticity in the 1980s that was much higher than in previous periods because of institutional or other factors but, perhaps more plausibly, it might reflect the importance of various biases in the 1980s estimates.

It is important to note that this is not meant to imply the elasticity of taxable income is zero. Most of the results so far indicate a positive elasticity suggesting that there should at least some element of dynamics in revenue estimates. This is more important, the higher is the marginal rate. The behavioral responses, however, at least in these historical periods, are substantially smaller than claimed in the recent literature.

As discussed at the outset, the estimated elasticities of taxable income cannot be used to calculate whether a given tax change raised or lowered revenue. To give some idea about magnitudes, however, it is instructive to observe that if there were only one rate in the tax code, the revenue maximizing tax rate given the elasticity estimated using 1985-89 data (column 1 of table 2B) would be only about .42. It would be .63 using 1922 to 1926, .83 using 1931 to 1935, .86 using 1948 to 1952, and .98 using 1962 to 1966 (and, technically at the maximum of 100% using 1934 to 1938 since the elasticity was negative). These are quite high rates, well in excess of average rates on high income people in these time periods but marginal rates on the very highest income brackets sometimes did reach these levels. Note that this is not in any sense the "optimal" tax rate. The fact that efficiency costs rise with the square of the tax rate are likely to make the optimal rate well below the revenue maximizing rate, even in a very simple tax code.

VI. PANEL DATA ON HIGH-INCOME CORPORATE EXECUTIVES

To address some of the concerns raised in the previous results because they were based on aggregate, cross-sectional data, I will turn here to panel data from two distinct time periods. Unfortunately, the panels of tax return data that have been available for study in the 1980s and 1990s simply do not exist for earlier time periods. Following on previous work, however, there are some panel data sources on high-income CEOs of major corporations. SEC regulations require all companies to report the compensation of the five highest paid employees each year in their proxy statements.[59] Although the potential universe of such declarations covers the entire time period, it is difficult to locate such statements well after the fact.

In two time periods, however, there are readily available data. First, the well known Forbes survey of executive compensation began in 1970 and in 1971 and 1972, the top marginal rate on earned (non-capital) income fell from 70 to 60 and then to 50 percent.

Second, soon after the introduction of the SEC regulations in 1934, the government (as part of a Work Projects Administration project) began collecting and publishing the executive compensation information along with balance sheet data for the major corporations of the United States in the *Survey of Listed American Corporations*. This is the same data used by Charles Hadlock and Gerald Lumer.[60] The data cover the same 1934 to 1938 period in one of the cross-sectional experiments described above.

There are advantages and disadvantages to using compensation data to estimate behavioral responses to taxation. The advantage is that there are large numbers of high income people, the income definitions are consistent over time, it is a panel, and it is possible to control for firm level factors in the compensation regressions. The disadvantage is that there is no information about deductions or about other forms of income so there is bound to be error in the imputed marginal tax rates. The results from more recent data suggest that this was relatively unimportant in the recent executive compensation data, but there is no way to know for these earlier time periods.[61]

These data suffer from the additional problem that they report only direct compensation and not stock or stock options. Given the rise of stock options, this is a much more important issue now than in earlier periods but is certainly a potential issue.[62]

To get a marginal tax rate for the first year for each executive, I take the executive's income in the period before the tax change and use that as taxable income. To get the marginal tax rate for other years in a way that is not endogenous, I will use one of two measures. I will use the standard approach

and take the executive's salary in the first period and inflate it at the rate of nominal GDP growth and use the tax rate from that income level. I will also calculate the tax rate using the executives predicted pay using solely the firm's or individual's subsequent performance and characteristics.

EXECUTIVE COMPENSATION: 1970 TO 1974

The tax cut of the early 1970s was not a typical rate cut. It lowered the marginal rate only on earned income. This was quite relevant for corporate executives, however, since so much of their income comes as wages and salaries. As table 9A shows that from 1970 to 1973 the net-of-tax share at the top of the income distribution rose substantially for wage and salary income. For anyone below about $90,000 in 1971 or $50,000 in 1972, there was no change at all because their marginal rates were below the new caps. This ought to generate the standard NTR natural experiment by creating larger incentives to shift non-taxable income back into salary form for the higher income executives.

Table 9B presents summary statistics for the compensation of CEOs in this sample. With a mean income of more than $150,000, these executives were obviously quite rich. Their incomes in 1970 ranged from $32,000 to $757,000, though, so there was variation in the amount of earned income across peoples.

To examine the tax hypothesis, I estimate a regression for wage, salary, and bonus executive compensation using four years of data from the Forbes surveys. Information on the firms is relatively limited in these early years of the survey, including only the number of employees, the age of the CEO, and the tenure of the CEO. I estimate a regression for the income of executive j in year t of the form

$$\ln(Y_{jt}) = a_j + b \ln(1 - t_{jt}) + \Gamma' Z_{jt} + d_t + e_{jt},$$

where Y is income, α is an individual fixed effect, τ is the individual's marginal tax rate in year t, Z is a vector of firm specific variables including age and age squared, tenure as CEO and tenure squared, and the log of the number of employees in the year, δ is a year effect, and ε is an error term. When there are year dummies in the specification mean that this is the regression equivalent of the natural experiment results. In that case the results are identified off of cross-sectional variation in the change in tax rates across different executives within a given year. In specifications where I do not include year dummies, I include the real growth rate of GDP.

The regressions are reported in table 9C. Columns 1 and 2 use the tax rates calculated by inflating at the nominal GDP growth rate. Columns 3 and 4 use tax rates calculated using predicted income based on the number of employees, the CEO age, age squared, tenure, and tenure squared in later years. In all four cases, there appears to be at most, rather modest effects of taxation on the taxable component of CEO salaries. In the pure natural experiments (regressions including year dummies), the elasticities are actually negative, suggesting that the highest executives had the biggest tax cuts but the smallest salary increases. Without the year dummies, the elasticities are less than .25. It is possible that the Nixon wage price controls during part of this sample, provided at least some constraint on salary growth for high income executives relative to other executives. Overall, however, executives' nominal incomes rose by almost 10 percent per year during this time period so these pressures may not have been too great.

EXECUTIVE COMPENSATION: 1934 TO 1939

In the 1930s, as noted above, there were some large increases in marginal tax rates for high income tax payers. Using the panel data of Hadlock and Lumer, I examine the role that these taxes

appeared to play in the compensation of corporate executives over this period. The sample is drawn from the universe of firms with returns data at the end of May 1933 on the Center for Research and Security Prices (CRSP) New York Stock Exchange (NYSE) monthly tape that were also listed in the Moody's Industrial Manual for 1933 and had book value of assets greater than $20 million. There were extremely high firm survival rates in the sample (only six firms exited) and the turnover of management was low by modern standards.

The compensation data for these companies comes from the *Survey of American Listed Corporations* for the years 1934 to 1938, spanning the same tax change described in one of the natural experiments above. The survey was a Work Projects Administration program supervised by the Securities and Exchange Commission to report compensation and balance sheet data for publicly traded firms. The data report the direct compensation of the highest paid employee. Hadlock and Lumer track the timing of top management changes in the sample so it is possible to create an (unbalanced) panel of high income executives. There were 298 such executives at various points in the sample. Table 10A illustrates that their incomes in 1934 were very high. The average salary and bonus exceeded $70,000 (about $840,000 in 1998 dollars).

Table 10B gives the marginal rates for people in the relevant income ranges. The tax increase was very progressive. If there is a large behavioral response to taxation among high-income people, the reported incomes of the highest paid group of executives should rise at slower rates than the lower paid executives as they shift more income out of non-taxable forms.

To estimate the effect of taxes on reported compensation, I regress the same specification as for the Forbes CEO data above but with different firm level controls. Here, I have the log of market value for the firm, the annual return for the firm, and, in specifications without year dummies, the annual return

for the market and the real GDP growth rate. We might imagine that good controls for firm and market performance would be important since this was taking place during turbulent economic times. Again I calculate the tax rate using the nominal GDP growth rate on their income at the start of the sample and also with income predicted using firm performance.

The results are listed in table 10C. The panel evidence does not show a sizable elasticity of taxable income. Three of the four specifications are negative and even in the one that is not (column 1), the elasticity is only .28. The data suggest that although taxes rose most for the very rich, in this sample there is little evidence that their relative incomes declined. Indeed, they may well have risen.

VII. Conclusions

This paper has used evidence from seven different tax changes since 1922 to examine the evidence in support of the high-income Laffer curve and the New Tax Responsiveness Literature. While that work emphasizes the potential importance of behavioral responses to marginal tax rates, the results in this paper suggest that the evidence on which those conclusions are based—evidence from the 1980s—is atypical in the historical experience. Using the same methods that NTR authors have used for the 1980s, the elasticities of taxable income calculated for other tax changes seem to be much more modest with several indistinguishable from zero. This is true in the aggregate cross-sectional tax return data as well as in panel data on executive compensation. The largest estimates of the taxable income elasticity from all of the previous historical periods is lower than the smallest estimates of the elasticity in the literature based on the 1980s. Given the importance of the behavioral response to taxation, it is my hope that this will stimulate further research on the topic using data outside of conventional tax returns in the 1980s and 1990s.

The notion that governments could raise more money by cutting rates is, indeed, a glorious idea. It would permit a Pareto improvement of the most enjoyable kind. Unfortunately for all of us, the data from the historical record suggest that it is unlikely to be true at anything like today's marginal tax rates. It seems that, for now at least, we will have to keep paying for our tax cuts the old fashioned way.

APPENDIX: INCOME STATISTICS AND THE PARETO DISTRIBUTION

Statistical discussions of the Pareto distribution can be found in Johnson and Kotz (1970). The distribution function of the Pareto is

$$P(x \leq X) = 1 - \left(\frac{k}{X}\right)^q$$

so the density is

$$f(x) = -q \;\; k^q x^{-q-1}.$$

A. Estimating the Pareto Distribution

There are three steps needed to calculate the income statistics used in the results. First, it is necessary to estimate the Pareto parameters using the histogram data. To do this, I follow the method described by Johnson and Kotz.[63] For any income cutoff, L, call the number of observations in the data with income greater than the cutoff, N_L. Using the distribution function, we know that this number is

$$N_L = \left(\frac{k}{L}\right)^q N,$$

where N is the total number of observations in the full sample.

The histogram gives a set of data on the number of observations greater than each income level listed in the histogram. The parameter θ can be estimated directly by using these observations within a given year to estimate the regression.

$$\ln(N_L) = a - q \ln(L) + e.$$

Since the constant term is actually a function of N, k and θ, it would be easy to solve for the implied value of k but the elasticity calculations will use only the value of θ so I do not bother.

The estimates for the years used in this paper are listed in the appendix table. The fit of the data is extremely good with the typical R^2 exceeding .99 and the predicted mean incomes match quite well to the observed means. This is, perhaps, not surprising since the Pareto has long been known to fit the top of the income distribution well.

B. Calculating the New Income Brackets

The second step, given the value for the shape parameter θ, is to find the new cutoff levels for the original income groups. There are two types of groups to consider. The first is the highest group. This group starts with incomes on an interval [L*, ∞], say over $100,000 in the base year. Let the size of this group be N_t in the base year and N_{t+1} in the later year (where $N_{t+1} > N_t$). To calculate the lower bound, L, on the incomes of the richest N_t people (among the N_{t+1} now in the bracket), take the share of the later year bracket that are comprised of the original group, N_t / N_{t+1}, and then solve for L to match this probability according to the ratio that comes from the original Pareto distribution function,

$$\frac{N_t}{N_{t+1}} = \frac{(k/L)^q}{(k/L^*)^q}.$$

The second type of group has income in the interval [L*, H*], say between $100 thousand and $200 thousand. In the later year, some people will have added from below and some people will have moved up into the higher bracket. Call the number of people in the interval [L*, H*] before the tax change M_t and the number of people after the change is M_{t+1}. We know from the first calculation that $N_{t+1} - N_t$ people from this income group must have moved into the group above. The upper bound, H, on the interval for the group in question is, therefore, the lower bound previously calculated for the higher group. The more difficult question is what is the lower bound cutoff income, L, such that there

are exactly M_t in the interval [L, H]. To calculate this number, note that the probability that x is in [L*, H*] is

$$P(H^* \geq x > L^*) = \left(\frac{k}{L^*}\right)^q - \left(\frac{k}{H^*}\right)^q .$$

The share that was in that same group originally (i.e., did not rise up from below or move up into the group above) can then be matched to the probabilities of observing these shares to yield L according to

$$\frac{M_t - (N_{t+1} - N_t)}{M_{t+1}} = \frac{\left(\frac{k}{L}\right)^q - \left(\frac{k}{H^*}\right)^q}{\left(\frac{k}{L^*}\right)^q - \left(\frac{k}{H^*}\right)^q} .$$

C. Calculating the New Mean Incomes

Given the cutoffs for the new income brackets, the final step is to calculate the mean incomes of the groups in the later year. Again there will be two types of groups. To get the mean income of people for the highest group where people have with income greater than L (the lower bound calculated in part B). This will be

$$E[x \mid x > L] = \frac{\int_L^\infty -xq \;\; k^q x^{-q-1} dx}{\left(\frac{k}{L}\right)^q} = L^q \left(\frac{q}{1-q}\right) x^{1-q} \Big|_L^\infty .$$

$$= L\left(\frac{q}{q-1}\right) . \qquad \text{(A)}$$

For incomes in a lower group in a closed interval [L, H], the expected value will be

$$E[x \mid H \geq x > L] = \frac{\int_L^H -xq \;\; k^q x^{-q-1} dx}{\left(\frac{k}{L}\right)^q - \left(\frac{k}{H}\right)^q} = \frac{\left(\frac{q}{1-q}\right) x^{1-q} \Big|_L^H}{\left(\frac{1}{L}\right)^q - \left(\frac{1}{H}\right)^q} = \left(\frac{q}{q-1}\right)\left[\frac{\left(\frac{1}{L}\right)^{q-1} - \left(\frac{1}{H}\right)^{q-1}}{\left(\frac{1}{L}\right)^q - \left(\frac{1}{H}\right)^q}\right]$$

$$= HL\left(\frac{q}{q-1}\right)\left[\frac{L^{q-1} - H^{q-1}}{L^q - H^q}\right]. \qquad \text{(B)}$$

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TABLE 1A: Adjusted Gross Income Histograms, 1985 and 1989[a]

Income Group	Tax Returns 1985	Total Income 1985	Tax Returns 1989	Total Income 1989
30-40	11,635	402,942	12,100	420,231
40-50	6,702	297,914	8,590	389,689
50-75	5,629	333,710	9,921	594,483
75-100	1,263	107,424	3,059	261,107
100-200	909	119,200	2,090	276,331
200-500	238	68,986	613	179,115
500-1,000	41	27,541	116	78,516
1,000+	17	40,100	58	151,465

Source: *Department of the Treasury, Statistics of Income* (1985, 1989).

[a] All numbers in this table are in thousands. Incomes are in current dollars.

Table 1B: Income Growth Estimated Using Pareto Method[a]

Income Groups: 1985 [b]	Income Groups: 1989 (Pareto) [c]	Mean Income 1985 [d]	Mean Income: 1989 (Pareto) [e]	Change in Ln(Income) [f]	Change in Ln(1-t) [g]
30 – 40	38 – 52	35	44	.232	-.041
40 – 50	52 – 66	44	58	.272	.072
50 – 75	66 – 106	59	82	.322	.150
75 – 100	106 – 159	85	127	.402	.144
100 – 200	159 – 354	131	221	.521	.197
200 – 500	354 - 1,000	290	527	.598	.365
500 - 1,000	1000 - 1,916	672	1319	.675	.365
1,000+	1,916+	2359	4077	.547	.365

Source: Author's calculations using data from the *Department of the Treasury, Statistics of Income* (1985, 1989).

[a] Income numbers are in thousands of current dollars.

[b] Income groups as reported in 1985. The number of returns in each group are listed in Table 1A.

[c] Income groupings, assuming no rank reversals, of the same tax returns in 1989 as calculated by the Pareto method described in the appendix.

[d] Calculated from table 1A.

[e] As calculated using the Pareto method on the 1989 histogram data.

[f] The change in log income is the log of the fourth column minus the log of the third column.

[g] The change in the log net-of-tax share for each group is calculated as described in the text.

Table 2A: Natural Experiment, 1985-1989 Tax Change[a]

	Number of Returns [b]	Income Group 1985	Mean Income 1985 [c]	Mean Income 1989 (Pareto) [d]	Change in Ln(Income)[e]	Change in Ln(1-t)[f]
A	25,229	30 – 100	45.3	59.0	.265	.072
B	1,147	100 – 500	164.1	277.2	.525	.197
C	58	500 +	1,166.2	1,898.1	.487	.365

Comparison: [g]	**Elasticity**[h]
C vs. B	-0.22
B vs. A	0.76
C vs. A	2.07

Source: Author's calculations using data from the relevant issues of the *Department of the Treasury, Statistics of Income.*

[a] The elasticities listed in the bottom panel are based on the data in the top panel using the method described in the text. Nominal GDP in the later years was 1.301 times nominal GDP in the base year. The shape parameter, θ, used in the Pareto method was 1.887, as listed in the appendix. Income variables are in thousands of current dollars.

[b] The number of tax returns (in thousands) is from 1985.

[c] Mean income in 1985 calculated for the income group listed in the second column.

[d] Mean income in 1989 calculated using the Pareto method described in the appendix.

[e] The change in log mean income for each group from 1985 to 1989.

[f] The change in log net-of-tax share for each group calculated as described in the text.

[g] Groups being compared as listed in the top panel.

[h] Difference-in-differences elasticity calculated as $(\Delta\ln(\text{income}_I)-\Delta\ln(\text{income}_j))/(\Delta\ln(1-t_I)-\Delta\ln(1-t_j))$

Table 2B: Regression Results Using Income Category Data: 1985-1989 Tax Change[a]

Independent Variable	(1) Baseline	(2) Higher θ	(3) Lower θ
Change in Ln(1-t)	1.003	.875	1.149
	(.878)	(.193)	(.141)
Constant Term	.243	.250	.235
	(.038)	(.048)	(.035)
Number of Income Categories	8	8	8
R^2	.88	.77	.92

Source: Author's regressions using data from the relevant issues of the *Department of the Treasury, Statistics of Income.*

[a] The elasticities listed in the bottom panel are based on the data in the top panel using the method described in the text. Nominal GDP in the later years was 1.301 times nominal GDP in the base year. The shape parameter, θ, used in the Pareto method was 1.887, as listed in the appendix. Income variables are in thousands of current dollars.

Table 3: Top Marginal Tax Rate 1913-1923[a]

Year	Top Marginal Rate
1913	7
1914	7
1915	7
1916	15
1917	67
1918	77
1919	73
1920	73
1921	73
1922	58
1923	58

Source: Pechman (1984) and *Department of the Treasury, Statistics of Income* (1940)

[a] These are the top marginal tax rates including both the normal and the surtax for the given year.

Table 4A: Marginal Tax Rates For Selected Income Levels, 1992-26[a]

Income Levels	Marginal Rate 1922	Marginal Rate 1926
$5,000	.08	.03
$10,000	.10	.06
$25,000	.18	.12
$50,000	.31	.18
$100,000	.56	.25
$500,000	.58	.25
$1,000,000	.58	.25

Source: *Department of the Treasury, Statistics of Income* (1940)

[a] These are the top marginal tax rates including both the normal and the surtax for the given year. Incomes listed are in current dollars for the year in question.

Table 4B: Natural Experiment 1922-1926 Tax Change[a]

	Number of Returns[b]	Income Group 1922	Mean Income 1922[c]	Mean Income 1926 (Pareto)[d]	Change in Ln(Income)[e]	Change in Ln(1-t)[f]
A	121,250	25-50	34.1	48.1	.346	.048
B	25,841	50-100	67.1	104.0	.439	.124
C	1,146	100+	221.5	441.6	.690	.556

Comparison:[g]	**Elasticity**[h]
C vs. B	0.58
B vs. A	0.68
C vs. A	1.22

Source: Author's calculations using data from the *Department of the Treasury, Statistics of Income.*

[a] The elasticities listed in the bottom panel are based on the data in the top panel using the method described in the text. Nominal GDP in the later years was 1.336 times nominal GDP in the base year. The shape parameter, θ, used in the Pareto method was 1.619, as listed in the appendix. Income variables are in thousands of current dollars.

[b] The number of tax returns is from 1922.

[c] Mean income in 1922 calculated for the income group listed in the second column.

[d] Mean income in 1926 calculated using the Pareto method described in the appendix.

[e] The change in log mean income for each group from 1922 to 1926.

[f] The change in log net-of-tax share for each group calculated as described in the text.

[g] Groups being compared as listed in the top panel.

[h] Difference-in-differences elasticity calculated as $(\Delta\ln(\text{income}_I)-\Delta\ln(\text{income}_j))/(\Delta\ln(1-t_I)-\Delta\ln(1-t_j))$

Table 4C: Regression Results Using Income Category Data: 1922-1926 Tax Change[a]

Dependent Variable	(1) Baseline	(2) High Income	(3) High θ	(4) Low θ
Change in Ln(1-t)	.581	.528	.528	.643
	(.112)	(.179)	(.075)	(.160)
Constant Term	.292	.320	.289	.294
	(.043)	(.080)	(.028)	(.061)
Number of Income Categories	7	5	7	7
R^2	.84	.74	.91	.76

Source: Author's regressions using data from the *Department of the Treasury, Statistics of Income.*

[a] The standard errors are in parentheses. The dependent variable in each regression is the change in log income for each income group as calculated using the Pareto method described in the text. The shape parameter, θ, used in the Pareto method is estimated in the appendix table for columns (1) and (2). In column (3) it is two standard errors larger, in column (4), two standard errors smaller. The sample includes all groups with at least $5,000 in income in 1922 except column (2) which includes those with at least $25,000.

Table 5A: Marginal Tax Rates For Selected Income Levels, 1931-1935 [a]

Income Level	Surtax 1931	Surtax 1935
$5,000	.02	.08
$10,000	.06	.11
$25,000	.12	.21
$50,000	.18	.34
$100,000	.25	.56
$500,000	.25	.61
$1,000,000	.25	.63

Source: *Department of the Treasury, Statistics of Income* (1940)

[a] These are the top marginal tax rates including both the normal and the surtax for the given year. Incomes listed are in current dollars for the year in question.

Table 5B: Natural Experiment 1931-1935 Tax Change[a]

	Number of Returns[b]	Income Group 1931	Mean Income 1931[c]	Mean Income 1935 (Pareto)[d]	Change in Ln(Income)[e]	Change in Ln(1-t)[f]
A	121,250	25-50	33.8	33.8	.00	-.01
B	25,841	50-100	67.4	64.4	-.05	-.02
C	1,146	100+	244.7	204.3	-.18	-.59

Comparison:[g]	**Elasticity**[h]
C vs. B	0.24
B vs. A	0.31
C vs. A	--

Source: Author's calculations using data from the *Department of the Treasury, Statistics of Income.*

[a] The elasticities listed in the bottom panel are based on the data in the top panel using the method described in the text. Nominal GDP in the later years was 0.952 times nominal GDP in the base year. The shape parameter, θ, used in the Pareto method was 1.816, as listed in the appendix. Income variables are in thousands of current dollars.

[b] The number of tax returns is from 1931.

[c] Mean income in 1931 calculated for the income group listed in the second column.

[d] Mean income in 1935 calculated using the Pareto method described in the appendix.

[e] The change in log mean income for each group from 1931 to 1935.

[f] The change in log net-of-tax share for each group calculated as described in the text.

[g] Groups being compared as listed in the top panel.

[h] Difference-in-differences elasticity calculated as $(\Delta\ln(income_I)-\Delta\ln(income_j))/(\Delta\ln(1-t_I)-\Delta\ln(1-t_j))$. The C vs. A experiment is not listed because the change in log net-of-tax shares are almost identical for the two groups so the denominator is close to zero.

Table 5C: Regression Results Using Income Category Data: 1931-1935 Tax Change[a]

Dependent Variable: Change in Ln(Income)	(1)	(2)	(3) Higher θ	(4) Lower θ
Change in Ln(1-t)	.210	.272	.298	.154
	(.087)	(.135)	(.070)	(.148)
Constant Term	.001	.026	.012	-.009
	(.043)	(.071)	(.035)	(.073)
Number of Income Categories	8	7	8	8
R^2	.49	.45	.75	.34

Source: Author's regressions using data from the *Department of the Treasury, Statistics of Income.*

[a] The standard errors are in parentheses. The dependent variable in each regression is the change in log income for each income group as calculated using the Pareto method described in the text. The shape parameter, θ, used in the Pareto method is estimated in the appendix table for columns (1) and (2). In column (3) it is two standard errors larger, in column (4), two standard errors smaller. The sample includes all groups with at least $5,000 in income in 1931 except column (2) which includes those with at least $25,000.

Table 6A: Marginal Tax Rates For Selected Income Levels, 1934-1938 [a]

Income Level	Surtax 1934	Surtax 1938
$5,000	.08	.08
$10,000	.11	.11
$25,000	.21	.21
$50,000	.34	.35
$100,000	.56	.62
$500,000	.61	.74
$1,000,000	.63	.77
$5,000,000	.63	.79

Source: *Department of the Treasury, Statistics of Income* (1940)

[a] These are the top marginal tax rates including both the normal and the surtax for the given year. Incomes listed are in current dollars for the year in question.

Table 6B: Natural Experiment 1934-1938 Tax Change[a]

	Number of Returns[b]	Income Group 1934	Mean Income 1934[c]	Mean Income 1938 (Pareto)[d]	Change in Ln(Income)[e]	Change in Ln(1-t)[f]
A	20,931	25-50	33.4	37.7	.108	-.083
B	6,093	50-100	66.6	75.8	.129	-.271
C	1,907	100+	220.1	267.4	.194	-.272

Comparison:[g]	**Elasticity**[h]
C vs. B	--
B vs. A	-0.46
C vs. A	-0.11

Source: Author's calculations using data from the *Department of the Treasury, Statistics of Income.*

[a] The elasticities listed in the bottom panel are based on the data in the top panel using the method described in the text. Nominal GDP in the later years was 1.302 times nominal GDP in the base year. The shape parameter, θ, used in the Pareto method was 1.765, as listed in the appendix. Income variables are in thousands of current dollars.

[b] The number of tax returns is from 1934.

[c] Mean income in 1934 calculated for the income group listed in the second column.

[d] Mean income in 1938 calculated using the Pareto method described in the appendix.

[e] The change in log mean income for each group from 1934 to 1938.

[f] The change in log net-of-tax share for each group calculated as described in the text.

[g] Groups being compared as listed in the top panel.

[h] Difference-in-differences elasticity calculated as $(\Delta\ln(\text{income}_I)-\Delta\ln(\text{income}_j))/(\Delta\ln(1-t_I)-\Delta\ln(1-t_j))$. The C vs. B experiment is not listed because the change in log net-of-tax shares are almost identical for the two groups so the denominator is close to zero.

Table 6C: Regression Results Using Income Category Data: 1934-1938 Tax Change[a]

Dependent Variable: Change in Ln(Income)	(1)	(2)	(3) Higher θ	(4) Lower θ
Change in Ln(1-t)	-.550	-.825	-.499	-.607
	(.217)	(.302)	(.191)	(.247)
Constant Term	.079	-.208	.081	.076
	(.067)	(.106)	(.059)	(.076)
Number of Income Categories	9	7	9	9
R^2	.48	.60	.49	.46

Source: Author's regressions using data from the *Department of the Treasury, Statistics of Income.*

[a] The standard errors are in parentheses. The dependent variable in each regression is the change in log income for each income group as calculated using the Pareto method described in the text. The shape parameter, θ, used in the Pareto method is estimated in the appendix table for columns (1) and (2). In column (3) it is two standard errors larger, in column (4), two standard errors smaller. The sample includes all groups with at least $5,000 in income in 1934 except column (2) which includes those with at least $25,000.

Table 7A: Marginal Tax Rates For Selected Income Levels, 1948-1952 [a]

Income Level	Marginal Rate 1948	Marginal Rate 1952
$10,000	.2288	.29
$25,000	.3784	.48
$50,000	.5192	.66
$100,000	.6600	.77
$250,000	.7832	.90
$500,000	.8213	.92

Source: Pechman (1984)

[a] These are the top marginal tax rates. Incomes listed are in current dollars for the year in question.

Table 7B: Natural Experiment 1948-1952[a]

	Number of Returns[b]	Income Group 1948	Mean Income 1948[c]	Mean Income 1952 (Pareto)[d]	Change in Ln(Income)[e]	Change in Ln(1-t)[f]
A	52,725	50 – 100	66.7	71.4	.069	-0.351
B	15,716	100 – 500	160.6	170.1	.057	-0.737
C	564	500 +	944.6	951.7	.007	-0.850

Comparison:[g]	**Elasticity**[h]
C vs. B	0.40
B vs. A	0.12
C vs. A	0.03

Source: Author's calculations using data from the *Department of the Treasury, Statistics of Income.*

[a] The elasticities listed in the bottom panel are based on the data in the top panel using the method described in the text. Nominal GDP in the later years was 1.330 times nominal GDP in the base year. The shape parameter, θ, used in the Pareto method was 2.107, as listed in the appendix. Income variables are in thousands of current dollars.

[b] The number of tax returns is from 1948.

[c] Mean income in 1948 calculated for the income group listed in the second column.

[d] Mean income in 1952 calculated using the Pareto method described in the appendix.

[e] The change in log mean income for each group from 1948 to 1952.

[f] The change in log net-of-tax share for each group calculated as described in the text.

[g] Groups being compared as listed in the top panel.

[h] Difference-in-differences elasticity calculated as $(\Delta\ln(\text{income}_I)-\Delta\ln(\text{income}_j))/(\Delta\ln(1-t_I)-\Delta\ln(1-t_j))$.

Table 7C: Regression Results Using Income Category Data: 1948-1952 Tax Change[a]

Dependent Variable: Change in Ln(Income)	(1)	(2)	(3) Higher θ	(4) Lower θ
Change in Ln(1-t)	.157	.102	.168	.146
	(.048)	(.081)	(.042)	(.055)
Constant Term	.162	.122	.164	.160
	(.028)	(.054)	(.025)	(.033)
Number of Income Categories	8	6	8	8
R^2	.64	.28	.73	.59

Source: Author's regressions using data from the *Department of the Treasury, Statistics of Income.*

[a] The standard errors are in parentheses. The dependent variable in each regression is the change in log income for each income group as calculated using the Pareto method described in the text. The shape parameter, θ, used in the Pareto method is estimated in the appendix table for columns (1) and (2). In column (3) it is two standard errors larger, in column (4), two standard errors smaller. The sample includes all groups with at least $15,000 in income in 1948 except column (2) which includes those with at least $30,000.

Table 8A: Marginal Tax Rates For Selected Income Levels, 1962-1966[a]

Income Level	Marginal Rate 1962	Marginal Rate 1966
$10,000	.26	.22
$25,000	.43	.36
$50,000	.59	.50
$100,000	.75	.62
$250,000	.89	.70
$500,000	.91	.70

Source: Pechman (1984)

[a] These are the top marginal tax rates. Incomes listed are in current dollars for the year in question.

Table 8B: Natural Experiment 1962-1966[a]

Number of Returns[b]	Income Group 1962	Mean Income 1962[c]	Mean Income 1966 (Pareto)[d]	Change in Ln(Income)[e]	Change in Ln(1-t)[f]
121,250	50-100	65.7	88.8	.301	.169
25,841	100-500	161.8	228.3	.344	.693
1,146	500+	1,051.7	1322.6	.229	1.204

Comparison:[g]	**Elasticity**[h]
C vs. B	-0.22
B vs. A	-0.07
C vs. A	0.08

Source: Author's calculations using data from the *Department of the Treasury, Statistics of Income.*

[a] The elasticities listed in the bottom panel are based on the data in the top panel using the method described in the text. Nominal GDP in the later years was 1.346 times nominal GDP in the base year. The shape parameter, θ, used in the Pareto method was 2.063, as listed in the appendix. Income variables are in thousands of current dollars.

[b] The number of tax returns is from 1962.

[c] Mean income in 1962 calculated for the income group listed in the second column.

[d] Mean income in 1966 calculated using the Pareto method described in the appendix.

[e] The change in log mean income for each group from 1962 to 1966.

[f] The change in log net-of-tax share for each group calculated as described in the text.

[g] Groups being compared as listed in the top panel.

[h] Difference-in-differences elasticity calculated as $(\Delta\ln(\text{income}_I)-\Delta\ln(\text{income}_j))/(\Delta\ln(1-t_I)-\Delta\ln(1-t_j))$.

Table 8C: Regression Results Using Income Category Data: 1962-1966 Tax Change[a]

Dependent Variable: Change in Ln(Income)	(1)	(2)	(3) Higher θ	(4) Lower θ
Change in Ln(1-t)	.022	.001	.006	.041
	(.024)	(.027)	(.036)	(.016)
Constant Term	.293	.315	.285	.301
	(.020)	(.025)	(.030)	(.013)
Number of Income Categories	6	5	6	6
R^2	.17	.01	.01	.62

Source: Author's regressions using data from the *Department of the Treasury, Statistics of Income.*

[a] The standard errors are in parentheses. The dependent variable in each regression is the change in log income for each income group as calculated using the Pareto method described in the text. The shape parameter, θ, used in the Pareto method is estimated in the appendix table for columns (1) and (2). In column (3) it is two standard errors larger, in column (4), two standard errors smaller. The sample includes all groups with at least $20,000 in income in 1962 except column (2) which includes those with at least $50,000.

Table 9A: Marginal Tax Rates on Earned Income for Selected Levels, 1970-1974[a]

Income Level	Marginal Rate 1970	Marginal Rate 1971	Marginal Rate 1972-74
$25,000	.369	.36	.36
$50,000	.5125	.50	.50
$75,000	.56375	.55	.50
$100,000	.6355	.60	.50
$250,000	.7175	.60	.50
$500,000	.7175	.60	.50

Source: Pechman (1984)

[a] These are the top marginal tax rates on earned income. Incomes listed are in current dollars for the year in question.

Table 9B: CEO Compensation in 1970[a]

Percentile	1970 Cash Compensation
10	$77,000
25	$100,000
50	$140,000
75	$190,000
90	$250,000
Mean	$154,427
Standard Deviation	$77,789
N	2,338

Source: Forbes (1971)

[a] Incomes listed are in current dollars and include salary and bonus compensation.

Table 9C: Panel Data On Executives: Forbes Survey 1970-1974[a]

Independent Variable[b]	(1)	(2)	(3)	(4)
Ln(1-t)	.083	-.361	.219	-.185
	(.033)	(.057)	(.034)	(.107)
Ln(Employees)	.051	.030	.044	.033
	(.012)	(.012)	(.012)	(.012)
GDP Growth	-.006		-.494	
	(.179)		(.182)	
Tenure as CEO	.012	.004	.008	.003
	(.003)	(.003)	(.003)	(.003)
$Tenure^2$	-.0004	-.0002	-.0003	-.0002
	(.0001)	(.0001)	(.0001)	(.0001)
Age	.010	-.001	.003	-.002
	(.003)	(.003)	(.003)	(.003)
Age^2	-.00002	-.00000	-.00001	-.00000
	(.00001)	(.00001)	(.00001)	(.00001)
Year Dummies	no	yes	no	yes
n	2869	2869	2869	2869
R2	.90	.90	.90	.90
Tax Rate	GDP Predicted	GDP Predicted	Firm Predicted	Firm Predicted

Source: Author's regressions using data from the *Forbes* executive compensation survey.

[a] Standard errors are in parentheses. The dependent variable is the log of real income for the executive in a given year.

[b] Ln(1-t) is the log of the net-of-tax share as calculated using the method listed at the bottom of the column, as described in the text. Ln(Employees) is the log of the number of employees in the CEO's company in the year. Tenure is the years the individual has served as CEO. Age is the CEO's age in years.

Table 10A: CEO Compensation in 1934[a]

Percentile	1970 Cash Compensation
10	$32,000
25	$40,000
50	$60,000
75	$85,000
90	$126,000
Mean	$73,007
Standard Deviation	$51,789
N	888

Source: Author's calculations from *Survey of American Listed Corporations* (1940)

[a] Incomes listed are in current dollars and include salary and bonus compensation.

Table 10B: Marginal Tax Rates For Selected Income Levels, 1934-1938[a]

Income Level	Marginal Rate 1934-35	Marginal Rate 1936-38
$25,000	.21	.21
$50,000	.34	.35
$75,000	.46	.51
$100,000	.56	.62
$250,000	.58	.68
$500,000	.61	.74

Source: *Department of the Treasury, Statistics of Income* (1940)

[a] These are the top marginal tax rates including both the normal and the surtax for the given years. Incomes listed are in current dollars for the year in question.

Table 10C: PANEL DATA ON EXECUTIVE COMPENSATION 1934-1938[a]

Independent Variable[b]	(1)	(2)	(3)	(4)
Ln(1-t)	.278	-.347	-.088	-.587
	(.177)	(.090)	(.190)	(.140)
Ln (Market Value)	.113	.142	.115	.100
	(.031)	(.028)	(.042)	(.041)
Firm Annual Return	-.009	-.105	-.001	.004
	(.022)	(.052)	(.027)	(.027)
Market Annual Return		-.019		-.041
		(.022)		(.057)
GDP Growth Rate		-.154		-.236
		(.174)		(.188)
Year Dummies	yes	no	yes	no
n	755	755	755	755
R2	.934	.931	.927	.924
Tax Rate	GDP Predicted	GDP Predicted	Firm Predicted	Firm Predicted

Source: Author's regressions using data from *Survey of American Listed Corporations* (1940).

[a] Standard errors are in parentheses. The dependent variable is the log of real income for the executive in a given year.

[b] Ln(1-t) is the log of the net-of-tax share as calculated using the method listed at the bottom of the column, as described in the text. Ln(Market Value) is the log of the real market value of the CEO's firm in a given year. Firm annual return is the change in log market value in the year. Market Annual Return is the return on the entire market from Hadlock and Lumer (1997).

Appendix Table: Estimates of the Pareto Distribution[a]

	(1)	(2)	(3)	(4)	(5)	(6)
θ [b]	-1.619	-1.794	-1.765	-2.107	-2.063	-1.887
	(.033)	(.055)	(.032)	(.022)	(.050)	(.056)
Constant	16.563	15.824	16.077	19.556	20.522	16.897
	(.187)	(.271)	(.156)	(.196)	(.257)	(.278)
N	8	8	8	7	6	8
R^2	.997	.994	.998	.999	.998	.995
Year	1926	1935	1938	1952	1966	1989

Source: Author's calculations based on data from various issues the *Department of the Treasury, Statistics of Income* as listed at the bottom of each column

[a] Each row estimates the shape parameter to a Pareto distribution using the histogram data from the IRS *Department of the Treasury, Statistics of Income* for the year listed in the first column as described in the appendix. The dependent variable is the log number of returns greater than some amount and the right hand side variable is the log of that amount. Standard errors are listed in parentheses.

[b] The coefficient on the right hand side variable is θ, the shape parameter of the Pareto distribution.

[1] The Secretary of the Treasury in the 1920s, Andrew Mellon, was the chief public advocate of the position and discussed it at length in his book *Taxation: The People's Business* (Mellon, 1924). Irwin (1998) documents that a central component to the debates over tariffs in the 1880s was the issue of whether "excessive" government surpluses could be eliminated by *increasing* tariff rates.

[2] See the work of Pencavel (1986), MaCurdy (1992), Heckman (1993) and Moffitt and Wilhelm (2000). This statement is less true for women deciding whether to enter the labor force (see Eissa, 1996 for recent work on the subject) as it may well be for particular types of workers such as doctors or entrepreneurs (see the results of Showalter and Thurston, 1997; Carroll and others, 1998).

[3] In particular, Lindsey (1987) and Feldstein (1995). Discussions of the literature can be found in Slemrod (1999) and Goolsbee (2000).

[4] See Feldstein (1996) and Slemrod and Yitzhaki (1996).

[5] Slemrod (1998, p. 774).

[6] Slemrod (1996), Goolsbee (2000).

[7] See, for example, Blundell, Duncan, and Meghir (1995) or Heckman (1996).

[8] Feldstein (1999).

[9] The idea that the deadweight loss is *exactly* the same whether it is a shift in hours worked or in form of compensation may be a bit extreme. There may be social externalities to working, for example, that do not accrue to tax avoidance. More importantly, Slemrod and Kopczuk (1998) consider the case where the government can directly affect the elasticity of taxable income through its enforcement regime and show that the implications may be rather different than those in this model.

[10] Feldstein (1995).

[11] Heckman (1996).

[12] Feldstein (1995).

[13] Slemrod (1998a) and Slemrod (1998b) survey some components of the NTR literature.

[14] See Auerbach (1988), Clotfelter (1997), or Woodbury and Huang (1991) for surveys of some of these topics.

[15] Lindsey (1987).

[16] Feenberg and Poterba (1993).

[17] Slemrod (1996).

[18] Slemrod (1992, 1994, 1996).

[19] Feldstein (1995).

[20] Slemrod (1995) and Gravelle (1993).

[21] Auten and Carroll (1995, 1997)

[22] Indeed, there is enough literature on the effects of TRA86 on various economic behavior that Auerbach and Slemrod (1997) could write an entire survey on the subject. Fullerton (1996), Gordon and Slemrod (1999), and others stress that changing the incentives to shift income from the corporate base to the individual base.

[23] See Katz and Murphy (1992) or the survey of Levy and Murnane (1992).

[24] Slemrod (1996) shows that such trends may eliminate all estimated effects of tax policy except in the case of 1986. Goolsbee (1999) shows that using secular trends from the compensation of very high income people such as executives and professional athletes, even the elasticities from 1986 get dramatically smaller.

[25] Feldstein and Feenberg (1996).

[26] See Parcell (1996). The importance of timing shifts more generally has been discussed in detail by Slemrod (1992; 1994; 1996).

[27] Goolsbee (1999).

[28] Sammartino and Weiner (1997), using a Treasury panel of tax returns in the 1990s, argue that the evidence showed little effect of tax rates on taxable income. Carroll (1998), uses a long panel of individual tax returns from 1989 to 1995 drawn from Treasury data indicating that although not near one, there is a significant elasticity of around .4 to .5.

[29] Slemrod (1998b).

[30] Recent exceptions include the work of Saez (1999a, 1999b). Saez (1999a) estimates the impact of marginal rate increases caused by inflationary "bracket creep" from 1979 to 1981. Saez (1999b) examines the impact of tax rates on the number of returns by income class in the period before World War Two and uses a similar procedure to the one here.

[31] See Feenberg and Poterba (1993) or Saez (1999b)

[32] References can be found in Johnson and Kotz (1970)

[33] This is explained in detail in Carroll (1998), Triest (1998), and Moffitt and Wilhelm (2000).

[34] Carroll (1998). A different way to think about this is to note that there can be a large elasticity of deductions with respect to the tax rate but this may have very little effect on the elasticity of total taxable income since deductions make up a small part of total income.

[35] This is not meant to imply that the large existing estimates from TRA86 are the "true" elasticity. As described above, trends in inequality and simultaneous changes to many parts of the tax code may be

the source of the large estimated elasticities. The goal here is rather to test if the Pareto method gives similar results to the micro data for the same tax change.

[36] See Gravelle (1993) for a discussion.

[37] I also tried to test for the importance of the Pareto assumption itself, since it enforces a smoothness to the income distribution that may not exist. Using the estimated Pareto distribution, I calculated the mean income for the observed nominal brackets in the later year (as opposed to the mean income for the same people in the previous year). This has the advantage that the true value is reported in the later year's data. To create an adjustment factor, I added the log difference between the predicted and observed income to the mean incomes of the original groups. In other words, if predicted mean income for people with over $1 million of income in 1989 was 10% lower than actual mean income, I added 10% to the mean income of the highest income group in the regression (those with more than $1.9 million in 1989). The estimated elasticities were very similar in all of the cases and that is due to the fact that the differences between predicted and actual income were minimal in almost all cases.

[38] Slemrod (1998), and Slemrod and Kopczuk (1998) have emphasized that the taxable income elasticity will depend directly on the enforcement regime and other aspects of the tax system.

[39] See the evidence in Saez (1999b) and Goolsbee (2000).

[40] Goldin and Margo (1992), Katz and Murphy (1992), Goldin and Katz (1999) analyze the subject in detail.

[41] The data are taken from Pechman (1984) and the *Statistics of Income* (1940).

[42] Goolsbee (1998) gives a description of the relative tax treatment of corporate and equity income during this period.

[43] Murray (1978).

[44] Mellon (1924, p. 81)

[45] Sobel (1998)

[46] See Soule (1947), Lampman (1967) or the data in Kuznets (1953).

[47] Goldin and Katz (1999).

[48] Gordon (1998).

[49] Because of the extremely small number of tax returns involved, I combined people with greater than $300,000income per year into a single category.

[50] Burner (1979).

[51] The evidence in Goldin and Katz (1999), and the earlier data of Lebergott (1947) and Kuznets (1953), clearly show a narrowing of income inequality in the 1930s.

[52] Leuchtenburg (1963).

[53] Brownlee (1996).

[54] Goolsbee (1998) examines the relative incentives in this period.

[55] McNaughton and Haymeyer (1948).

[56] Goldin and Margo (1992) present clear evidence that income inequality fell substantially during this period. It was part of what they term, "the great compression." They are not using data on the incomes of the very rich, however. If the pattern extended throughout the distribution, tax rose most on people whose relative income was already declining.

[57] Reeves (1993).

[58] See Goldin and Margo (1992) and Katz and Murphy (1992).

[59] See Goolsbee (1999, 2000).

[60] Hadlock and Lumer (1997).

[61] Goolsbee (1999).

[62] Discussions of the relative magnitude of option compensation relative to salary for various periods can be found in Hall and Liebman (1998) and Lewellan (1968).

[63] Johnson and Kotz (1970).